Town of Johnstown

TOWN COUNCIL WORK SESSION

450 S. Parish, Johnstown, CO
Monday, April 12, 2021 at 6:00 PM

MISSION STATEMENT: *"The mission of the government of the Town of Johnstown is to provide leadership based upon trust and integrity, commitment directed toward responsive service delivery, and vision for enhancing the quality of life in our community."*

AGENDA

CALL TO ORDER

AGENDA ITEMS

1. Road Naming Discussion - 30 Minutes
2. Economic Development Incentive Policy - 30 minutes
3. Discussion - Taste & Odor Mitigation and Water Plant Expansion

ADJOURN

AMERICANS WITH DISABILITIES ACT NOTICE

In accordance with the Americans with Disabilities Act, persons who need accommodation in order to attend or participate in this meeting should contact Town Hall at (970) 587-4664 within 48 hours prior to the meeting in order to request such assistance.

TOWN COUNCIL AGENDA COMMUNICATION
WORK SESSION

AGENDA DATE: April 12, 2021

SUBJECT: Road Naming Discussion

ATTACHMENTS: 1. GMA Major Roads Exhibit

PRESENTED BY: Kim Meyer, Planning and Development Director

As the Town of Johnstown grows and plats properties adjacent to major roadways, Staff believes it is appropriate and vital to rename these future urban roadways to identify them as Town roads and part of our community. As new residents arrive, and new signage is installed, these names will slowly transition. Platting is the ideal time to establish community-appropriate road names that carry forward consistently to new developments along these alignments. Internal roads often reflect the identity or theme of a development; but major roads should be named by the Town.

Major roadways anticipating near-term platting: (See Attachment 1 for a map)

*LCR 3E *(2 mi.- Freedom Pkwy to Marketplace/HPB/CR 50)*	
LCR 16 / CR 52	
*LCR 14 / CR 50	
*CR 46	
*CR 44 (w/ Berthoud)	
*CR 42 (w/ Berthoud)	
*CR 46.5	Centennial Dr (+ future west extension)
Frontage Rd. *(CR 50 to RR)*	
Hwy 60 (remain S 1st St?)	
CR 19 (w/ Milliken)	
CR 48.5 (w/ Milliken)	
CR 11 (w/ Berthoud)	
CR 40 (w/ Mead)	

Note: All road names will be vetted with Fire Districts to avoid confusion in an emergency.

Town of Johnstown, Colorado - Area Map

Town of Johnstown

Legend

- Town Limits
- Johnstown Growth Management Area
- Roads
- Parcels

0 0.25 0.5 1 Miles

Data Sources: Right-of-way and parcel linework provided by the Weld County and Larimer County GIS Departments. Other information taken from various Town of Johnstown GIS layers and sources.

Information conveyed on this map was produced using the most current data available through the Town of Johnstown's Geographic Information System. However, accuracy, completeness and distances are not guaranteed. This map is for general reference purposes only.

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Loveland

Windsor

Greeley

Johnstown

Unincorporated Weld County

Unincorporated Larimer County

Milliken

Larimer County

Weld County

HIGH PLAINS BLVD

COLORADO BLVD

!! (Frontage Rd) !!

FREEDOM PKWY (LCR 18 / WCR 54)

!! (LCR 3E) !!

!! (LCR 16 / WCR 52) !!

!! (LCR 14 / WCR 50) !!

PARISH AVE

!! (WCR 48.5 w/ Milliken) !!

!! (Rename S 1st St / Hwy 60??) !!

!! (WCR 46) !!

CENTENNIAL DR (needs Resolution for East of Parish)

!! (WCR 11 w/ Berthoud) !!

!! (WCR 44 *w/ Berthoud) !!

!! (WCR 42) !!

Possible Road Names:
**All need to be vetted with FRFR & LFRA*

5 Urgent road names - will plat soon
5 Less urgent - need coordination names

Johnstown Blvd. (Hwy 60 / S 1st St Downtown still?)
Hillsborough Rd.
Beet Street
Roosevelt Ave./Pkwy (CR 46) - Coord. with RE5-J

Area Family Names:
Massey
Cito
Beeten (owned old service station)
Reider (prior postmaster)
Sauer
Fahrenbruch (diary farm, Clerk & Town Board)

Prepared by the Planning & Development Department
Accurate as of 06/22/2020

TOWN COUNCIL AGENDA COMMUNICATION

WORK SESSION

AGENDA DATE: April 12, 2021

SUBJECT: Economic Development Incentive Policy

ACTION PROPOSED: Provide feedback regarding Economic Development Incentive Policy

ATTACHMENTS:
1. Current Economic Development Incentive Policy
2. 2021 Draft Economic Development Policy
3. 2021 Draft Economic Development Incentive Request form

PRESENTED BY: Sarah Crosthwaite, Economic Development Manager

AGENDA ITEM DESCRIPTION:

Staff has prepared a draft of an economic development incentive policy including an incentive request form to replace the existing incentive policy in place by the Town of Johnstown. The purpose of the incentive policy is to establish a procedural guideline as to how incentives are requested, awarded, and executed while also determining the types of industry the Council wishes to attract to the community.

The incentive policy itself is sectioned to clearly outline its goal, purpose, objectives, targeted industries, types of incentives, request process, and the establishment of an incentive agreement. The incentive policy focuses on attracting distinct but complementary industries of growth such as commercial, destination, industrial, and affordable housing. These targeted industries will allow for a diversified economy within Johnstown while ensuring positive fiscal, community, and employment impact. The types of incentives offered are a range of current incentives the Council has historically approved while incorporating new concepts that provide Johnstown a competitive edge within a growing region.

A process has also been incorporated into the incentive policy to ensure a fair and judicious method of how incentives are requested by an applicant to the Town. Having a process in place ensures the Town's goal and purpose of the incentive policy is strategically used for a maximization of benefits for all parties involved. The incorporation of an incentive agreement also ensures incentives are clearly outlined for all parties, expectations are defined, and the Town establishes remedies within each agreement should the applicant not meet its obligation to the standard of the Council.

An incentive request form has also been incorporated as a separate document to be utilized by staff so that as incentives are requested by an applicant, certain data points are collected and a

clear outline of the project is presented. This will ensure Council makes the most informed decision regarding an incentive request.

Staff requests feedback regarding the incentive policy and incentive request form to ensure it aligns with the goals of Council in terms of economic development activity, attraction, and development of the Town.

Town of Johnstown

ECONOMIC DEVELOPMENT INCENTIVE POLICY

GOAL STATEMENT

The Town of Johnstown ("Town") supports economic development to sustain the fiscal health of the community, promote employment opportunities and enhance the quality of life in the Town. To further those goals, the Town desires to create tools to assist economic development in order to attract new businesses to the community, retain and promote the expansion of existing businesses in the community and diversify the local economy.

ELIGIBLE PROJECTS

The Town may consider providing economic incentives to businesses that offer extraordinary long-term benefits to the Town. In determining whether to grant an economic incentive, the Town is guided by whether an economic incentive is likely to attract new, sustainable and desirable development to the community, whether a proposed development that is attractive to the community would locate in the Town without an economic incentive, whether an existing business desires to expand in a manner that would be beneficial to the Town or whether an existing business is actively seeking to relocate outside the Town. The Town shall be particularly inclined to grant economic incentives to businesses with a strong sales tax base or to businesses within the historic downtown area.

Based on those broad principles, the Town considers the following criteria in determining whether to grant an incentive:

- Potential to generate sales tax revenue
- Substantial capital investment in the Town
- Creation of new employment
- Above-average wages
- Diversification of businesses that enhance quality of life
- Desirable retail establishments
- Vital industry with a long term commitment to the Town
- Uniqueness of a project deemed advantageous and beneficial to the Town
- Location of new sales tax generating business
- Potential to induce other desirable businesses to locate in the Town
- Quality of the proposed improvements and use

POTENTIAL INCENTIVES

For eligible development projects, the Town may consider the following potential economic incentives based upon the magnitude and attractiveness of the project:

Use Tax. The Town may waive, reimburse or defer payment of a portion of the use tax generated by a development if the funds are otherwise used to assist in the payment of the cost of the public improvements associated with the development project.

Development Fees. The Town may waive, reimburse or defer payment of building permit and inspection fees if the funds are otherwise used to assist in the payment of the cost of the public improvements associated with the development project.

Sales Tax. The Town may consider a rebate, or share-back, of a portion of the sales tax generated to reimburse a developer for the cost of public improvements associated with the development project.

Impact Fees. The Town may consider deferral of all or a portion of the transportation facilities development fees, the public facilities development fees or the police facilities development fees from the application for a building permit to the issuance of a certificate of occupancy.

Metropolitan Districts. The Town may consider a service plan for the formation of a metropolitan district under the Special District Act, Title 32, Article 1, C.R.S., allowing the metropolitan district to finance, design, plan, construct, install and/or complete public improvements. When appropriate, the Town may authorize the metropolitan district to collect public improvement fees on sales transactions to pay for debt associated with public improvements.

Personal Business Property Tax. The Town does not impose a personal business property tax.

Downtown Façade Grant Program. The Town may provide financial assistance for improvement projects to building façades in the downtown area to encourage revitalization of private and commercial properties. See www.townofjohnstown.com/309/historic-downtown.

Coordination with Economic Development Agencies. The Town may actively assist and help coordinate efforts to obtain grants and financial assistance from other economic development agencies, such as Upstate Colorado Economic Development and the Colorado Office of Economic Development and International Trade.

Weld County Enterprise Zone. Pre-certified companies that locate or expand within the Town's portion of the Weld County Enterprise Zone may be eligible to earn a variety of state income tax credits.

For purposes of this economic development incentive policy, public improvements include public infrastructure improvements, such as street improvements, traffic signalization, sidewalks or trails, water and sanitary sewer lines, storm sewer lines, drainage improvements, parking facilities or water quality improvements, and also include improvements to public spaces, public art, landscaping and the construction of unique or enhanced elements of streetscape and the built-environment.

COORDINATED AND EXPEDITED REVIEW

A request for an economic incentive shall be evaluated on a case-by-case basis to determine the overall benefit and impact to the community. In reviewing a request, the Town commits to expedited review, superior customer service and a quality development review process.

A developer or business ("applicant") seeking an economic incentive shall submit a written request to the Town. Upon receipt of the written request, Town staff shall review the request and schedule an in-person review meeting with the applicant. As a part of the review process, Town staff shall perform a cost-benefit analysis of the requested economic incentive, identifying and calculating the benefits to the community compared with the costs and impacts. When appropriate, Town staff may require that the applicant obtain a cost-benefit analysis from an independent outside consultant to determine the viability of the requested economic incentive.

Once Town staff and the applicant have finalized discussions and negotiations, regardless of whether Town staff and the applicant have reached agreement on the economic incentive request, the applicant shall have an opportunity to appear before Town Council to request the economic incentive. At that time, Town staff shall present its findings and also make a recommendation to Town Council. Town Council retains full discretion and final authority to approve or deny an economic incentive, and may do so on any basis that it deems to be proper and appropriate and in the best interests of the Town.

DRAFT: Town of Johnstown Incentive Policy

Goal Statement
The Town of Johnstown (Town) aims to attract new businesses, retain and expand its existing businesses, diversify the local economy, and enhance the quality of life for its residents.

Purpose
The purpose of the incentive policy is to establish general procedures and requirements to govern the fair, judicious, and strategic use of incentives by the Town in order to meet its economic development goals.

Objectives
In evaluating any economic development project and the use of incentives, the Town will apply the following objectives:

- Incentives will be based on a "case by case" review of each economic development project and incentive request and must clearly demonstrate substantial
    - Fiscal Impact
        - How much direct sales tax will be generated
        - How much real and personal property value will be added to the local economy
        - What is the capital investment of the project
        - What infrastructure will be required to sustain the development
    - Community Impact
        - Is the project compatible with the Town's Comprehensive Plan
        - Does the project compliment the existing local business community
        - Does the project enhance the quality of life for residents
        - Does the project create any environmental impact
    - Employment Impact
        - How many local jobs will be created both directly and indirectly
        - What type of jobs will be created
        - What will be the average salary per employee
        - What will be the total annual payroll
- To be most effective, the Town will creatively and effectively combine or package resources and/or incentives from public and private sources
- The Town retains the right to deny an incentive request and/or modify the incentive policy

Targeted Industries
The Town recognizes the need for diversification and will focus on four distinct but complementary categories of development; commercial, destination, industry, and housing.

- Commercial: to increase the Town's tax base, and to diversify, expand, and increase the market presence of services and products in the community
- Destination: to increase the Town's tax base, and to attract customers from outside the Town, and provide new and different shopping, dining, and/or entertainment experiences.
- Industry: to increase the Town's tax base, diversify, expand, and increase the presence of private-sector companies, and create high-paying quality jobs in the community

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- Housing: to increase the City's tax base, and to provide a diverse range of housing types, with an emphasis on affordable/attainable housing for current and future residents.

Available Incentives

The Town offers several types of incentives either individually or in various combinations in order to meet its economic development goals.

Incentives include but are not limited to:

Expediated Review Process

The Town may consider expediating the development review process should the project meet one of the targeted industries within one of the targeted corridors. The expediated review process guarantees an applicant's project will receive priority review and approval of land use applications and building permits.

Provision of Land and Property

The Town may consider the provision of land and/or property to a developer and/or business for a project that meets one of the targeted industries within one of the targeted corridors.

Site Preparation Including Infrastructure Improvements

The Town may consider to work in conjunction with a developer to create reasonable, cost-effective infrastructure options. Provision of materials and expert resources may be negotiated, including fill material, environmental investigations, wetland investigations, permitting processes, etc.

Land Development Fees

The Town may consider reducing or waiving development fees such as those for:

- Plan Review
- Building Permit
- Use Tax

Creation of Special Financing Districts

The Town may consider a variety of special financing districts which would allow the district to finance, design, plan, construct, install and/or complete public improvements related to a development project. Special financing districts can include but are not limited to:

- Public Improvement Fees
- Tax Increment Financing
- Metropolitan District
- Urban Renewal Authority

Grants, Loans, and/or Forgivable Debt

The Town may consider grant, loan, and/or forgivable debt programs to a developer and/or business in order to assist with the development costs of a project. Available funds are at the discretionary authority of the Town. Grant programs can include but are not limited to:

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- Johnstown Façade Grant

Sales Tax Rebate

The Town may consider a rebate or share-back, of a portion of the sales tax generated specific to the project as a payment to the business and/or developer.

Job Creation

For every net new job created from a primary employer and maintained for at least one (1) year, and where the employee resides in Johnstown, Colorado, and is paid at least 150% of the average annual wage in the county (Weld or Larimer County) where the project will be located, the business is eligible to receive a one-time maximum payment of up to $1,000 per net new employee. The average annual wage for Weld or Larimer County will be determined by the United States Department of Labor, Bureau of Labor Statistics.

Priority Annexation

Applicants seeking a project within an unincorporated area (Weld or Larimer County) can annex into the Town limits through an expediated process and where associated voluntary annexation application fees can be waived or reduced.

Liaison between Economic Development Agencies and External Parties

The Town's Economic Development Department can serve as a liaison between developers, private owners, local lending institutions, and State and federal agencies, if requested. Agencies can include but are not limited to:

- Office of Economic Development and International Trade (OEDIT)
- Weld County
- Larimer County Economic & Workforce Development
- Up State Colorado
- Small Business Administration (SBA)

Incentive Request

Any person, organization or corporation requesting incentives from the Town of Johnstown will comply with the following procedural guidelines. An Applicants submission of an incentive request and/or documentation does not constitute an approval from the Town to provide incentives.

Incentive Request Process

All incentive requests will be initiated through the Town's Economic Development Department. An applicant must contact the Economic Development Manager to schedule a preliminary meeting to discuss project concept and incentive request. Applicant should be prepared to provide during the preliminary meeting:

- General site plan
- Capital investment projection
- Timeline/phase of the project
- Overall fiscal, community, and employment impact to the Town and region

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Additional information may be requested as needed.

Following the preliminary meeting, Town staff will review the project and incentive request internally. Subsequent meetings may be held with the applicant before bringing to the Town Council for consideration.

The Economic Development Manager will work with the Applicant to finalize the incentive request and be the point of contact throughout the process.

The final decision for any incentive request will be the sole discretion of the Town Council.

Incentive Agreement

If approved by the Town Council, all incentive packages will require a fully executed incentive agreement. The development agreement will include at minimum the responsibilities of each party, the expectations of the development, and claw backs, if applicable. Negotiated reporting requirements will be the responsibility of the business to provide to the Town. Failure to provide the required information in a format acceptable to the Town may constitute a breach of the incentive agreement.

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Town of Johnstown, Colorado
Incentive Request Form

SECTION I

Applicant

Company Name: _____

Applicant headquarters address: _____

City: _____ State: _____ Zip: _____

Ownership: ☐Private ☐Public

Business Structure: ☐Proprietorship ☐Partnership
☐Corporation ☐Other

Contact person

Name: _____ Title: _____

Phone Number: _____ Email: _____

SECTION II

Project information

Proposed location address: _____

City: _____ County: _____ Zip: _____

NAICS code: _____ Industry type: _____

Does the site require annexation into the Town limits: ☐Yes ☐No

Building: ☐New construction ☐Expansion ☐Improvements

Acquisition: ☐Purchased

If yes, purchase date Click or tap to enter a date.

☐Leased

If yes, lease term_____

Briefly describe project (conceptual site plan in lieu will be accepted): _____

_____

_____

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List other communities considered for this project: _____
_____
_____

Has the company applied or received any incentives for this project? If yes, briefly explain which entity and type of incentive: _____
_____
_____

SECTION III

Fiscal Impact Information

Real Property:

Land	$
Existing Building Improvements	$
New Building Improvements	$
Total	**$**

Personal Property:

Equipment	$
Machinery	$
Furniture and Fixtures	$
Other	$
Total	**$**

Total capital investment for proposed project $_____

How much annual gross revenue will be generated $_____

If applicable; how much direct sales tax will be generated annually $_____

SECTION IV

Employment Impact Information

Provide number of Full-Time jobs, with hourly wage/salary, to be created or retained. Fringe benefits are not to be included in these calculations. Include current employment numbers, if applicable. Attach additional sheets if necessary.

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Title or Occupation	Number of employees	Hourly wage per employee	Annual Salary
		$	$
		$	$
		$	$
		$	$
		$	$

Provide number of Part-Time jobs, with hourly wage/salary, to be created or retained. Fringe benefits are not to be included in these calculations. Include current employment numbers, if applicable. Attach additional sheets if necessary.

Title or Occupation	Number of employees	Hourly wage per employee	Annual Salary
		$	$
		$	$
		$	$
		$	$
		$	$

Total company jobs to be created or retained once project is complete: _____

If available, include expected number of constructions jobs: _____

Provide total annual payroll years 1-3, excluding fringe benefits:

	Year 1: 202_	Year 2: 202_	Year 3: 202_
# Existing jobs			
# New jobs			
Total annual payroll	$	$	$

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Please submit the completed incentive request form and any additional documentation to:

Sarah Crosthwaite
Economic Development Manager
scrosthwaite@townofjohnstown.com
970-578-9612

TOWN COUNCIL AGENDA COMMUNICATION
WORK SESSION

AGENDA DATE: April 12, 2021

SUBJECT: Discussion - Taste & Odor Mitigation and Water Plant Expansion

ATTACHEMENTS:
1. Microbac Laboratory Services White Paper
2. Technical Memorandum – Burns & McDonnel
3. Presentation – Burns & McDonnel - DRAFT
4. Taste & Odor Spreadsheet Cost

PRESENTED BY: Marco Carani, PW Director

In an effort to address taste and odor complaints received from our residents, the Town contracted with Burns and McDonnel in December 2020, to begin a study to evaluate our best alternatives to improve the aesthetics of the Town's drinking water. While the taste and odor issues have not impacted water quality as measured by the State, it does impact the enjoyability of the water and both the Council and Staff are committed to making improvements that change the residents perception of the water we provide. To support this initiative, funds were appropriated by Council in FY 2021, based on a best guess by Staff, regarding how to deliver improved water taste on either an interim or permanent bases. This interim basis improvement has the ability to be a permanent solution, dependent on the long-term vision for the expansion of the water treatment plant, also scheduled to begin design in FY 2021.

Burns and McDonnel are near completion of their analysis and will be presenting their findings with recommendations on how to improve the water quality before the warm water season approaches. The warmer months are significant contributors which impact of taste and odor, as it enables for the productions of geosmin and MIB (see attached laboratory white paper).

Burns and McDonnel will also provide information on long-term alternatives in an effort for Staff to understand what Council would desire/consider in terms of ultimate solutions to this issue. Burns and McDonnel are one of the finalist for our water treatment expansion. As Council provides Staff with the direction desired on water facility and quality outcomes, we have asked Burns and McDonnel to provide some high-level information related to alternatives of the plant expansion while contemplating the characteristics of water desired.

The objectives from this work session item are to:

1. Understand from Council if the recommendation of a GAC system and its ancillary components are supported by Council or if other alternative methods are preferred for the immediate upgrades for taste and odor. A formal agenda item would be presented to Council on April 19 based on Council's feedback.
2. Understand from Council, what the long-term outcomes for water taste and odor issues are for our community based on preliminary ideas for the water treatment plant expansion from Staff and Burns and McDonnel.

Options that will be discussed:

Granular Activated Carbon (GAC) 80% removal.
A GAC system is especially suited for the removal of dissolved organic compounds responsible for poor taste and odor in drinking water.

Ultrasonic Buoy. At Town Lake.
This buoy activates the optimal ultrasonic treatment frequencies according to the water conditions and type of algae present. This reduces existing algae and prevent the growth of new algae.

Ozone with Bio Active Filtration (BAF) 95% removal.
A BAF system is a cost-effective treatment process that provides the foundation for controlling taste & odor, it removes disinfection byproducts and other contaminants which increase water stability and quality. This system has a higher up-front cost but a lower annual cost compared to GAC. Removal of taste & odor using BAF would be in the 95% range.

Goal is to hit the 7 ng/l. (7 is limit for human detection)
GAC with Buoy – 9 ng/l
Ozone BAF – 4 to 6 ng/l

Geosmin and MIB and Resulting Taste and Odor Problems in Finished Drinking Water

Committed to providing their customers quality drinking water, utilities across the country perform thorough chemical and biological testing to ensure that their product meets primary drinking water standards established by applicable regulatory agencies. Secondary standards relating to the aesthetic quality of drinking water are not mandated, but are often a source of consumer complaints when they are exceeded. In several instances, complaints regarding the taste and odor of a water, a secondary standard, have been related to two compounds, **Geosmin** and **MIB**. Consumer complaints regarding a musty and earthy odor have been attributed to these two compounds and continue to be an area of study in regard to their formation, measurement, and removal to improve aesthetic drinking water quality.

Geosmin, chemically known as 1,2,7,7-tetramethyl-2-norborneol, is an organic compound that is responsible for the earthy smell often associated with fresh-turned dirt. The name, Geosmin, directly translates to “earthy smell” from its origin over 100 years ago. **MIB**, or 2-methylisoborneol, has also been associated with musty taste and odor concerns in drinking waters. Both Geosmin and MIB are low molecular weight volatile tertiary alcohols. In water sources, these compounds are produced by some species of cyanobacteria (blue green algae) and actinobacteria (a group of gram positive bacteria). The presence of these bacteria are required for the formation of the compounds, however, production of the compounds are not always evident when these bacteria are present. MIB is produced during the life cycle of these bacteria and Geosmin is commonly trapped in the cell bodies and released in high concentrations when these bacteria die. As a result, taste and odor can be directly related to summer algae blooms in some water systems. There are other known sources of these taste and odor compounds that can be attributed to the decay of timber, leaves, and other naturally-occurring organic matter commonly found in surface waters.

Both Geosmin and MIB have extremely low odor thresholds to humans. It is not uncommon for the average person to detect the presence of theses compounds in the 10 to 30 part per trillion (ng/L) concentration range. Often during the summer months, water systems that depend upon surface water sources will experience complaints from consumers regarding taste and odor which can directly be attributed to Geosmin and MIB.

The presence of these two compounds in drinking water is an increasing concern. Quite simply put, consumers do not want their water smelling and tasting like dirt. This gives the impression that the water is not clean and, therefore, unsafe to drink. The matter is further complicated because these compounds are difficult to remove and continue to pose a problem at extremely low concentrations. To better understand this issue, two

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areas of study are actively underway as to the exact mechanisms of the chemical formation and how they can be cost-effectively removed from finished drinking water sources.

Recent studies conducted by Brown University chemists have discovered the protein responsible for the formation of Geosmin **(1).** The researcher found the gene responsible for Geosmin formation in streptomyces coelicolor, a strain of plant-munching bacteria found in soil. Understanding the mechanism as to how these odor chemicals are formed may lead to corrective measures to reduce or remediate occurrences. Since these mechanisms are poorly understood, studies continue to identify other water quality parameters such as dissolved oxygen, total organic carbon, temperature, and various nutrients to identify correlations between these parameters and increased concentrations of taste and odor-related chemicals. It is already well documented that increased nutrient concentrations (phosphorus and nitrogen) contribute to the formation of algae blooms in the warmer months.

When present in water at objectionable levels, engineering controls must be used to reduce or eliminate the concentration of Geosmin and MIB present in finished water. Adsorption onto activated carbon is one effective way of reducing Geosmin and MIB concentrations. This treatment technology is also effective at eliminating other undesirable chemicals from finished waters such as trihalomethanes, various other unwanted organic compounds, and a general reduction in Total Organic Carbon (TOC). Different treatment efficiencies will be observed from various water systems and effective removal is highly dependent upon contact time and other water quality parameters.

Other treatment approaches include the use of sand filters. Removal of taste and odor compounds has been demonstrated with sand filters that contain biofims. Higher removal efficiencies have been demonstrated with older beds that contain well-established biofims. As with activated carbon treatment, sand filter efficiency is contact time-dependant and varies with changing water qualities. A third treatment technology that is gaining in popularity is ozone. Ozone technologies are effective at treating and removing chemical and biological parameters of concern in finished water. Ozone treatment can prove to be a cost-effective treatment and removal mechanism over the long run, but often involves costly capital investments. Other approaches include ozone-enhanced biofiltration, which is effective for disinfection and trace organic removal and removal of odorants such as Geosmin and MIB.

Part of the effective control and treatment of Geosmin and MIB is having the ability to accurately measure the concentrations of these compounds in source and treated waters. Engineering decisions required for effective removal must be made on sound analytical

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data. Over treating or unnecessary treatment can result in unneeded expenditures, while under treatment can result in water quality that does not meet consumer standards and results in complaints. As increased study in the formation and control of taste and odor contaminants evolves, reliable analytical data is imperative.

Previous analytical methodologies for the analysis of Geosmin and MIB included closed loop stripping and conventional purge and trap techniques. Closed loop stripping involved large sample volumes and an adsorbent bed which must be eluted properly for accurate compound quantitation. With purge and trap technologies, large enough sample volumes cannot be easily analyzed to obtain the sensitivity required without encountering technological challenges. One of the current and effective ways to measure the concentration of taste and odor compounds in raw and finished water sources is Solid Phase Microextraction (SPME) followed by GC/MS detection. The SPME method utilizes a SPME fiber that is exposed to the headspace of the sample being evaluated. Target compounds from the sample are adsorbed in the fiber coating and then thermally desorbed from the fiber in a heated injection port. The method has recently been accepted and published as Standard Method 6040 D, Analysis of Taste and Odor Compounds. The method is sensitive for the odor compounds to the low single digit part per trillion reporting limits using quadrapole or ion trap mass spectrometers. The method allows for the easy and reliable extraction of the analytes of interest from drinking waters with good precision across a range of concentrations.

Summary

Taste and odor-related problems are a rising concern for water suppliers. Studies have indicated that 3% of utilities had a continuous problem with 10 percent of utilities having greater than 150 days per year of taste and odor-related problems. Two compounds, **Geosmin** and **MIB**, have been identified as the source of several of these complaints. The compounds originate primarily from various forms of algae and bacteria and can increase in concentration based upon various food sources of organic material. Current treatment technologies include the use of activated carbon, sand filters with biological active colonies, and ozone treatment. The efficiencies of these technologies can vary considerably depending upon overall water quality. To maintain high quality drinking water with acceptable taste and odor qualities, utilities must be able to accurately measure pre and post-treatment concentrations of these taste and odor-producing chemicals to cost effectively utilize existing resources. The use of SPME for the detection and measurement of Geosmin and MIB will be an important tool in providing consistent and reliable data to assist with the engineering controls to control taste and odor problems in finished drinking waters.

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Microbac Laboratories, Inc.'s Camp Hill Division has incorporated methodology to detect the presence and concentration of Geosmin and MIB in drinking and source waters. The methodology, based on Standard Method 6040 D, provides for the determination of Geosmin and MIB in finished drinking water, source water, or drinking water in any treatment stage.

(1) *Brown University (2007, September 19). Good Earth: Chemists Show Origin Of Soil-scented Geosmin. ScienceDaily. Retrieved March 19, 2010, from http://www.sciencedaily.com/releases/2007/09/070916143521.htm*

For more information, please contact: microbac_info@microbac.com

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Memorandum

BURNS McDONNELL

Date: February 9, 2021

To: Town of Johnstown, CO

From: Burns & McDonnell
9785 Maroon Circle Suite 400
Centennial, CO 80112

Subject: Technical Memorandum – Jar Testing Results with Powdered Activated Carbon for Taste and Odor Control, Burns & McDonnell Project No. 130019

1. Introduction

This memorandum summarizes the results from jar testing that took place on January 4, 2021 and makes general taste and odor control recommendations based on the jar testing results. The purpose of this testing was to investigate powder activated carbon (PAC) dosages for optimal taste and odor removal. The goal of the testing was to identify potential improvements in current dosages and provide recommendations to the Town of Johnstown (Johnstown) for future improvements to the PAC system. If jar testing results show that PAC improvements are insufficient or not feasible, this memo will identify the next steps in developing a taste and odor control strategy.

2. Background

Johnstown has access to three primary raw water sources: Lonetree Reservoir, Johnstown Reservoir (Town Lake), and the Home Supply Ditch. Both reservoirs are subject to seasonal taste and odor issues, primarily caused by Geosmin and 2-methylisoborneol (MIB). While Geosmin and MIB concentrations are not regulated or harmful, they have a very strong, earthy taste and odor that is detectable by humans at very low levels (approximately 7 to 10 ng/L).

Geosmin and MIB concentrations are usually highest during late summer into early fall when reservoir levels are low. Both Lonetree and Johnstown Reservoirs are predominantly impacted by Geosmin. Table 1 summarizes approximately 9 years of Geosmin data for Lonetree and Johnstown Reservoirs. Figure 1 illustrates seasonal and yearly fluctuations in these concentrations. Analysis shows that of the two reservoirs, Lonetree tends to have slightly higher Geosmin concentrations.

Table 1: Historic Geosmin Concentrations

	Minimum	Average	Maximum	85th Percentile	90th Percentile	95th Percentile
Lonetree Reservoir	1.51	129	985	188	330	365
Johnstown Reservoir	0.81	79	856	33.4	177	460

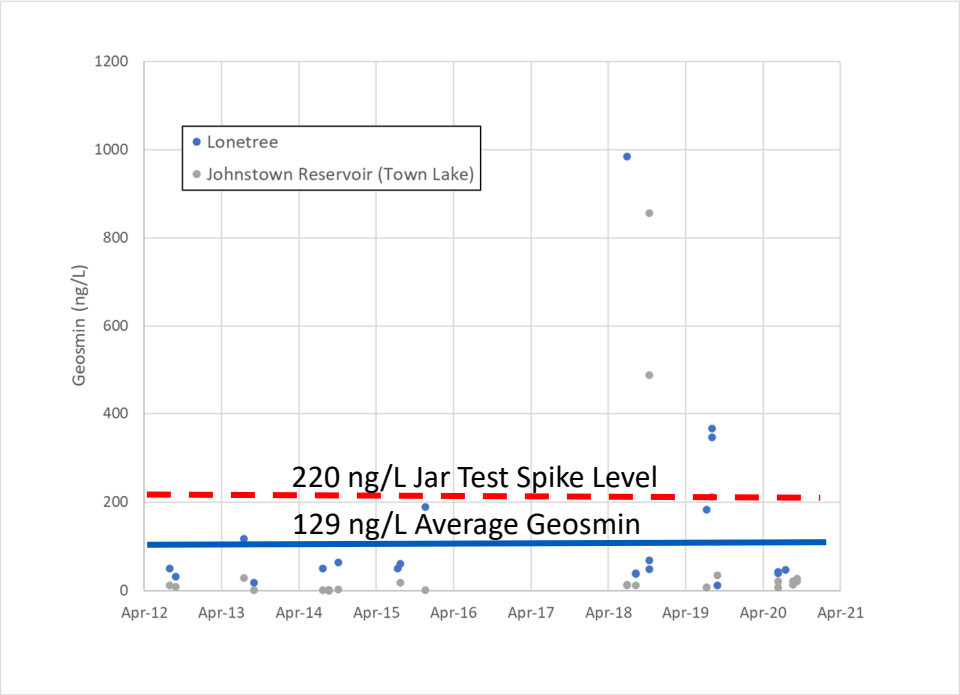

Figure 1: Historic Geosmin Concentrations

The current Johnstown WTP (3.1 mgd firm filtration capacity, 6.2 mgd total filtration capacity) processes include rapid mix, two-stage flocculation, dissolved air flotation (DAF), granular media filtration, and disinfection. PAC can be injected at the Lonetree Pump Station (PS) for pretreatment of raw water from Lonetree Reservoir and Home Supply Ditch. Currently, PAC dosing is limited to 1 to2 mg/L, due to equipment limitations and the manual labor required to add more than one or two 50 pound sacks of PAC per day. The existing system does not currently allow for adding more than one sack at a time, and the distance from the WTP limits the ability of operators to make frequent trips to the PS. The existing PAC system has a rated capacity of 150 pounds per day (lb/d). The PAC system was previously located at the Johnstown Reservoir PS but was relocated because the contact time was too limited and did not affect taste and odor levels at the WTP.

3. Comparison with Similar Systems

Johnstown data was compared with three similar municipalities in Colorado that also face taste and odor issues: The Town of Erie, the City of Thornton, and the City of Greeley. Each of these municipalities uses a different combination of technologies for seasonal taste and odor control.

3.1. Town of Erie

The Town of Erie (Erie), Colorado operates the Lynn R. Morgan Water Treatment Facility (16.65 mgd). The WTF processes include PAC injection, rapid mix, four-stage flocculation, sedimentation with inclined plate settlers, microfiltration membranes (submerged and pressure), granular activated carbon (GAC) contactors, solids handling, and disinfection. The PAC injection and GAC contactors are used for seasonal taste and odor control.

Erie utilizes four surface water sources for treatment and distribution: Raw Water Pump Station, Erie Lake, Northern Colorado Water Conservancy District (NCWCD), and Thomas Reservoir. All four raw water sources are conveyed to the facility by pipelines that combine in Vault B, which includes a PAC dosing point on the common feed. The GAC feed system operates downstream of the pressurized membrane system. The GAC system is utilized based on raw water TOC concentrations. Filtrate from the pressure membrane system is fed through the GAC system and blended with filtrate from the submerged membrane system.

Similar to Johnstown, Erie taste and odor issues are primarily caused by Geosmin. Raw water from Erie Lake presents the greatest treatment challenge for Erie, with an average value of approximately 400 ng/L and a maximum value of approximately 700 ng/L. However, Erie Lake is only used as a floating storage reservoir off the RWPS discharge pipes and is used periodically. Erie primarily utilizes water from the RWPS, which draws water from the Boulder Feeder Canal through diversion structure. The Boulder Feeder Canal averages below 10 ng/L Geosmin.

3.2. City of Thornton

The City of Thornton, CO (Thornton) recently completed construction on the new Thornton Treatment Plant (TTP, 20 mgd capacity). The TTP will treat water from three sources, Standley Lake, Thornton Water and East Gravel Lakes #4 (EGL4). Standley Lake water has few treatment challenges, with low pH being the primary concern as it could result in higher corrosion potential, and dissolved manganese concentrations varying over the course of a day. EGL4 water is challenging to treat due to organic material, higher mineral content, algal blooms, manganese, and taste and odor constituents. The TTP process design allows poor water quality EGL4 source to be treated separately prior to an ozone process. This ability to isolate EGL4 water for pre-treatment is expected to reduce chemical costs and allows operational flexibility.

TTP processes include iron and manganese oxidation, flash mixing, three-stage flocculation, lamella plate settlers, intermediate ozone, biological filtration, and disinfection. The combined use of ozone and biological filtration will be utilized to address taste and odor concerns that come with treating EGL4 water. A combination of jar testing, bench scale testing, and pilot testing was performed with both Standley Lake and ELG4 source waters to confirm and refine the individual treatment processes including pretreatment, ozone, and biological filtration.

Historic raw water quality from EGL4 indicated an average value of 4 ng/L and a maximum value of 80 ng/L for Geosmin. Design criteria for the facility assumed a maximum value of 300 ng/L.

3.3. City of Greeley

The City of Greeley, CO (Greeley) operates two water treatment plants, the Bellevue Water Treatment Plant (35 mgd) and the Boyd Lake Water Treatment Plant (38 mgd). The Boyd Lake WTP is a seasonal peaking plant that treats water from Boyd Lake and Lake Loveland. Boyd Lake has comparable water quality to Lonetree and Johnstown Reservoirs, as it is also filled with Big Thompson River water The Boyd Lake WTP has dealt with historic taste and odor issues, similar to Johnstown. Multiple technologies have been tested at the Boyd Lake WTP to control MIB and Geosmin including algaecide and DAF, but the WTP has continued to face taste and odor issues. Greeley is currently designing an ozone system to address their taste and odor issues.

4. Jar Testing Materials and Methods

At the time of testing, raw water was entirely sourced from Johnstown Reservoir. A week before jar testing, a raw water sample was taken from a sample tap on the WTP influent line to estimate a baseline concentration of Geosmin and MIB. This sample indicated that Geosmin and MIB concentrations were below detection limits.

To complete the jar testing, the raw water was spiked with Geosmin[1] to simulate estimated typical summer conditions in Lonetree Reservoir, approximately 200 ng/L. The raw water and spiked raw water were sent for analysis along with the jar testing samples. The raw water Geosmin concentration was still below detection limits at the time of jar testing. The spiked raw water Geosmin concentration was approximately 220 ng/L. The approximate human detection

[1] The raw water was also spiked with MIB to simulate a typical estimated summer condition of 20 ng/L. However, all lab results had an MIB concentration below detection limits, indicating a potential bad ampule of MIB stock solution. This does not impact analysis or recommendations because in general Geosmin and MIB behave similarly and removals can be correlated. Additionally, Johnstown taste and odor issues are dominated by Geosmin.

threshold of Geosmin is 10 ng/L. This value was used to an establish a goal finished Geosmin concentration of 7 ng/L.

The jar tests used a Phipps & Bird jar tester. Each jar test followed the same protocol. The jar test protocol simulated the hydraulic retention time (HRT) in the pipeline from Lonetree Reservoir to the WTP. The HRT was calculated based on 4.5 mgd , which was typical of average maximum day demand in 2020 when taste and odor issues were present. Each test lasted approximately 176 minutes with the jar tester mixers operating at 5 RPM to simulate the slow-mixing conditions in the pipeline. One test also included a sample representative of the HRT from Johnstown Reservoir to the WTP, which is approximately 12 minutes. After the pipeline simulation, Burns & McDonnell pulled water samples from each of the four jars.

ESML Analytical tested the samples for Geosmin and MIB. Johnstown provided total organic carbon (TOC) data, taken at the time of the jar testing, as well as historic data.

4.1. Chemical Additives

Jar testing was limited to PAC as the only type of chemical additive. PAC adsorbs constituents (e.g., TOC, taste & odors) located within the liquid process stream. Burns & McDonnell prepared stock solutions of PAC using Burns & McDonnell equipment as well as equipment provided by the Johnstown WTP lab. Jar testing was performed to determine the Geosmin removal rates for varying PAC doses. Burns & McDonnell evaluated three (3) types of PAC as adsorbents in this study: Norit Hydrodarco® 20BF, Calgon WPH800, and Calgon WPH1000. Johnstown WTP historically used Calgon WPH800, but recently switched to Calgon WPH1000.

5. Jar Testing Results

Figures 2 through 5 display the removal of Geosmin by varying PAC types and dosages.

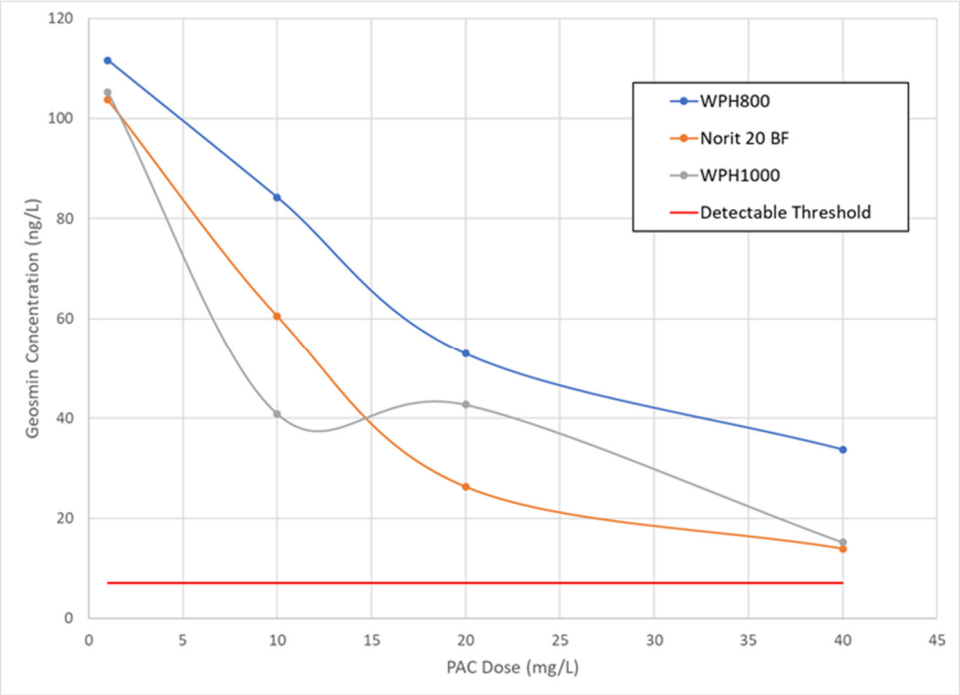

Figure 2: Final Geosmin Concentrations versus PAC Dose (mg/L)

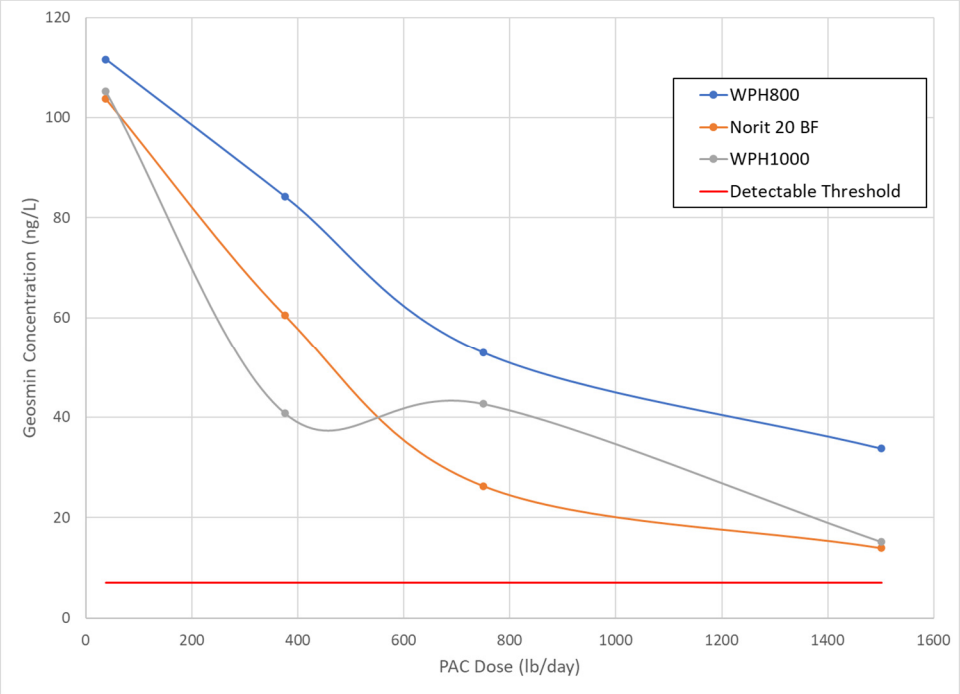

Figure 3: Final Geosmin Concentration versus PAC Dose (lb/d)

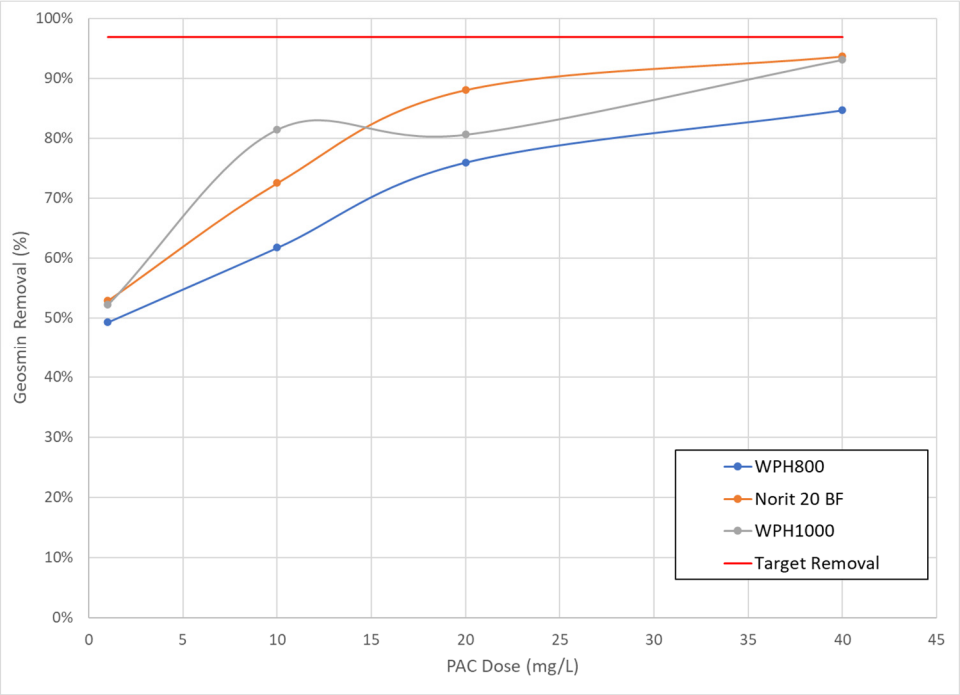

Figure 4: Percent Geosmin Removal versus PAC Dose (mg/L)

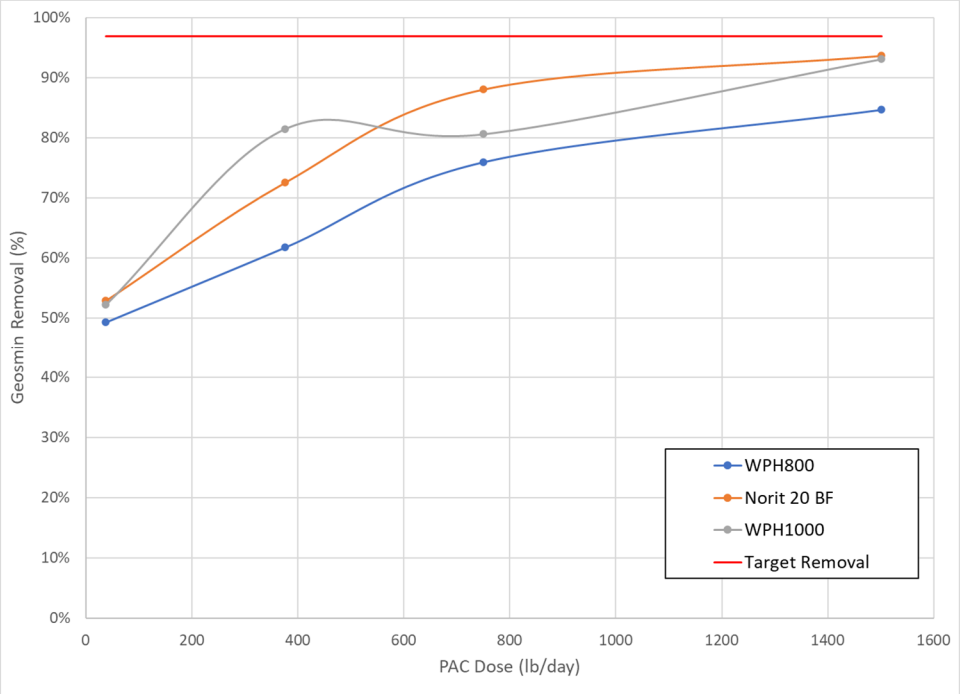

Figure 5: Percent Geosmin Removal versus PAC Dose (lb/d)

At all four doses tested, the previously used PAC, Calgon WPH800, proved to be the least effective. The newly employed PAC, Calgon WPH1000, demonstrated the best performance at all doses, except for at a dose of 20 mg/L. Norit Hydrodarco 20BF performed comparably to the Calgon WPH1000, particularly at the highest dose, and should be considered as an alternative. Both Calgon WPH1000 and Norit Hydrodarco 20BF demonstrated a maximum removal over 95%, while Calgon WPH800 demonstrated a maximum removal of approximately 85%. None of the PAC types tested were able to achieve the goal Geosmin concentration of 7 ng/L based on a starting concentration of 220 ng/L (96.8% removal).

The WTP currently doses approximately 1 to2 mg/L or one to two 50 pound sacks of PAC per day during peak taste and odor issues in the summer. At this dose in the jar tests, Geosmin was reduced approximately 50% to a level of 100 ng/L, which is consistent with the limited historic data provided by the town, as measured at the DAF inlet. At the doses of 10 and 20 mg/L, Geosmin removal was increased to approximately 60 to 80%. At the highest dose tested, 40 mg/L, Geosmin removal increased to almost 95% and almost met the detection threshold of 7 ng/L. However, this dose would mean a forty-fold increase in PAC consumption, which is not possible with current PAC system and staffing levels. High PAC doses are expected to have implications with the WTP operations, in particular on the DAF performance, shorten filter run times and increase the solids in the backwash pond. The high carbon load in the waste stream is also expected to have negative implications on the Central Wastewater Treatment Plant (WWTP), which is currently operating at its capacity.

5.1. HRT Impact

During the third jar test using WPH1000, a sample was also taken at approximately 12 minutes to simulate the HRT of the pipeline between Johnstown Reservoir and the WTP. Figure 6 compares the results of the two HRTs. At a dose of 10 mg/L WPH1000, the Johnstown Reservoir HRT only achieved a Geosmin concentration of approximately 85 ng/L. In comparison, the Lonetree HRT with same dose achieved a Geosmin concentration of approximately 40 ng/L. A sample was also taken from the 1 mg/L PAC dosed jar, but an error at the ESML lab resulted in the 10 mg/L sample being tested twice, resulting in the same Geosmin value for both jars.

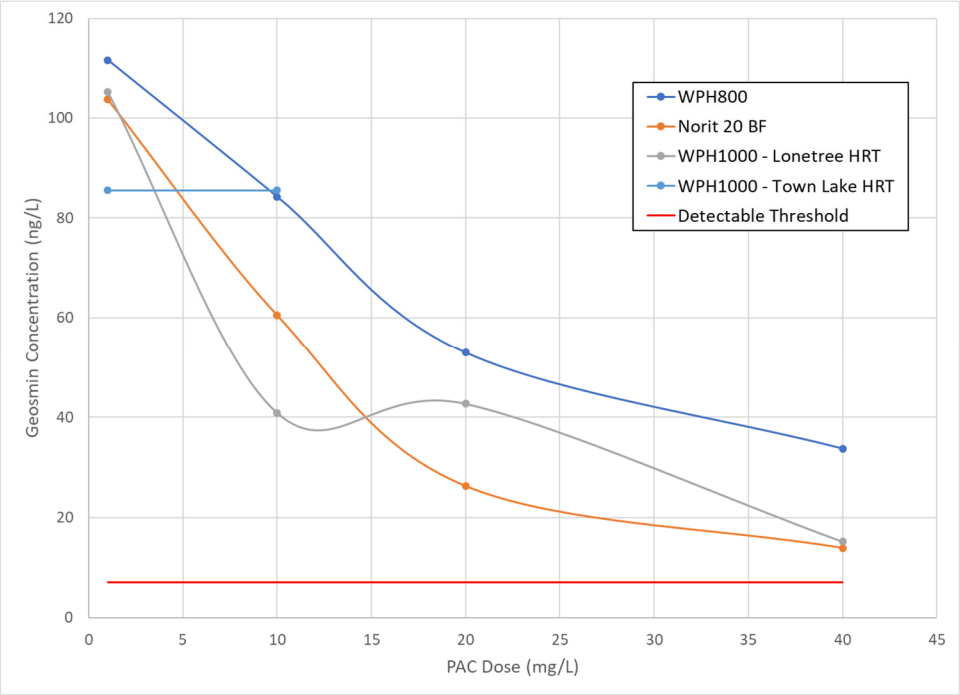

Figure 6: HRT Impact on Geosmin Removal

5.2. TOC Potential Impacts

Johnstown WTP staff provided TOC data for the week of testing as well as historic data (see Table 2 and Figure 7). The sample taken on January 7, 20201 had a TOC concentration of 4.3 mg/L, which is comparable to the average influent TOC. This is an important consideration because PAC may selectively remove TOC over Geosmin and MIB when TOC concentrations are high. TOC is typically highest in the summer when Geosmin and MIB are also highest. This means that the results of this jar testing are likely accurate for average conditions, but that lower Geosmin and MIB removal may be expected when TOC concentrations are higher.

Table 2: Historic TOC Data Summary (2016-2020)

	TOC (mg/L)
Minimum	2.6
Average	4.0
Maximum	5.3

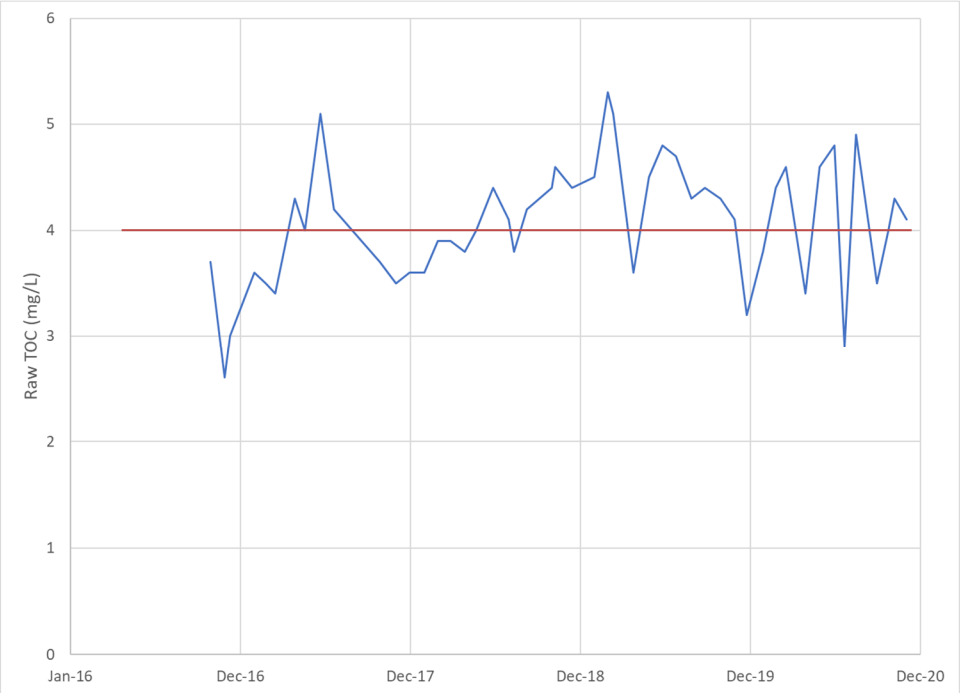

Figure 7: Historic TOC Trends

6. Jar Testing Conclusions

Jar testing confirmed that the new WPH1000 PAC is more effective than the previously used WPH800 PAC, particularly at higher doses. Results also showed the Norit Hydroarco 20BF PAC to perform comparably to the WPH1000. The WTP can use this information to make decisions about future PAC purchases.

Jar testing also confirmed that the HRT in the pipeline from the Johnstown Reservoir to the WTP provides insufficient contact time to remove Geosmin in comparison to the pipeline from Lonetree to the WTP.

The jar testing revealed limitations in the existing PAC dosing system. The current dose of 1 to 2 mg/L is insufficient to reduce Geosmin levels to below the detection threshold. A dose of 10 to 40 mg/L is required to achieve closer to the Geosmin concentrations desired but may not be feasible due to existing infrastructure and potential impacts to other processes in the WTP, including increased labor and solids loading.

7. Alternative Taste and Odor Removal Technologies

There are several operational approaches and treatment technologies for taste and odor control available to the town:

- Source Water Management
- Lake Management
- Powdered Activated Carbon
- Optimize DAF
- Granular Activated Carbon
- Oxidant
- Biologically Active Filtration

7.1. Source Water Management

The Johnstown water supply system is included in Figure 7 below. Lonetree Reservoir and Johnstown Reservoir are the town's primary water sources. However, to mitigate taste and odor issues, the town may consider the following source management alternatives:

- Strategically switch the blending ratio between Lonetree Reservoir and Johnstown Reservoir during taste and odor events
- Establish the ability to pump directly from the Home Supply Ditch to avoid high taste and odor compounds in the Lonetree Reservoir. Current piping configurations prevent direct access to the Home Supply Ditch when the Lonetree Reservoir is at a high operating level.
- Use the existing interconnections with the Little Thompson Water District, Central Weld County Water District, or the City of Greeley to replace or supplement the WTP production when taste and odor compounds are present.
- Investigate the feasibility of accessing the town's Chapman Reservoir water right to diversify raw water sources.

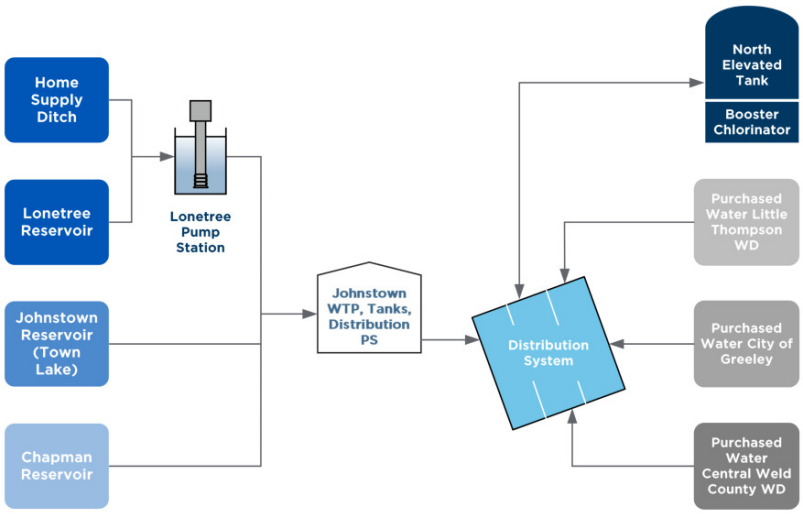

Figure 7: Johnstown Water Supply System

7.2. Lake Management

Lake management strategies for reducing taste and odor issues include level management, use of algaecide or ultrasonic buoys. The town does not have control over the operating levels in the Lonetree Reservoir. Algaecide will require care to prevent overdosing and risk to natural life. Ultrasonic buoys have the ability to reduce blue-green algae growth using with ultrasonic technology. The buoys are solar powered and low maintenance. Ultrasonic buoys are recommended as an easily implemented option ahead of the high taste and odor season of 2021. The application is suitable for the shallow depths in the Johnstown Reservoir. Deploying ultrasonic buoys in Lonetree Reservoir is more complex and may not be allowed by the reservoir manager.

7.3. Powder Activated Carbon

If the town desires to keep using PAC at a higher dose, this could be accomplished through changes to the existing system, a temporary system, or an entirely new system.

The existing system is only rated for 150 lbs/day with a hopper sized for 126 lbs. In order to increase the output, the town could either change the gear reducer to increase auger speed or change the existing auger and spout diameter to a larger size. However, these changes could only feasibly increase the output to 200 lbs/day. Jar testing indicated approximately 60% removal at this dose. It would be the lowest cost PAC expansion but would significantly increase the labor required to monitor the existing PAC system at its maximum capacity. Any increase to the PAC dose also will significantly increase solids loading on the WTP and increase the carbon load at the WWTP.

Multiple manufacturers such as Velodyne, Cabot Norit and SST have pre-fabricated, skid or container-mounted PAC systems. These systems come in different configurations, including indoor, outdoor, and container system options. A temporary PAC system could increase dose rates to over 1,600 lbs/day, which showed removals ups to 90%. The lead time on a temporary system could be anywhere from 4 weeks to over 6 months depending on the manufacturer and option selected. Lease costs are variable between $5,000 to $8,000/month in comparison to a purchase cost of approximately $200,000.

The town could also replace the entire existing PAC system. This would likely require adding a new a building at the Lonetree Reservoir. An approximately 45-foot by 10-foot footprint is available to either expand the existing concrete masonry unit building or add a new foundation for a pre-engineered metal building. A new system could increase the capacity to over 2,500 lbs/day, which demonstrated over 90% removal in jar testing. Lead time for the building would likely be approximately five months to account for permitting and approvals, while the equipment lead time is approximately six months. This option would likely cost between $300,000 to $700,000 for PAC equipment, an estimated building cost of $200,000 and related piping, valves, electrical and controls between $100,000 and $500,000.

7.4. Pretreatment Optimization

Two options to potentially increase T&O removal in pretreatment are optimizing the existing DAF or consider a saturated air flotation (SAF) conversion.

Optimizing the DAF process could potentially increase TOC, T&O, and algae removal. In order to optimize the DAF system, testing would need to occur to establish baseline removals. Increased removal could be achieved by adjusting chemical doses with alternative chemicals, such as the Cat-Floc 8108-Plus polymer the town intends to implement in early 2021.

A SAF conversion involves a change from dissolved to saturated air. SAF processes utilize a surfactant to create anionic bubbles that both attract and lift suspended compounds in the raw water. A conversion would require the addition of a foaming agent generator and emulsion mixer. The existing saturators, compressors, and recycle pumps would be abandoned or removed. SAF systems offer increased flow and solids loading capacities when compared with conventional DAF processes. While a DAF process typically runs at approximately 7 gpm/sf and floats 3% of solids, a SAF process may achieve over 20 gpm/sf and floats up to 6 to 8% of solids. The equipment for a SAF conversion would be approximately $500,000 and likely would involve CDPHE approval of the process change.

7.5. Granular Activated Carbon

There are many options for implementing GAC at the WTP. GAC absorbs T&O compounds through contactors, which can be installed as either pressure vessels or as media in the existing filters (GAC caps). If installed as pressure vessels, the process could be either before or after filtration. GAC involves frequent media replacements after the GAC has been consumed. In comparison to other alternatives, GAC has increased maintenance and is more expensive in terms of both capital and maintenance costs. GAC is anticipated to achieve between 40 to 70% Geosmin removal or higher, depending on the contact time, age of the GAC, solids loading rate, source of the carbon and pretreatment performance. GAC has slightly lower MIB removals than Geosmin removals. Costs and lead time will be highly dependent on configuration chosen.

7.6. Oxidation

Oxidation can be accomplished by using ozone, chlorine, potassium permanganate, or aeration. Chlorine, potassium permanganate and aeration are typically applied to oxidize other compounds in drinking water not related to taste and odor. Ozone is a strong oxidant that is effective at removing taste and odor compounds. An ozone system includes a liquid oxygen vessel (lease or purchase), ozone generators, reactors, and destructors. There is potential to reuse the existing clarifiers for the reactor, but the open basins must be refitted with tops to prevent the unwanted loss of ozone to the atmosphere. An ozone system would likely be the most expensive option for the town, for both capital and maintenance. Equipment costs for a fully redundant ozone system is approximately $2,700,000, plus costs for the associated structure, reactor vessel, piping, valves, electrical, controls and installation. Ozone is also the most complex to operate but would likely achieve the highest Geosmin removal (over 90%). An added benefit of ozone is that it is eligible for primary disinfection credits and will reduce the required water level to be maintained in the existing ground storage tanks to meet disinfection contact time. The town could also consider adding hydrogen peroxide for more advanced oxidation. One potential option would be pre-ozonate at the Lonetree PS, which would increase the reaction time. However, it is important to consider the potential to generate bromate, a harmful disinfection byproduct.

7.7. Biologically Active Filtration

Biologically active filtration (BAF) is another taste and odor control process that can achieve over 90% removal. BAF achieves T&O removal by biodegradation. Chemicals are added as a nutrient source, including pre-ozone or another carbon source, ammonium sulfate, and phosphoric acid. BAF could be implemented at the WTP by retrofitting the existing granular media filters. A recycle stream would be added to maintain the biology, and a deeper filter column may be required. The process would also require increased monitoring to manage the

biological process through more complex chemical injection and monitoring systems. BAF is not applicable if the town converts to a membrane filtration based process.

8. Conclusions

Jar testing revealed that PAC is likely not a practical option to address the historic taste and odor issues related to Gesomin to below detection thresholds. A multi-phased approach is recommended to gain partial removals through several steps across the water sources and treatment processes. The town is interested in a temporary, leased equipment option to help with taste and odor control for the 2021 summer season while a longer term solution is implemented with the WTP expansion. The town should determine if a leased or purchased facility is suitable for the short term.

Longer term, the town should consider a multi-phase approach that incorporates reservoir management, and either a combination of PAC, DAF, and GAC technologies. Alternatively, the high effectiveness of ozone makes it suitable as a single-step process for taste and odor control.

Additional water quality testing, jar testing and potentially pilot testing is recommended for the optimization of the existing DAF system, an evaluation of a SAF conversion and additional investigation into potential GAC configurations for short-term relief in 2021.

BDP/mal

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Agenda

- Introductions
- Current Conditions
- Short-Term Approach
- Long-Term Approach
- Comparison
- Land Options
- Q&A

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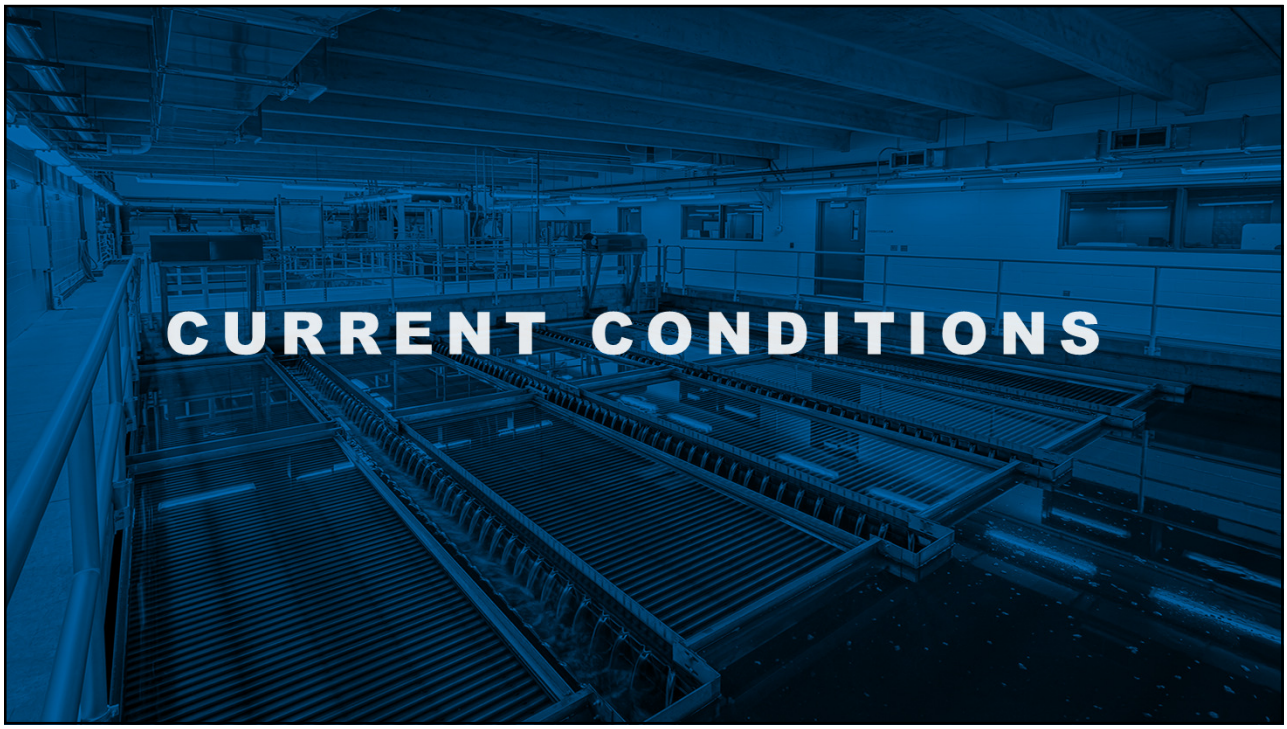

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Johnstown Water Supply

- Seasonal taste & odor issues
  - Aesthetic
  - Not heath limit
- Cause
  - Microbial and algae growth in reservoirs
  - Earthy, musty, fishy
  - Attributed to Geosmin & MIB
- How to Address?
  - Short term
  - Long term with WTP expansion

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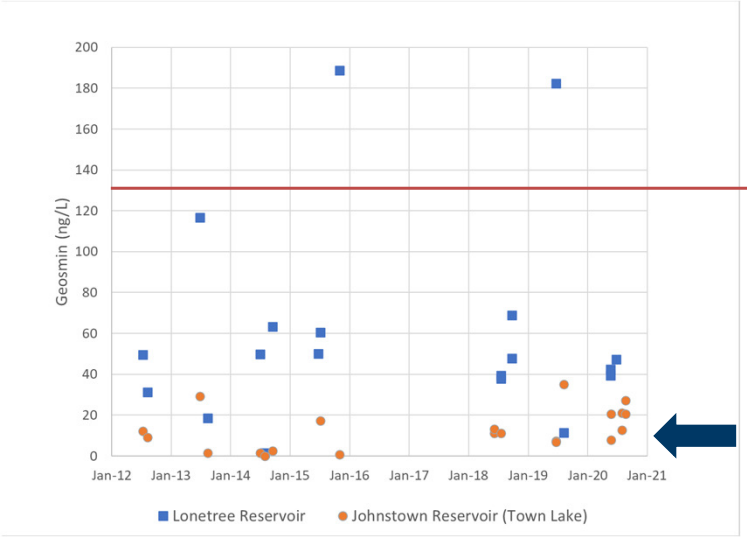
Historic Geosmin Concentrations



Average 129 ng/L

Goal: 7ng/L
70 to 95% Removals

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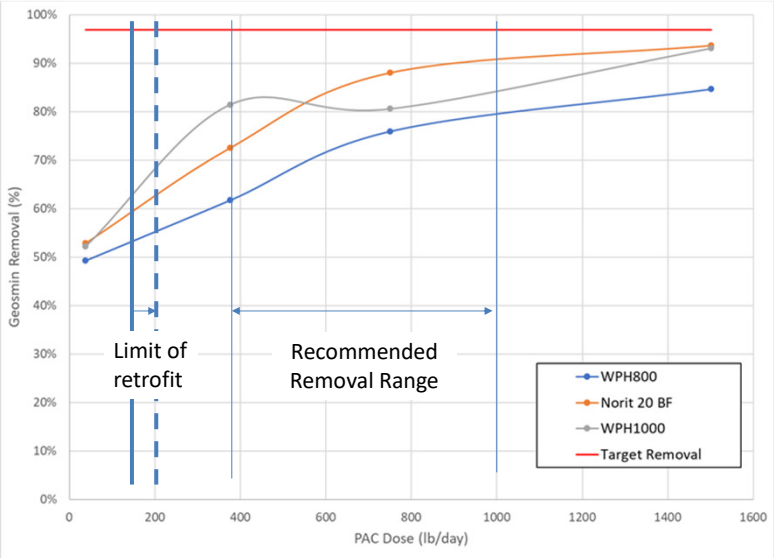
Need to dose over 20x current PAC dose to reach 90%



- Current dose approx. 50% removal
  - Still 15x detection threshold
- 150-200 lb/day improve to approx. 60 to 65%
- 400-800 lbs/day increased removal to 80%
- Highest dose provided almost 95% removal
  - High operating cost
  - Impact to WTP and WWTP

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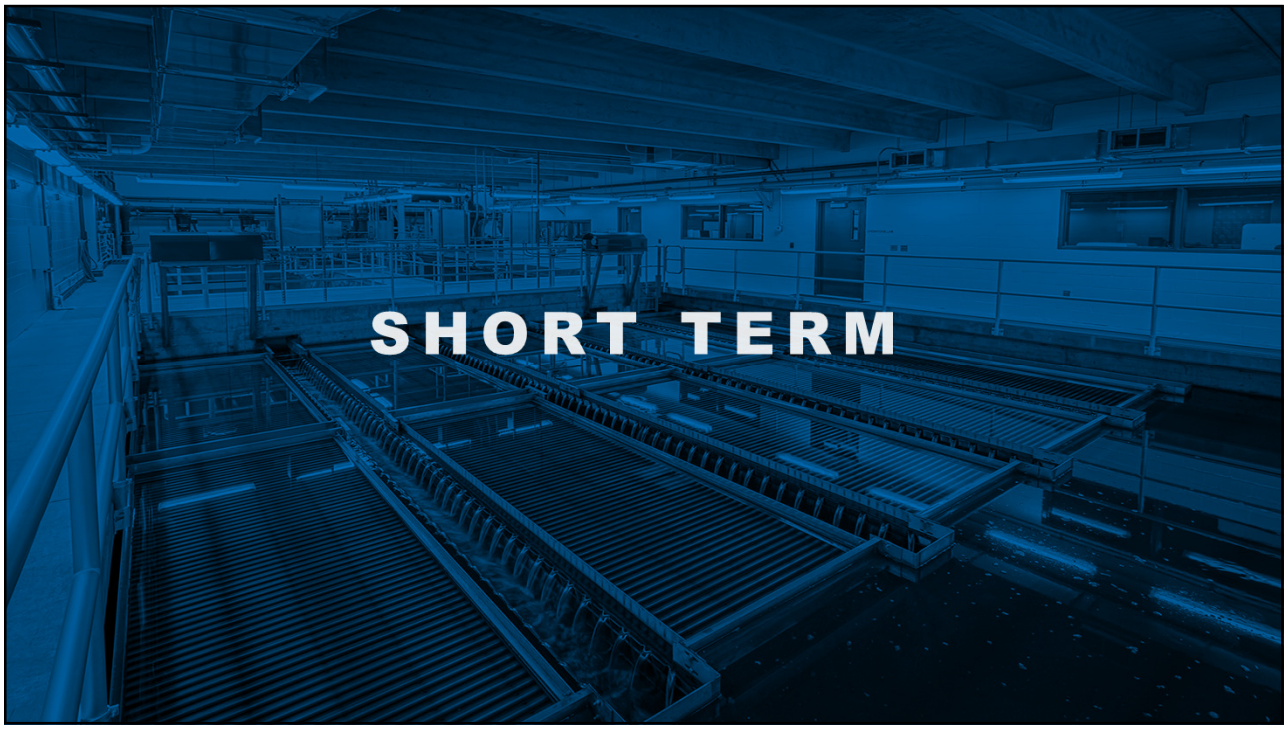

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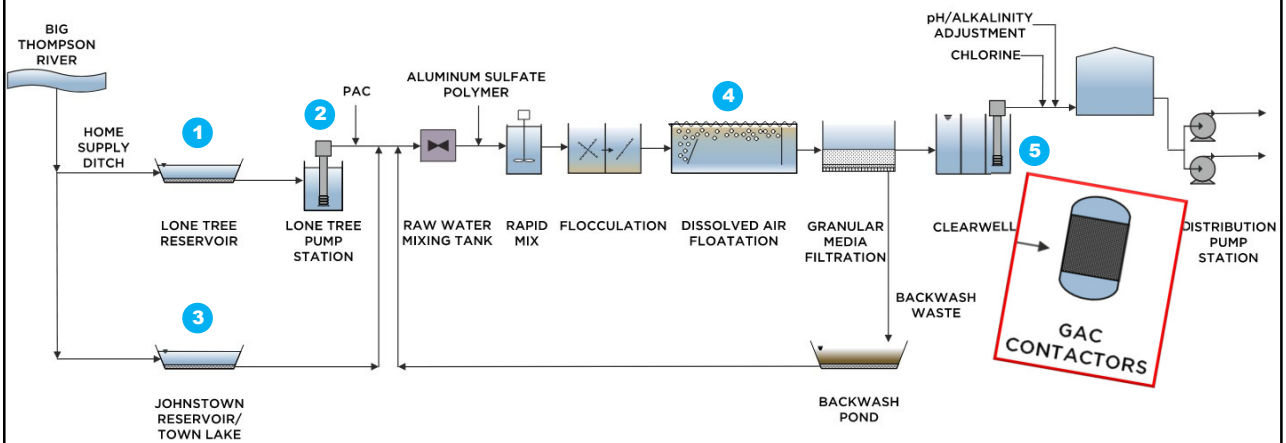
Short Term Relief



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Granular Activated Carbon

- Absorb through wood-based coal
- Removal and Life of GAC Varies
  - Upstream % removals
  - Mass loading rate
  - Contact time
  - Age of carbon
  - 40 to 85%
- Consume media, then must replace
  - Two technicians 4 hours
  - Remove GAC
  - Install new GAC
  - Reactivate in Mesa, AZ
  - $38,000 per vessel, 6 vessels

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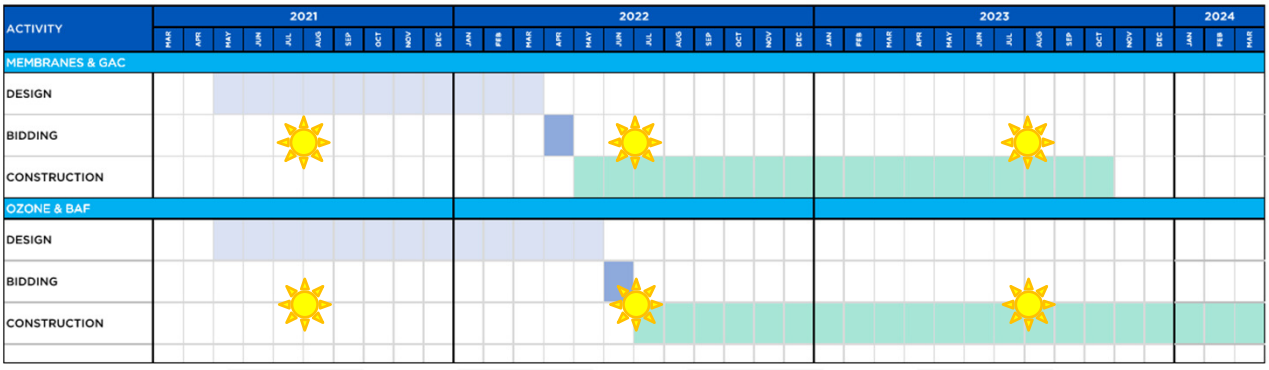
Schedule Comparison



3 Summer Seasons before WTP Expansion

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Temporary Taste & Odor Cost

Item	Rent	Purchase	Purchase & Resale
2021	$835,000	$1,486,000	$1,486,000
2022	$571,000	$356,000	$356,000
2023	$582,000	$236,000	<$26,000>
Total	**$1,988,000**	**$2,078,000**	**$1,816,000**

Scope:

- 6 GAC Vessels
- 1 Rebed Per Year
- Winterize GAC Vessels
- Buoys on Town Lake
- Upgrade PAC Equipment at Lonetree
- Resale GAC Vessels at 30% Equipment Cost

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WTP Phasing

Current Capacity	Phase I	Phase II
• 6 mgd • 16,000 population	• 12.5 mgd • 34,000 population	• 18 mgd • 50,000 population

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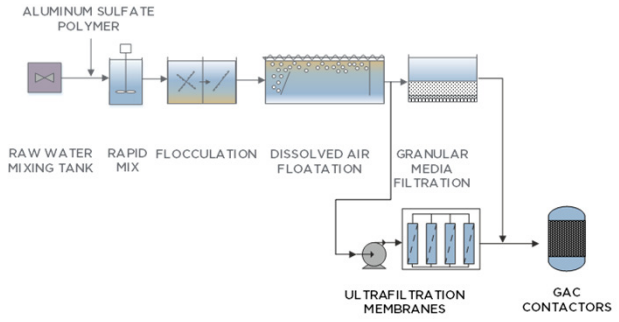
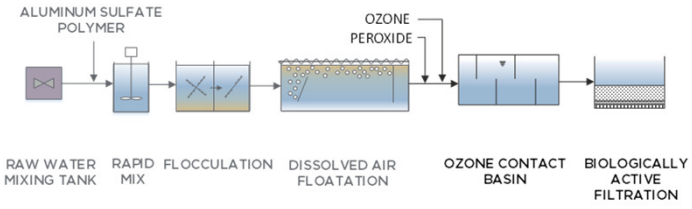
Taste & Odor Removal Trains

1. Membranes + GAC



2. Ozone + BAF



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Removal Scenarios*

Scenario	1		2		3		4		5	
Description	Existing Conditions		Existing PAC Buoy Optimize DAF Temp GAC		Existing PAC Buoy Optimize DAF Temp GAC		No PAC Buoy Convert to SAF GAC		No PAC Buoy Convert to SAF Ozone	
Starting conc. ng/L	220		220		80		220		220	
PAC at Lonetree	110	50%	88	60%	32	60%	220	0%	220	0%
Buoy Town Lake	110	0%	62	30%	22	30%	176	20%	176	20%
Pretreatment	99	10%	43	30%	16	30%	88	50%	88	50%
GAC	99	0%	6	85%	6	60%	9	90%	88	0%
Ozone & Biologic Filtration	99	0%	6	0%	6	0%	9	0%	4	95%
Resulting conc. ng/L	**99**	**55%**	**6**	**97%**	**6**	**92%**	**9**	**96%**	**4**	**98%**
Target 7 ng/L										

**Estimated Range of Removals. Actual to Vary.*

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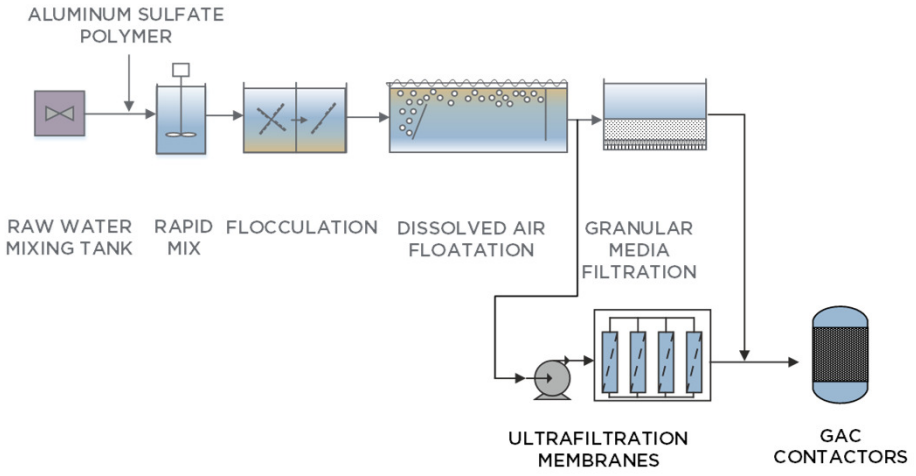
Membrane Filtration and GAC



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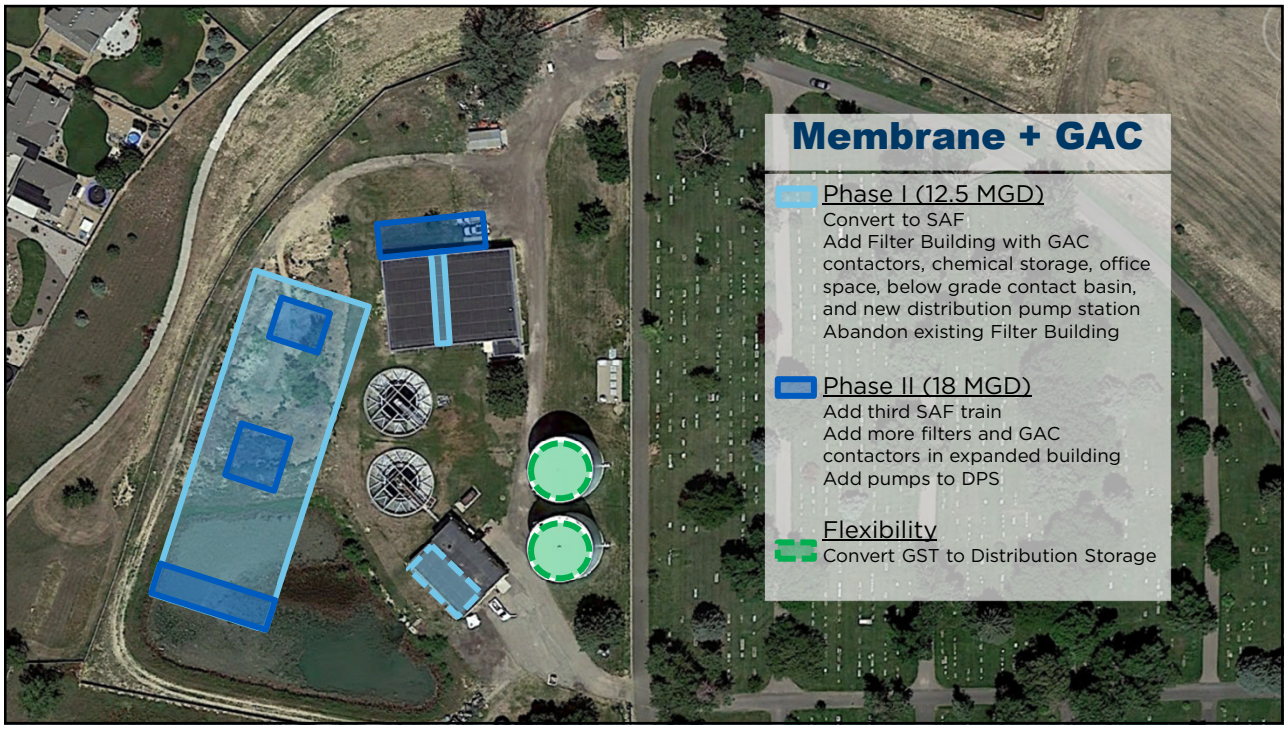
Membrane + GAC
Phase I (12.5 MGD)
Convert to SAF
Add Filter Building with GAC contactors, chemical storage, office space, below grade contact basin, and new distribution pump station
Abandon existing Filter Building
Phase II (18 MGD)
Add third SAF train
Add more filters and GAC contactors in expanded building
Add pumps to DPS
Flexibility
Convert GST to Distribution Storage

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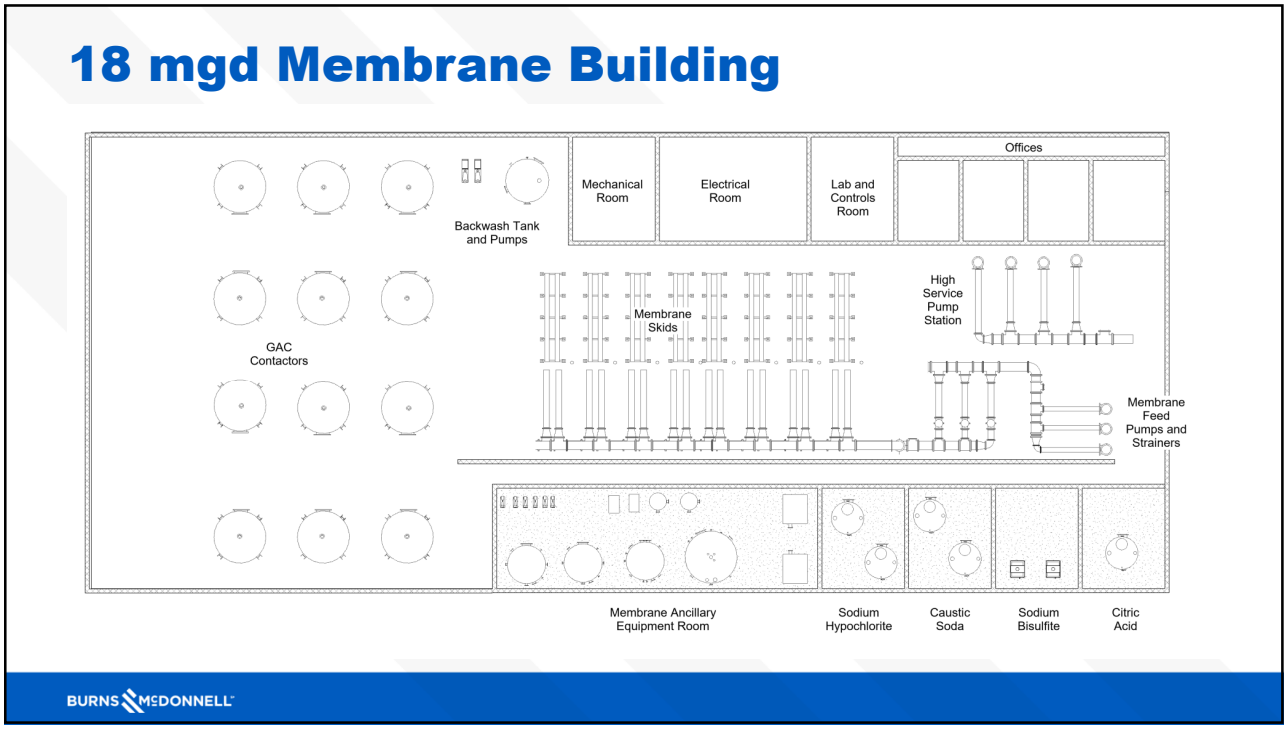
18 mgd Membrane Building
Offices
Mechanical Room
Electrical Room
Lab and Controls Room
Backwash Tank and Pumps
GAC Contactors
Membrane Skids
High Service Pump Station
Membrane Feed Pumps and Strainers
Membrane Ancillary Equipment Room
Sodium Hypochlorite
Caustic Soda
Sodium Bisulfite
Citric Acid
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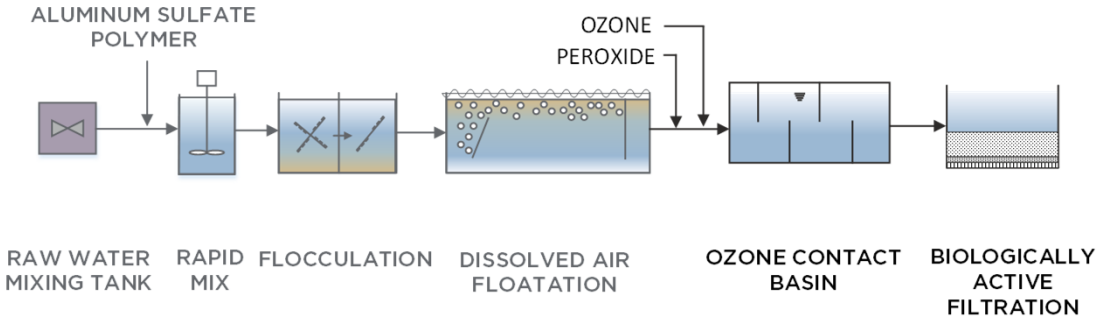
Ozone and Biologically Active Filtration



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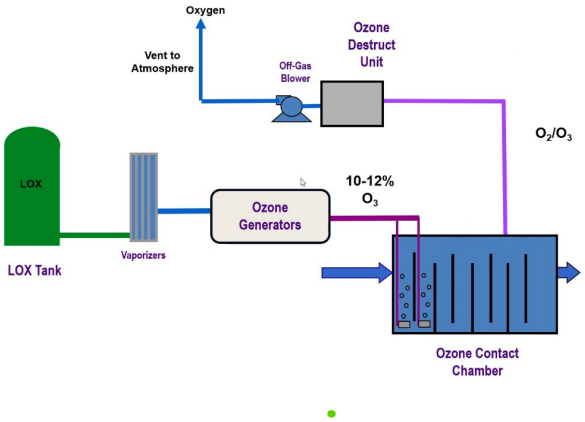
Ozone Process Flow Diagram



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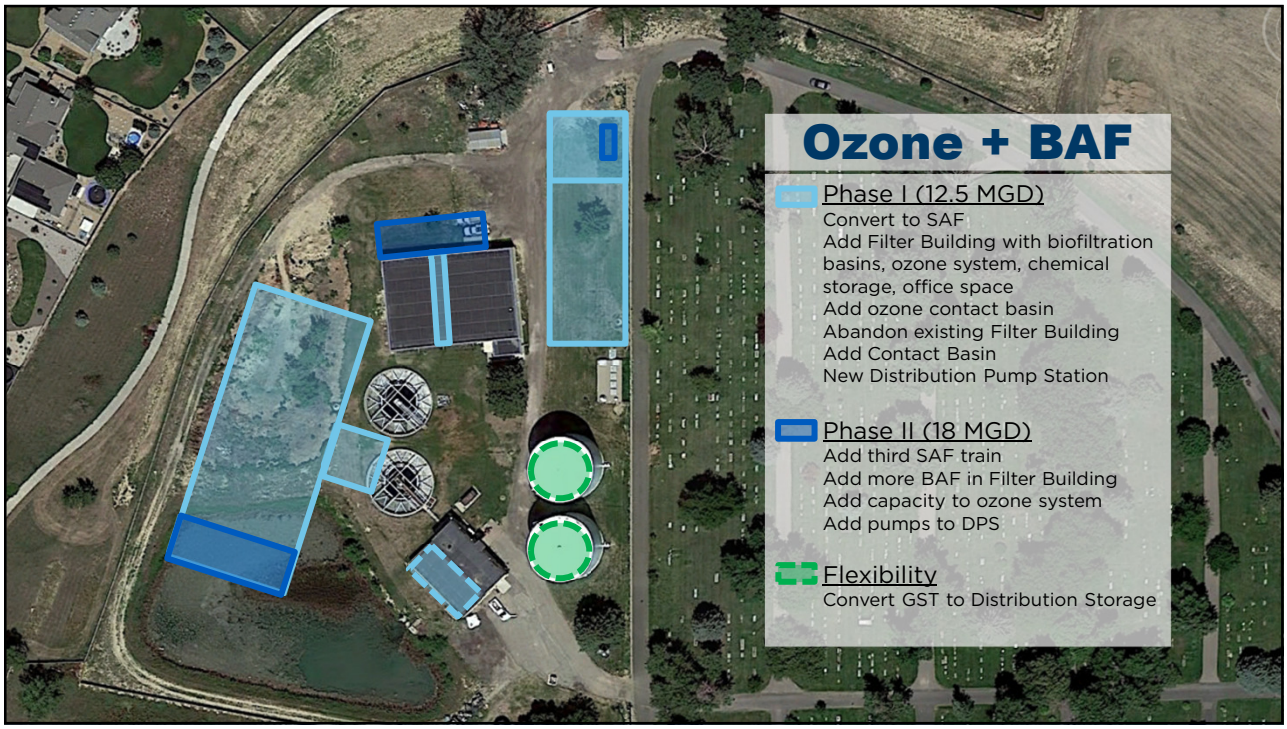
Ozone + BAF
Phase I (12.5 MGD)
Convert to SAF
Add Filter Building with biofiltration basins, ozone system, chemical storage, office space
Add ozone contact basin
Abandon existing Filter Building
Add Contact Basin
New Distribution Pump Station
Phase II (18 MGD)
Add third SAF train
Add more BAF in Filter Building
Add capacity to ozone system
Add pumps to DPS
Flexibility
Convert GST to Distribution Storage

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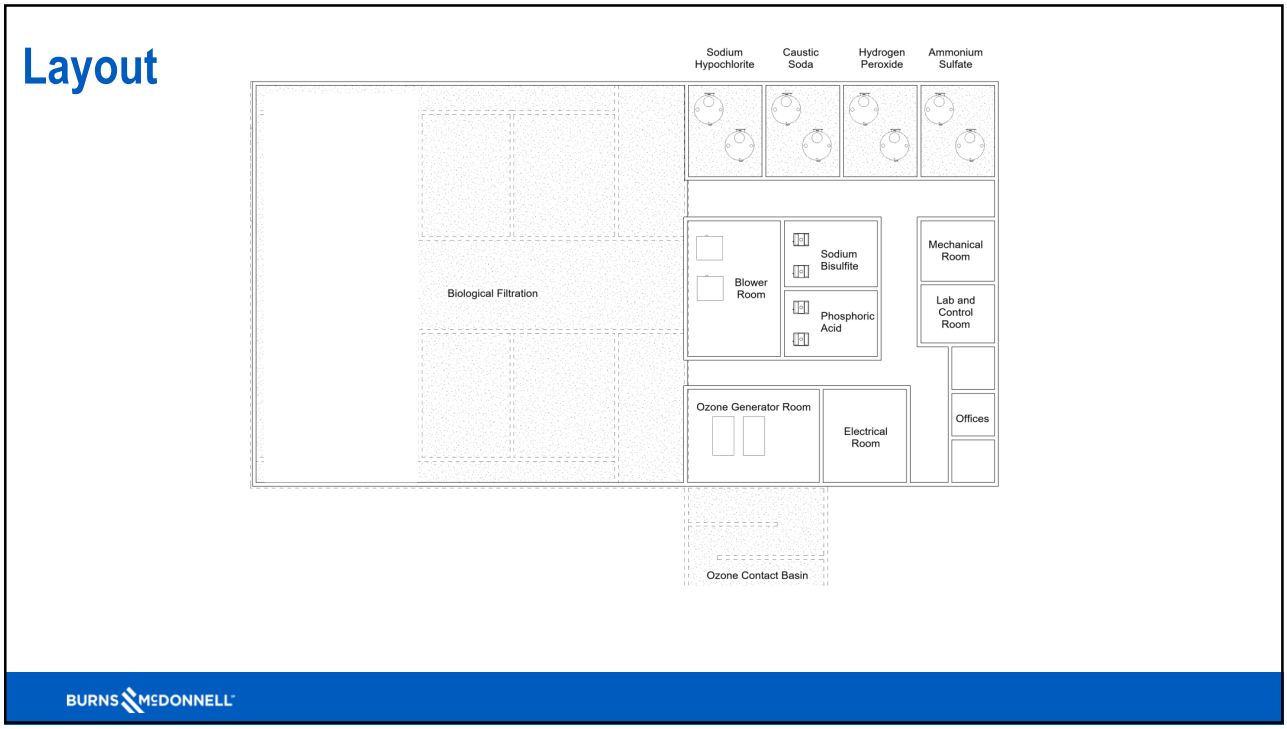
Layout
Sodium Hypochlorite
Caustic Soda
Hydrogen Peroxide
Ammonium Sulfate
Biological Filtration
Blower Room
Sodium Bisulfite
Phosphoric Acid
Mechanical Room
Lab and Control Room
Ozone Generator Room
Electrical Room
Offices
Ozone Contact Basin
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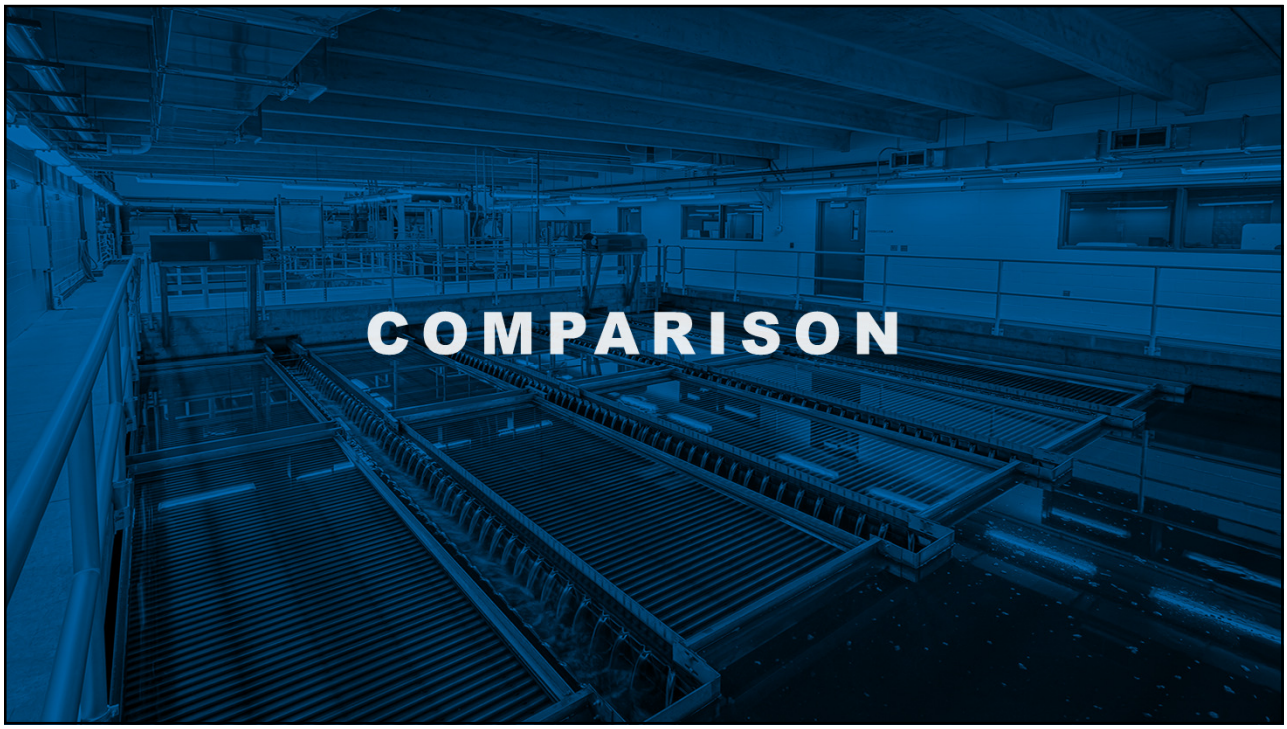

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Cost Assumptions

- Based on 2021 Dollars
- Class V Estimate
  - <2% Project Definition
  - Concept screening
  - - 20% to + 30%
- Capital costs based on Phase 1 (12.5 mgd)
- Operation Cost based on 2023
  - Phase I Expansion Complete
  - 7 mgd maximum day

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Estimated Construction Cost

Item	UF/GAC	O3/BAF

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Operating Cost Comparison

Item	GAC	Ozone
Year 1 (7 mgd)	$342,000	$50,000
Ultimate (18 mgd)	$608,000	$129,000
Construction Cost		
Life Cycle Cost (30 years)		

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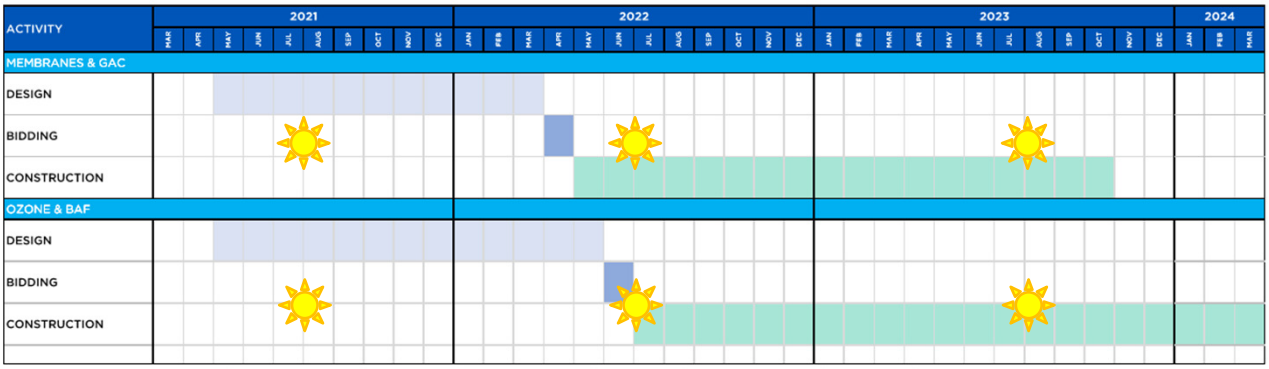
Schedule Comparison



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Comparison Summary

	Membrane and GAC	Ozone and BAF
Major Components		
Ancillary Systems		
O&M Costs		
Capital Costs		
Expandability		
Implementation Timeline		

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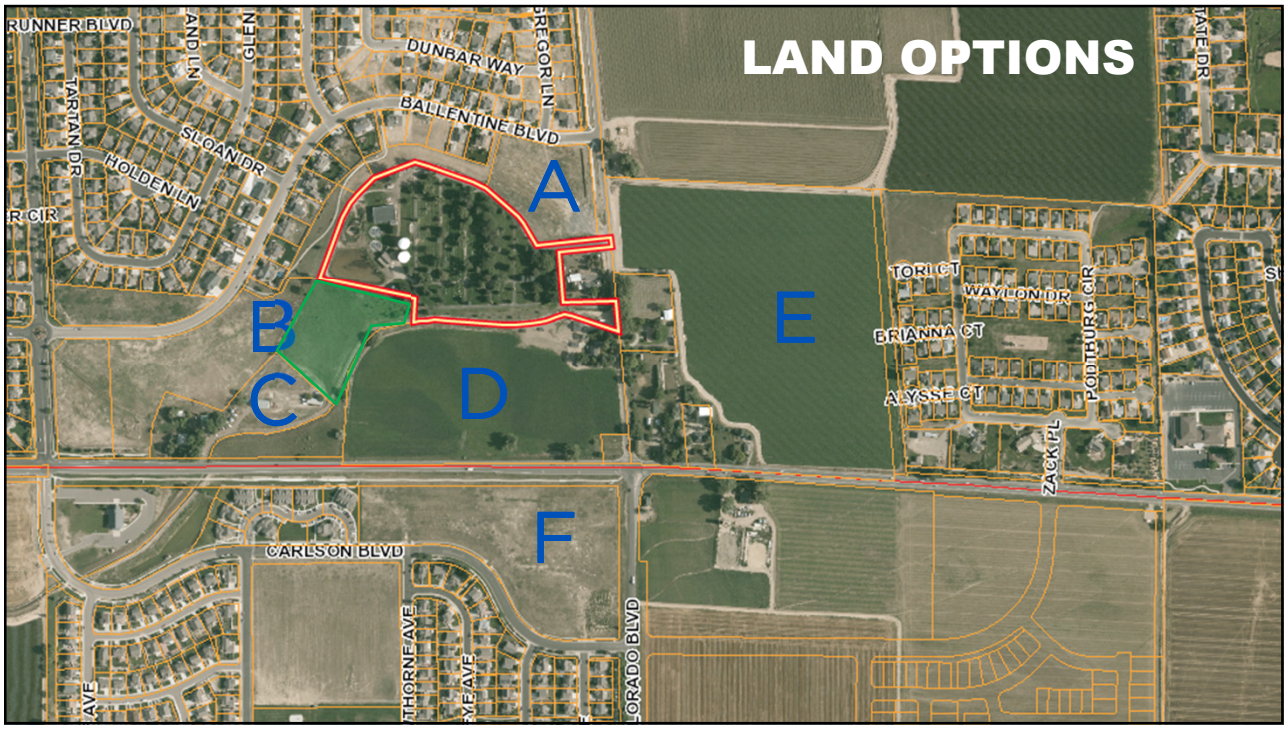
LAND OPTIONS
A
B
C
D
E
F
RUNNER BLVD
TARTAN DR
HOLDEN LN
SLOAN DR
DUNBAR WAY
BALLENTINE BLVD
GREGOR LN
TORI CT
WAYLON DR
BRIANNA CT
ALYSSE CT
ZACK PL
POOTHURG CIR
CARLSON BLVD
THORNE AVE
COLORADO BLVD

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Thank you!

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Johnstown Taste & Odor Control	Rent	Purchase	Purchase with Resale
GAC Mobilization	$299,977		
GAC Rental or Purchase (6 Vessels)	$136,500	$1,098,000	$1,098,000
GAC Installation	$10,000		
GAC Site Improvements	$100,000	$100,000	$100,000
GAC Rebed (1 per year, first included with equipment)	$0	$0	$0
GAC Winterize Vessels	$120,000	$120,000	$120,000
Buoys for Town Lake Purchase	$115,000	$115,000	$115,000
Upgrade PAC equipment at Lonetree Reservoir	$3,000	$3,000	$3,000
Contingency	$50,000	$50,000	$50,000
Total - 2021	**$835,000**	**$1,486,000**	**$1,486,000**
GAC Rental	$214,500		
GAC Rebed (1 per year)	$228,000	$228,000	$228,000
GAC Winterize Vessels	$120,000	$120,000	$120,000
Buoys for Town Lake Monitoring Service	$7,560	$7,560	$7,560
Total - 2022	**$571,000**	**$356,000**	**$356,000**
GAC Rental	$195,000		
GAC Rebed (1 per year)	$228,000	$228,000	$228,000
GAC Demobilize	$150,674		
GAC Sell Vessels (30% Equipment Value)			($261,000)
Buoys for Town Lake Monitoring Service	$7,560	$7,560	$7,560
Total - 2023	**$582,000**	**$236,000**	**-$26,000**
Total - Taste & Odor 2021 to 2023	**$1,988,000**	**$2,078,000**	**$1,816,000**

NOTES:

7	Rental Months 2021
12	Rental Months 2022
10	Rental Months 2023
29	Total Rental Months
$351,000	**Total Rent (Evoqua)**
$12,103	Rent over 3 years (assumed, not quoted by Evoqua)
$19,500	Monthly Rent for 18 months (Used same rate for comparison)