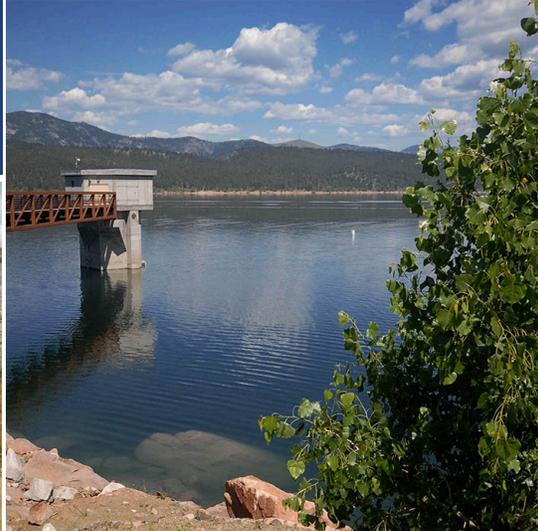




Broomfield's Drought Response Plan - 2023



Draft, May 2023
Prepared by the Department of Public Works,
Water Resources Division

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Acronyms and abbreviations

ATM - Alternative transfer method

C-BT - Colorado-Big Thompson project

CMO - City Manager's Office

DW - Denver Water

EPA - Environmental Protection Agency

GWR - Great Western Reservoir

HOA - Homeowners association

NOAA - National Oceanic and Atmospheric Agency

NRCS - Natural Resources Conservation Service

SWE - snow water equivalent

SWSP - Southern Water Supply Pipeline

TE - tap equivalent

USDA - US Department of Agriculture

USDM - US Drought Monitor

WEP - Water Efficiency Plan

WG - Windy Gap project

1. Introduction and Planning Process

Purpose of the Plan

This Plan describes how the City and County of Broomfield (Broomfield) will manage its water supply and water uses during droughts or other potential water shortages. The Plan documents policies (including those incorporated in Broomfield's Municipal Code), processes, analytical methods, and actions to manage water shortages, as well as goals and principles to guide decision-making during droughts and other events. This Plan will serve as a guide to operations and decisions and is not intended to be followed as a strict set of rules or procedures. Actual decisions will be up to the discretion of Broomfield staff, City Manager, and City Council (as appropriate) relying on the best available information to support those decisions.

This Plan applies to all of Broomfield's water sources and systems, as well as all residential, commercial, institutional, and industrial customers that are served by raw, treated or reclaimed water from Broomfield.

For purposes of this Plan, drought is defined as:

Temporary and relatively infrequent shortage of water in relation to normal levels of water demand that is caused by low precipitation and/or high temperatures and that requires a management response to avoid or minimize impacts.

Temporary water shortages can be caused by other events (e.g., infrastructure failure that interrupts water deliveries from Northern via the Southern Water Supply Pipeline) and would be managed as necessary and appropriate using this Drought Response Plan.

Goals and Priorities

Broomfield's goals in managing drought are to:

- 1) Minimize impacts of drought on Broomfield's residents, businesses and other organizations;
- 2) Ensure that unavoidable impacts of droughts are distributed equitably across demographic groups and customer classes;
- 3) Minimize permanent impacts on Broomfield's public and private landscapes;
- 4) Protect the integrity of Broomfield's water supply infrastructure; and
- 5) Minimize the fiscal impact of drought on Broomfield.

To pursue these goals during droughts and other water shortages, Broomfield has adopted a set of water supply and water use priorities to guide development of this Plan and to guide real-time decisions during water shortage events. The top priority is to secure additional water supply during droughts if feasible. As such, Broomfield will pursue fiscally responsible options to

augment water supply through temporary leases or other measures before imposing mandatory restrictions on water uses. Broomfield's water use priorities for drought response are:

Priority 1: water uses related to health and safety, including indoor residential use, indoor use at schools and important public facilities, indoor use at hospitals, and fire fighting.

Priority 2: indoor water use to support continued operations at Broomfield's businesses and industries

Priority 3: irrigation for trees and shrubs on public and private land

Priority 4: irrigation for functional turf in Broomfield's public parks

Priority 5: residential turf irrigation

Priority 6: irrigation for non-functional turf in public parks and other non-residential areas

Priority 7: water for construction and other miscellaneous uses

Risk Management Policy

In addition to the goals and priorities described above, Broomfield has established a policy of maintaining a buffer of water supply equivalent to 10% of total annual demand. This policy is applied to both the potable and reuse water systems.

2. Broomfield's Water Supply Portfolio

Potable Water Supply

Broomfield's potable water is supplied from two sources of high quality drinking water: (1) treated water purchased from the Denver Water Board and (2) raw water treated at the city's water treatment facility. These two treated water systems are blended together in the distribution system. All of Broomfield's drinking water, whether supplied by Broomfield or Denver Water, comes from surface water sources such as rivers, lakes, and reservoirs that are sustained from winter snowpack.

Broomfield has a perpetual agreement with Denver Water that allows Broomfield to purchase up to 6,500 acre-feet of treated water per year, with a minimum required purchase of 4,700 acre-feet. The supply from Denver Water is delivered to Broomfield through a master meter at Midway Boulevard and Zuni Street.

Broomfield's raw water is supplied by the Northern Colorado Water Conservancy District (Northern) from both the Colorado-Big Thompson (C-BT) and Windy Gap projects, which originate on the Colorado and Fraser Rivers on the western slope of Colorado. The Windy Gap project pumps its water into the C-BT system. Once there, the water from both projects is delivered to Carter Lake then piped through the Southern Water Supply Project Pipeline (also known as the Carter Lake Pipeline) to Broomfield's Water Treatment Facility.

Broomfield currently owns 13,698 units of C-BT. The amount of water available from these units varies from year to year. The Northern Water Board of Directors adopts a quota each year based on the amount of storage in reserves, the projected runoff from snowpack, and anticipated demand, especially for irrigation in eastern Colorado. A typical quota is 70%, providing 0.7 acre-feet per unit, but the quota has ranged from 50% to 100% since 1957.

Broomfield owns 56 of the total 480 Windy Gap Project units. The current annual yield of Broomfield's 56 units is highly variable, ranging from no yield to 5,600 acre-feet. The yield depends upon annual moisture and storage capacity in the C-BT system. Without its own storage reservoir, the Windy Gap water is not considered to be a firm source of supply because there is no storage capacity for Windy Gap water when Lake Granby is full, or when Windy Gap water rights do not come into priority during dry years. To firm the Windy Gap rights, Broomfield is participating in the Windy Gap Firming Project through which Chimney Hollow Reservoir is under construction. Once Chimney Hollow is operational, Broomfield can rely on 5,600 acre-feet of water from the Windy Gap project in most years, including during droughts.

Non-Potable Water Supply

Broomfield owns, maintains, and operates an extensive non-potable water system that is supplied by advanced treated wastewater effluent (called reclaimed or reuse wastewater) and raw surface water that is blended with the reclaimed wastewater. The blended water, called

non-potable water, is used for outdoor irrigation of parks, golf courses, commercial areas, and other landscaped areas within the service area boundaries of Broomfield.

Broomfield's primary source of non-potable water is Windy Gap effluent (or Windy Gap water that returns to Broomfield's Wastewater Treatment Facility via the city's sewer system). As described above, the yield of the Windy Gap system currently varies widely from year to year. Because Windy Gap water is fully consumable, while C-BT is not, Northern allows communities to use Windy Gap in lieu of C-BT water. In other words, Broomfield can take delivery of up 5,600 acre-feet of C-BT and use it as though that water is Windy Gap. This provides the fully reusable effluent for the non-potable system. Once Chimney Hollow Reservoir is operational, Broomfield will have access to 5,600 acre-feet of Windy Gap water each year and will be much less likely to use the in-lieu policy. In future, Broomfield will be able to reuse a portion of C-BT effluent by replacing return flows on the South Platte River. Heit Pit, which is currently in development, will allow Broomfield to replace the C-BT return flows.

Broomfield also owns 61 inches (i.e, shares) in Church Ditch, which provides raw water for the non-potable system. This raw water is pumped into Great Western Reservoir (GWR).

The non-potable water system is completely separate from the potable water system. It currently provides a supply of about 2,500 acre-feet per year (1 acre-foot = 325,851 gallons), on average, to a total of approximately 940 acres of irrigated parks in the city. There is approximately an additional 1,500 acres of non-city owned areas served by the reuse system, including Arista, Flatirons Mall, Legacy High School, Anthem, and Interlocken Business Park along Highway 36. The reuse system is extremely beneficial because it allows Broomfield to expand its water supplies beyond a single, one-time use and reduces the amount of treated domestic drinking water that would otherwise be needed for these irrigation purposes.

3. Drought Vulnerability

Drought can affect Broomfield’s water supply in multiple ways. Table 1 summarizes the general impacts that drought may have on Broomfield’s major water sources (note that Table 1 includes only major water sources and leaves out a number of other water rights that make only very small contributions to Broomfield’s total supply).

Table1: Potential drought impacts on Broomfield’s major water sources

Source (potable or reuse)	Potential Drought Impacts
C-BT (potable)	Low snowpack or reduced reserve storage in Lake Granby can lead the Northern Board to set lower than normal quota (e.g., in 2003 the quota was 50%); this can also reduce the amount of C-BT that Broomfield is able to carry-over from one year to the next
Windy Gap (potable)	Low snowpack in the Colorado River headwaters means that Windy Gap water rights would not be in priority and would not divert water; Chimney Hollow reservoir will enable storage from wet years
Denver Water (potable)	Low snowpack and low reservoir storage reserves can cause Denver Water to curtail deliveries to Broomfield
C-BT (reuse)	Drought limits yield on the water rights that will be stored in Heit Pit which would limit Broomfield’s ability to reuse C-BT effluent
Windy Gap (reuse)	Reduced yield of Windy Gap water rights can limit reusable effluent
Church Ditch Raw Water (reuse)	Low streamflows in Clear Creek could limit Church Ditch diversions and raw water available to Broomfield

Broomfield evaluated drought vulnerability as part of developing this Drought Response Plan. The evaluation considered drought conditions under observed and documented drought events, climate change, Colorado River management issues, and potential short-term water shortages that could be caused by infrastructure outages. The evaluation compared potential reductions in supply under different scenarios and projections of future total water demand, including near-term demand (~2025) and build-out demand (~2040). Evaluation of build-out conditions included new supply projects that will become operational before then (e.g., Chimney Hollow Reservoir). The analysis incorporated the policy of maintaining a 10% buffer over and above estimates of future demand.

The evaluation showed that Broomfield could be vulnerable to severe multi-year droughts, like the one that occurred from 2002 to 2004. Without restrictions on water use or additional water supply, Broomfield could experience water shortages under such a drought both in the near term and at build out. There is the potential for shortages in both the potable and reuse water systems, though shortages would likely be more severe for potable water. More severe

droughts, like those that are possible under severe climate change, would create the potential for larger shortages.

Available research and data suggests that shortages under conditions like those experienced in the 2002 drought could potentially be addressed entirely through mandatory water use restrictions, though it would require more stringent restrictions than any implemented by Broomfield in past droughts. Further, it will be critical for Broomfield to implement robust communications and enforcement to ensure that drought restrictions achieve the desired reductions in water use. As a result, this drought response plan includes robust strategies for implementing mandatory water use restrictions when necessary and for communicating with the Broomfield community about drought and water use restrictions.

Infrastructure outages could create a short-term shortage, but Broomfield can address these shortages through operational adjustments, interconnects with other communities, and short-term emergency implementation of water use restrictions.

4. Drought Monitoring

Introduction

Broomfield aims to make drought stage declarations and decisions about drought response based on indicators of drought risk each year. A robust drought monitoring approach will help Broomfield track hydrologic conditions and assess potential risks using the best available information. In previous versions of Broomfield's drought plan, drought monitoring and triggers focused on storage of potable water sources. That approach involved calculating a drought condition index using available storage, as a percent of capacity, in reservoir systems owned by Denver Water and Northern Water. In practice the storage-based index was not a primary tool for declaring drought conditions. Instead, Broomfield considered actions of neighboring communities to decide when to declare a Drought Watch. Broomfield has not declared a Drought Condition with mandatory water use restrictions since 2002.

Focusing entirely on storage conditions in the systems that provide Broomfield's water will not provide sufficient information to determine drought risk. With this updated drought plan, Broomfield is adopting a drought risk index that accounts for expected supply and projected demand to provide a better indicator of risk. This approach is consistent with the drought monitoring approaches among other water providers in our region.

While the New Drought Condition Index (summarized below) will help Broomfield monitor conditions across all sources of water and determine when drought conditions are present, Broomfield's contract with Denver Water allows them to progressively curtail deliveries of water to Broomfield "during such times as use restrictions are applied to all users furnished with water from the Board's water system." Denver Water's typical use reduction target for each water shortage stage is listed below, but the Board has the flexibility to adopt any percentage it finds appropriate.

- Water Shortage Watch: Use reduction target up to 10%
- Stage 1: Use reduction target up to 30%
- Stage 2: Use reduction target up to 50%
- Stage 3: Use reduction target will depend on the facts and circumstances at that time

Denver Water's drought actions will continue to be a key factor in Broomfield's drought monitoring and response.

Since Denver Water represents only a portion of Broomfield's water supply, there could be situations in which Denver Water's drought response actions would not make sense for Broomfield. For example, if Chimney Hollow reservoir is full and the C-BT quota is at least 70%, even with a curtailment in our Denver Water supply, mandatory water use restrictions for Broomfield may not make sense. Conversely, Broomfield may elect to declare a drought condition that is more severe than Denver Water's declaration if necessary.

Drought Condition Index - Potable Water

Broomfield will use a Drought Condition Index as a key piece of information in making decisions about drought stages and response. The Index includes both expected supply of water and projected demand for the year. The index will be calculated and updated from late winter through spring each year, especially after the spring C-BT quota is set by Northern in early April. The index is defined as follows:

$$\text{Drought Index} = \frac{\text{projected supply}}{\text{projected demand}}$$

The index is calculated on an annual aggregate basis using total annual supplies and total annual demand.

$$\text{Projected supply} = \text{C-BT} + \text{C-BT Carryover} + \text{Windy Gap} + \text{Denver Water}$$

Assumptions and procedures for estimating supply are covered below for each source of water.

C-BT Quota and Supply

Calculated as follows:

$$\text{CBT Supply} = \text{Fixed Shares} \times 0.7 + \text{Variable Shares} \times \text{Quota}$$

- As of 2023, Broomfield owns 5,089 fixed shares and 8,609 variable shares. Updated ownership numbers are kept in accounting files for Northern water sources.
- Fixed shares always yield at 70% and the annual quota does not affect them.
- For variable shares, the baseline assumption is that the final quota will be 70%, and the November initial quota will be 50%.
- If the final quota has been set by the Northern Board, we will use the actual quota.
- If the November quota is less than 50% and the final quota has not yet been set, then deduct the difference from 50% from the projected quota for the year.
 - E.g., if the November quota is 40%, assume the final quota will be 60% instead of 70%.
- If November quota is 50% (i.e., normal) AND final quota has not yet been set and if we need to project drought conditions, we will assume the final quota will be 60% (i.e., less than normal) if the following conditions are met:
 - Lake Granby is less than 50% capacity
 - Snow water equivalent in the Colorado River Headwaters Basin is less than 100% of the median annual maximum for the period of record
 - If Lake Granby is less than 30% capacity, assume a 50% quota

C-BT Carryover

- Carry-over amount is known by the beginning of the C-BT water year on November 1st.

- If an estimate is needed earlier in the year (i.e., well before November 1st), staff can project carry-over by about mid-summer.
- Note that carryover will be less each year as we approach build-out demand (unless Broomfield acquires more C-BT shares).

Windy Gap Supply

- Supply before Chimney Hollow is complete will be difficult to forecast because it depends on Windy Gap water rights being in priority and available storage space in Lake Granby. Available documents (e.g., the Chimney Hollow EIS) suggest that Windy Gap water rights did not yield in 2002. As a result, to be conservative, since Windy Gap tends not to yield in bad droughts and the system does not yet have reliable storage, Windy Gap supply is assumed to be zero for purposes of drought monitoring.
- After Chimney Hollow is complete, the Windy Gap system will have reliable yield for Broomfield of 5,600 acre-feet per year. If Broomfield's storage in Chimney Hollow is depleted below 5,600 acre-feet (e.g., in a persistent multi-year drought), assume yield is limited to the amount of water in storage and that the project will not divert/pump any additional water that year (since the Windy Gap water rights tend not to be in priority in droughts).

Denver Water Supply

$$\text{Denver Water Supply} = \text{Max}(4,700 \text{ AF}, \text{Prior Year's Delivery}) \times (1 - \text{Curtailment})$$

- If Denver Water has declared a Drought Stage, they will communicate any required curtailment in deliveries. If they have not yet communicated the curtailment, assume the following under DW's drought stages:
 - Drought Watch - 10% curtailment
 - Stage I - 30% curtailment
 - Stage II - 30% to 50% curtailment
 - Stage III - at least 50% curtailment
- The percent curtailment is applied to either our minimum required delivery of 4,700 acre-feet or the prior year's total delivery, whichever is greater
- If DW has not declared a drought but conditions suggest they might, we will use forecast storage conditions in Denver Water's system (if released yet for the current water year) or Snow Water Equivalent relative to 30-year median in the South Platte and Colorado River Headwaters to project whether they will declare a drought.

Projected demand

We have two potential methods for estimating total water demand for the coming year. To be conservative, staff will generally use the higher value in calculating the drought index.

With the first method, average total production over the last five years is inflated by the expected percent growth in TEs for the current year. Total production can be found in the water

treatment plant’s monthly reports. Total production is the amount ordered from Denver Water plus total produced at the water treatment plant. Growth in TEs can be obtained from Community Development. Table 2 below provides an example:

Table 2: Projecting growth based on past production

Year	Production, acre-feet
2018	12,157
2019	11,265
2020	12,609
2021	11,994
2022	12,348
5-year average	12,075
TE growth percentage for 2022 to 2023	9%
Estimated 2023 demand	13,162

Under the second approach, demand for the year can be estimated by combining the current number of Tap Equivalents (TEs) and data on average use per TE. This can be done by customer category.

$$Demand = TE_i \times D_i$$

TE_i represents the current number of TEs for customer group *i*.

D_i represents the water use per TE for customer group *i*.

The customer groups are:

- 1) Residential
- 2) Commercial/industrial
- 3) Church/public/other
- 4) Irrigation (potable, not reuse)

Average use per TE as of 2023 is shown in Table 3; these estimates should be updated every year. For the estimates shown below, TE and annual water use for the years 2017-2019 and 2022 were used (to avoid years that may have been affected by pandemic shutdowns). This yields annual water use, which can be used above with annual water supply to calculate the index.

Table 3: Average use per TE for four aggregate customer groups

Customer Group	User per TE per year (acre-feet)	TEs as of 2023
Residential	0.336	22,821.510
Commercial & Industrial	0.545	6,392.090
Irrigation (not including reuse)	0.754	3,147.563
Church, Public & all others	0.662	236.030

Drought Condition Index - Reuse

Supply for the reuse system is highly variable due to 1) uncertain raw water deliveries to Great Western Reservoir (GWR) from Church Ditch and 2) variation in how and when we order Windy Gap and C-BT. As a result, a drought index that takes into account supply and demand is not feasible for the reuse system.

Instead of a drought index, Broomfield will track and project storage in GWR throughout the irrigation season. Storage projections will take into account expected demands, anticipated Windy Gap orders, expected raw water deliveries to GWR and other key factors.

We will project the minimum expected storage at GWR for the on-going irrigation season. The assumption is that Windy Gap and C-BT (once Heit Pit is operational) will be fully used before the end of the irrigation season and that remaining storage in GWR represents the primary buffer against shortage.

Additional Data Sources

Additional data sources can supplement the drought index and projection of GWR Storage.

Snowpack

The SNOTEL system from USDA/NRCS provides data on current snowpack conditions and comparisons to historical statistics. In addition, NRCS provide basin-wide snowpack conditions.

We will use two different basin-wide averages for drought monitoring.

1. Colorado Headwaters Sub-basin (HUC8):
https://www.nrcs.usda.gov/Internet/WCIS/AWS_PLOTS/basinCharts/POR/WTEQ/assoc_HUC8/14010001_Colorado_Headwaters.html
2. Blue River Sub-basin (HUC8):
https://www.nrcs.usda.gov/Internet/WCIS/AWS_PLOTS/basinCharts/POR/WTEQ/assoc_HUC8/14010002_Blue.html

3. South Platte Basin (HUC6):
https://www.nrcs.usda.gov/Internet/WCIS/AWS_PLOTS/basinCharts/POR/WTEQ/assoc/HUC6/101900_South_Platte.html
4. Clear Creek Sub-basin (HUC8):
https://www.nrcs.usda.gov/Internet/WCIS/AWS_PLOTS/basinCharts/POR/WTEQ/assoc/HUC8/10190004_Clear.html

The SNOTEL links above provide a chart and table showing current snow-water-equivalent (SWE) across each basin relative to the median value from 1991 to 2020. If conditions are evaluated before the median peak date for the basin, we will use the current day's SWE relative to the median. The SNOTEL report provides this as a percentage. If conditions are evaluated beyond the median peak date, we will use the peak SWE for this season relative to the median peak. Note that the report does not provide this value and it will have to be estimated separately from values on the chart.

US Drought Monitor

The US Drought Monitor (USDM) is updated once a week and is based on a combination of multiple datasets ([Drought Classification | U.S. Drought Monitor](#)).

The current USDM for Colorado: [Colorado | U.S. Drought Monitor](#)

Other Drought Indicators

Other datasets that may be useful to support drought decisions are listed below. Note that the US Drought Monitor incorporates each of these datasets, but they may be helpful separately in some cases.

Palmer Drought Severity Index [Climate Prediction Center - Monitoring & Data: Drought Monitoring](#)

Standardized Precipitation Index
<https://www.ncei.noaa.gov/access/monitoring/nadm/indices/spi/div>

Soil Moisture

The National Weather Service maintains a daily dataset on current soil moisture conditions. This can help understand how well snowmelt and runoff will translate to streamflow.

https://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/US/Soilmst/Soilmst.shtml#

5. Drought Stages and Triggers

Drought stages allow us to set appropriate response actions, including water use restrictions, for the severity of drought conditions and potential risks. With each stage we increase our target

reduction in water use and the actions we take to achieve that target. The characteristics of Broomfield’s four drought stages are summarized in Table 4. Details on the exact water use restrictions are presented later and are in Broomfield Municipal Code, Title 13, Chapter 36.

Table 4: Broomfield’s drought stages and water use reduction targets for both potable and reclaimed water

Stage	Water use reduction target		General characteristics
	Summer outdoor water use	Annual total water use	
Drought Watch	5%	2.5%	Declared by staff Voluntary water use reductions
Drought Condition I - Moderate Drought	30%	16%	Requires City Council approval Mandatory water use restrictions on all customers Lawn irrigation restricted to two days per week Target 33% reduction for large non-residential customers, including parks
Drought Condition II - Severe Drought	50%	30%	Requires City Council approval Increased mandatory water use restrictions on all customers Lawn irrigation restricted to one day per week Target 50% reduction for large non-residential customers, including parks
Drought Condition III - Drought Emergency	50 to 75%, or more as needed	30% to 45% or more if needed	Requires City Council approval Increased mandatory water use restrictions on all customers Lawn irrigation is prohibited for most customers Target at least 75% reduction for parks and schools, limiting irrigation to actively used athletic fields Target at least 75% cut for golf courses, limiting irrigation to tees and greens

Emergency Declaration Due to Infrastructure Outage

An infrastructure outage, such as a temporary outage to the Southern Water Supply Pipeline that delivers C-BT and Windy Gap water, would create a unique situation. In this case, instead of a drought stage from Table 4, Broomfield’s City Manager could declare an emergency (BMC 8-32-020) and Water Resources staff would coordinate with the City Manager’s Office (CMO) and Emergency Management staff to manage the situation.

Drought Triggers - Potable Water System

The Drought Condition Index will inform decisions about declaring a Drought Watch or for making recommendations to the City Council about declaring Drought Conditions I, II, or III.

Table 5 shows how the Drought Condition Index will be used to help determine drought stages. While Table 5 shows a direct relationship between the drought condition index and drought conditions, in practice the index would not be used strictly as a single determinant of declared drought conditions. Other factors will be considered, such as trends in demand (i.e., if there is evidence that Broomfield residents are voluntarily using less water), expected pumping of Windy Gap (especially relevant before Chimney Hollow is complete), snowpack conditions and other factors. These other factors will be particularly important when the index value is near a threshold between one condition and another (e.g., Index =0.89).

Drought Triggers - Reuse Water System

Since reuse drought conditions will be tracked using projected storage drawdown at GWR, we will use a separate set of triggers to determine when drought conditions should be declared for the reuse system. Drought watches for reuse will coincide with drought watches for potable water (i.e., when a watch is declared for potable water, it will also apply to reuse). This is due to the fact that drought watches will typically be declared in the early Spring before we know anything specific about GWR drawdown for that year. Drought conditions I, II, and III will be declared according to the guidelines in Table 6.

Table 5: Broomfield's drought triggers for potable water

Drought Condition Index Value	Interpretation	Drought Condition
$1.0 \leq \textit{index} < 1.10$	Expected supplies are sufficient to meet anticipated demand for the year, but not sufficient to meet the 10% safety factor	Drought Watch
$0.85 \leq \textit{index} < 1.0$	Expected supplies are insufficient to meet anticipated demand for the year, with a shortage relative to unrestricted demand of up to 15% Water use reduction of up to 15% for the year will be required to avoid shortages	Drought Condition I <i>Moderate Drought</i>
$0.70 \leq \textit{index} < 0.85$	Expected supplies are insufficient to meet anticipated demand for the year, with a shortage relative to unrestricted demand of 15% to 30% Water use reduction of up to 30% for the year will be required to avoid shortages	Drought Condition II <i>Severe Drought</i>
$\textit{index} < 0.70$	Expected supplies are insufficient to meet anticipated demand for the year, with a shortage relative to unrestricted in excess of 30% or more. Water use reduction of more than 30% for the year will be required to avoid shortages	Drought Condition III <i>Drought Emergency</i>

Table 6: Broomfield's drought triggers for the reuse system

Projected minimum GWR Storage, acre-feet (% capacity) and timing	Interpretation	Drought Condition
<i>Potable System is in Drought Watch</i>	<i>Drought Watch is triggered by conditions in the potable system but applies to both potable and reuse</i>	<i>Drought Watch</i>
Varies (410 acre-feet as of 2023)	Active storage within GWR is expected to drop below the 10% buffer threshold (i.e., 10% of total reuse demand) before the end of the irrigation season	Drought Condition I
245 acre-feet (10.1%)	GWR is expected to drop to within 3 feet of the lower gate before the end of the irrigation season	Drought Condition II
150 acre-feet (6.2%)	GWR is expected to drop to lower gate or below, leaving only dead storage, before the end of the irrigation season	Drought Condition III

6. Drought Mitigation and Response Actions

Broomfield considers a range of options to increase drought resilience. Some options would increase supply, while others would reduce demand. Both types of measures are described in this section.

Drought Mitigation Actions

Drought mitigation refers to long-term investments and other actions that will reduce Broomfield's vulnerability to future drought. Drought mitigation can include conservation measures that permanently reduce water demand (e.g., conversion of turf grass landscaping to waterwise landscaping) or supply measures that increase the amount of water available to Broomfield.

Conservation Measures

Broomfield has numerous conservation programs that will increasingly slow the growth of potable and reuse water demand on a permanent basis (these measures are distinct from drought water use restrictions, which generally reduce demand on a temporary basis). All water providers who annually supply over 2,000 acre-feet of water to retail customers are required by the state to develop a water efficiency plan (WEP). Broomfield's current WEP was approved by the City Council through the adoption of Resolution 2020-31 on January 28, 2020. The 2020 WEP evaluated and ranked specific conservation activities based on estimated water savings, compliance with established water conservation goals and policies, benefit/cost ratio, ease of implementation, and public acceptance. Overall the WEP sets a goal of reducing total water demand by 10% by 2040.

Broomfield offers a number of rebate programs to residential and non-residential customers. Below is a brief description of each program:

- EPA WaterSense certified high efficiency toilets (up to a \$75 rebate for 3 toilets per residence)
- Rotary nozzles (\$2 rebate per nozzle, minimum 10, maximum 100)
- WaterSense certified weather based smart irrigation controller (up to \$100 rebate, 1 per residence)
- Rain barrels (up to \$50 rebate, two 55 gallon barrels per residence)
- Graywater systems (a \$200 rebate)
- Commercial and industrial water account holders can apply for a rebate for 25% of the purchase price of WaterSense certified irrigation controllers, flush-o-meters, toilets and rotary nozzles
- Large area turf replacement program. Multi-family and non-residential water customers can receive \$1.20 per square foot to convert areas of high-water, cool-season turf grass (such as Kentucky Bluegrass) into native and waterwise landscapes.

In addition, Broomfield partners with Resource Central to offer three programs including:

- Free outdoor water audits for both residential and non-residential water customers
- \$25 discount on Garden-in-a-Box kits
- Lawn Replacement Program. Broomfield residents may qualify to receive \$500 to apply toward lawn removal services (Broomfield pays \$1.25/sq ft up to \$500 per project; residents pay the remaining \$1/sq ft.) and/or complimentary Garden-in-a-Box kits (up to 300 sq. ft.)

Broomfield's graywater Ordinance No. 2158, passed September 2021, legalized the use of graywater within Broomfield. Graywater sources include water discharged from bathroom and laundry-room sinks, bathtubs, showers, and laundry machines. Graywater sources do not include water discharged from toilets, urinals, kitchen sinks, dishwashers, and non-laundry utility sinks. Broomfield residents are authorized to reuse graywater for both outdoor irrigation and indoor toilet and urinal flushing.

Broomfield is also participating as a partner community in a large-scale non-functional turf replacement pilot project to investigate the costs and benefits of implementing a large-scale turf replacement program (focusing primarily on city-owned parcels). "Non-functional turf" broadly refers to areas of irrigated, cool season grass that receive little, if any, practical use. Water Resources staff are also coordinating with the Planning Department on a new waterwise landscaping ordinance which would limit the installation of turfgrass and promote more efficient landscaping and irrigation practices in new development. This ordinance will be presented to Broomfield's City Council concurrently with this Drought Response Plan update.

Measures to Increase Water Supply

In addition to reducing demand, Broomfield will consider cost-effective options to augment supply. Several large projects to increase supply are already in development (e.g., Chimney Hollow Reservoir and Heit Pit) or are incorporated in Broomfield's capital improvement plans for future implementation. Chimney Hollow will firm the Windy Gap supply and enable Broomfield to rely on 5,600 acre-feet of additional supply each year. Heit Pit will enable Broomfield to reuse a portion of C-BT effluent by providing a source of water for replacing C-BT return flows on the South Platte River (per an existing agreement with Northern).

Broomfield is evaluating additional supply options. Acquisition of additional C-BT or FRICO-Marshall shares would add to supply, but acquisition of new water can be very expensive and financially impractical. Broomfield is currently studying the potential for implementing indirect potable reuse of wastewater. This could enable an option under which reusable Windy Gap and/or C-BT effluent would be used for potable drinking water rather than outdoor irrigation on a temporary, emergency basis. The indirect potable concept is under study and results are not expected before this Drought Response Plan is finalized.

Drought Response Actions

Drought response includes short-term, temporary measures that will increase supply and/or reduce demand.

Temporary Measures to Increase Supply

Broomfield has two options to temporarily increase supply during a drought. Broomfield has an agreement with Larimer County for 80 alternative transfer method (ATM) C-BT units. Larimer County uses the 80 ATM units in most years for irrigation of a county-owned farm. Broomfield has the option to use the 80 ATM units in up to 3 out of every 10 years. Broomfield must notify Larimer County by January 31st and pay at least \$38,000 for use of the 80 units for a single year. The price for use of the ATM units escalates each year based on the market price for water. Also, notification can come later but would require reimbursing Larimer County for any farming costs incurred after January 31st. The yield of the 80 ATM units would depend on the quota set by Northern. Under a typical quota of 70%, the 80 units would provide 56 acre-feet of water.

In some years, there are C-BT units available to lease. For example, in 2022 Broomfield leased 1,000 acre-feet of C-BT water to a farmer near Longmont. If staff anticipate needing additional water during a drought, we will evaluate the C-BT lease market. It is possible that C-BT shares to lease would not be widely available during drought conditions.

Demand restrictions

Without reducing water demands, Broomfield faces the risk of potential shortages in future droughts. On-going conservation programs will help reduce baseline demand to some degree, but the risk of shortages in droughts may still exist. Under a repeat of the 2002 drought and using conservative assumptions about demand (see Section 3 on Drought Vulnerability), Broomfield could face as much as an 18% shortage in the near term future, and a 19% shortage at buildout. Permanent conservation measures and short-term demand restrictions during a drought could make up some or all of the potential shortage.

This section summarizes the demand restrictions Broomfield will adopt for each drought condition.

Drought Watch - Voluntary Demand Reductions

The primary goal of a Drought Watch is to serve as a warning to the Broomfield community that more severe drought conditions could develop and to begin setting a foundation for response if a more severe drought does develop. Anticipated water use reductions under a Drought Watch are small. Communications about drought conditions and strategies to reduce water use will ramp up during a drought watch, especially if monitoring efforts suggest that conditions are worsening.

A Drought Watch will apply to both potable water and reuse systems and communications efforts will target customers on both systems.

Drought Condition I - Moderate Drought - Mandatory Water Use Restrictions

Under Drought Condition I, water use reductions become mandatory. If Condition I is declared for the reuse system, mandatory water use restrictions apply to all reuse customers. For the potable system, mandatory water use restrictions apply to nearly all outdoor water uses. Specific restrictions by customer type and water use category are summarized below.

Mandatory Water Use Restrictions, Drought Condition I, Potable Water Customers

1. Turf irrigation on residential and other small parcels (includes Single Family Homes, Townhouses, Duplexes, and small commercial parcels)

Water use reduction targets:

- 33% reduction from normal daily summer average use
- 1.0 inch of total turf irrigation per week

Restriction: Limit turf irrigation to no more than two times per week. No turf irrigation is allowed between the hours of 10:00 a.m. and 6:00 p.m. on any day.

- Single family homes, townhouses, and duplexes with addresses ending in odd numbers shall irrigate on Wednesdays and Saturdays
- Single family homes, townhouses, and duplexes with addresses ending in even numbers shall irrigate on Sundays and Thursdays
- Small commercial parcels shall irrigate on Tuesdays and Fridays; small parcels are those with less than 100,000 square feet (or 2.3 acres) of irrigated turf
- There shall be no irrigation of turf on these parcels on Mondays
- Property owners will be allowed to follow an alternative irrigation schedule if they can demonstrate to city staff that they do not exceed the quantitative irrigation target of no more than 1.0 inch per week.

Guidance: Small parcels are those with less than 100,000 square feet (or 2.3 acres) of irrigated turf. Irrigation of small parcels shall follow the normal zone schedule on permitted days following best irrigation practices. Broomfield will develop a best practices guide on its water resources website so that it is available to all customers. The guide will include best practices for normal conditions and for drought.

2. Turf irrigation on large parcels (including public areas within Homeowner Associations and large commercial parcels)

Water use reduction targets:

- 33% reduction from normal daily summer average use
- 1.0 inch of total turf irrigation per week

Restriction: Limit turf irrigation to no more than 1.0 inch of water per week. No turf irrigation is allowed between the hours of 10:00 a.m. and 6:00 p.m. on any day.

Guidance: Large parcels are those with more than 100,000 square feet (or approximately 2.3 acres) of irrigated turf. Property managers will be expected to adjust irrigation schedules so that total weekly irrigation does not exceed 1.0 inch. Broomfield will develop a best practices guide on its water resources website so that it is available to all customers. The guide will include best practices for normal conditions and for drought.

3. Turf irrigation for Parks and Athletic Fields, including those owned by schools

Water use reduction targets:

- 33% reduction from normal daily summer average use
- 1.0 inch of total turf irrigation per week

Restriction: Limit turf irrigation to no more than 1.0 inch of water per week. No turf irrigation is allowed between the hours of 10:00 a.m. and 6:00 p.m. on any day.

Guidance: Property managers will be expected to adjust irrigation schedules so that total weekly irrigation does not exceed 1.0 inch. Broomfield will develop a best practices guide on its water resources website so that it is available to all customers. The guide will include best practices for normal conditions and for drought.

Broomfield owned parks will be irrigated according to the Parks Department Drought Standard Operating Procedure.

4. Turf irrigation for public and private golf courses

Water use reduction targets:

- 33% reduction from normal daily summer average use

Restriction: Limit turf irrigation to no more than 1.0 inch of water per week. No turf irrigation is allowed between the hours of 10:00 a.m. and 6:00 p.m. on any day.

Guidance: Property managers will be expected to adjust irrigation schedules so that total weekly irrigation does not exceed 1.0 inch. Broomfield will develop a best practices guide on its water resources website so that it is available to all customers. The guide will include best practices for normal conditions and for drought.

5. Installation and irrigation of new sod and seed

Restriction: During Drought Condition I, newly sodded, seeded, or re-seeded turf areas in the city must be registered with the Department of Public Works. New sod, seed or re-seed shall not be installed between the dates of June 1st and September 15th. Once registered with the Department of Public Works, newly sodded, seeded, or reseeded turf areas are subject to the following limitations:

- Total irrigation is limited to 2.0 inches per week for up two weeks from initial installation; this will allow new sod or seed to become established
- No irrigation of new sod or seed or re-seeded areas is allowed between the hours of 10:00 a.m. and 6:00 p.m.
- After the first two weeks of establishment irrigation, newly sodded, seeded, or re-seeded turf areas are subject to the same requirements under 1-4 above, depending on the location of the new sod or seed.

6. Irrigation of trees, shrubs and gardens on any parcel in the city

Restriction: irrigation of trees, shrubs and gardens is allowed at any time and on any day if done by hand, with a drip irrigation system, a bubbler irrigation system, or a soaker hose.

Guidance: Hand watering means holding in the hand a hose with an attached positive shutoff nozzle, and does not include operating a hose with a sprinkler or manually operating an irrigation controller.

7. Irrigation system maintenance

Restriction: An irrigation system may be operated at any time for the purpose of repair or regular maintenance, provided that misuse or waste of water does not occur in violation of section 13-24-010, B.M.C.

8. Swimming pools

Restrictions: The city shall not issue building permits for new swimming pools. Existing swimming pools may be filled once a year and the water level maintained in the swimming pool throughout the year.

9. Washing of vehicles

Restriction: Personal vehicles may be washed no more often than once each week using a hose with a positive shutoff mechanism. Vehicles in government or commercial operations or fleets may be washed no more often than once a week. Vehicles may be washed at a commercial car wash at any time.

10. Washing impervious surfaces

Restriction: Impervious surfaces, such as sidewalks, driveways, or patios, may not be washed by hoses, except when necessary for public health or safety reasons.

11. Building maintenance

Restriction: Buildings may be washed by a pressure washer to clean the surface in preparation for maintenance, provided that misuse or waste of water does not occur in violation of section 13-24-010, B.M.C.

12. Outdoor water features (including fountains and misting systems)

Restriction: no restrictions in Drought Condition I

Drought Condition II - Severe Drought - Mandatory Water Use Restrictions

Drought Condition II is a severe drought with growing concern about potential shortages. Under Condition II, Broomfield increases mandatory water use restrictions. If Condition II is declared for the reuse system, mandatory water use restrictions apply to all reuse customers. For the potable system, mandatory water use restrictions apply to nearly all outdoor water uses. Specific restrictions by customer type and water use category are summarized below.

Mandatory Water Use Restrictions, Drought Condition II, Potable Water Customers

1. Turf Irrigation on residential and other small parcels (includes Single Family Homes, Townhouses, Duplexes, and small commercial parcels)

Water use reduction targets:

- At least 50% reduction from normal daily summer average use
- 0.75 inches of total turf irrigation per week

Restriction: Limit turf irrigation to no more than one time per week. No turf irrigation is allowed between the hours of 10:00 a.m. and 6:00 p.m. on any day.

- Single family homes, townhouses, and duplexes with addresses ending in odd numbers shall irrigate on Wednesdays
- Single family homes, townhouses, and duplexes with addresses ending in even numbers shall irrigate on Sundays
- Small commercial parcels shall irrigate on Fridays; small parcels are those with less than 100,000 square feet (or 2.3 acres) of irrigated turf
- There shall be no irrigation of turf on these parcels on Mondays, Tuesdays, Thursdays, or Saturdays

- Property owners will be allowed to follow an alternative irrigation schedule if they can demonstrate to city staff that they do not exceed the quantitative irrigation target of no more than 0.75 inches per week.

Guidance: Small parcels are those with less than 100,000 square feet (or 2.3 acres) of irrigated turf. Irrigation of small parcels shall follow the normal zone schedule on permitted days following best irrigation practices. Broomfield will develop a best practices guide on its water resources website so that it is available to all customers. The guide will include best practices for normal conditions and for drought.

2. Turf irrigation on large parcels (including public areas within Homeowner Associations and large commercial parcels)

Water use reduction targets:

- At least 50% reduction from normal daily summer average use

Restriction: Limit turf irrigation to no more than 0.75 inches of water per week. No turf irrigation is allowed between the hours of 10:00 a.m. and 6:00 p.m. on any day.

Guidance: Large parcels are those with more than 100,000 square feet (or approximately 2.3 acres) of irrigated turf. Property managers will be expected to adjust irrigation schedules so that total weekly irrigation does not exceed 0.75 inches. Broomfield will develop a best practices guide on its water resources website so that it is available to all customers. The guide will include best practices for normal conditions and for drought.

3. Turf irrigation for Parks and Athletic Fields, including those owned by schools

Water use reduction targets:

- At least 50% reduction from normal daily summer average use

Restriction: Limit turf irrigation to no more than 0.75 inches of water per week. No turf irrigation is allowed between the hours of 10:00 a.m. and 6:00 p.m. on any day.

Guidance: Property managers will be expected to adjust irrigation schedules so that total weekly irrigation does not exceed 0.75 inches. Broomfield will develop a best practices guide on its water resources website so that it is available to all customers. The guide will include best practices for normal conditions and for drought.

Broomfield owned parks will be irrigated according to the Parks Department Drought Standard Operating Procedure.

4. Turf irrigation for public and private golf courses

Water use reduction targets:

- At least 50% reduction from normal daily summer average use

Restriction: Limit turf irrigation to no more than 0.75 inches of water per week. No watering of roughs. No turf irrigation is allowed between the hours of 10:00 a.m. and 6:00 p.m. on any day.

Guidance: Property managers will be expected to adjust irrigation schedules so that total weekly irrigation does not exceed 0.75 inches. Broomfield will develop a best practices guide on its water resources website so that it is available to all customers. The guide will include best practices for normal conditions and for drought.

5. Installation and irrigation of new sod and seed

Restriction: Installation of new sod or seed, or re-seeding existing turf is prohibited during drought Condition II.

6. Irrigation of trees, shrubs and gardens on any parcel in the city

Restriction: irrigation of trees, shrubs and gardens is allowed at any time and on any day if done by hand, with a drip irrigation system, a bubbler irrigation system, or a soaker hose.

Guidance: Hand watering means holding in the hand a hose with an attached positive shutoff nozzle, and does not include operating a hose with a sprinkler or manually operating an irrigation controller.

7. Irrigation system maintenance

Restriction: An irrigation system may be operated at any time for the purpose of repair or regular maintenance, provided that misuse or waste of water does not occur in violation of section 13-24-010, B.M.C.

8. Swimming pools

Restrictions: The city shall not issue building permits for new swimming pools. Existing swimming pools may be filled once a year and the water level maintained in the swimming pool throughout the year.

9. Washing of vehicles

Restriction: Personal vehicles may be washed no more often than once each week using a hose with a positive shutoff mechanism. Vehicles in government or commercial operations or fleets may be washed no more often than once a week. Vehicles may be washed at a commercial car wash at any time.

10. Washing impervious surfaces

Restriction: Impervious surfaces, such as sidewalks, driveways, or patios, may not be washed by hoses, except when necessary for public health or safety reasons.

11. Building maintenance

Restriction: Buildings may be washed by a pressure washer to clean the surface in preparation for maintenance, provided that misuse or waste of water does not occur in violation of section 13-24-010, B.M.C.

12. Outdoor water features (including fountains and misting systems)

Restriction: Operation of outside water features, such as fountains or outdoor misting systems, is prohibited, except if such features or systems are used to sustain aquatic life or maintain water quality.

Drought Condition III - Drought Emergency - Mandatory Water Use Restrictions

Drought Condition III is an emergency state under which Broomfield will take all necessary actions to prevent shortages and system failures. Under Condition III, Broomfield increases mandatory water use restrictions. If Condition III is declared for either the potable or reuse system, turf irrigation will be prohibited, with the only potential exception being actively used athletic fields and tees and greens on golf courses. Other mandatory water use restrictions will increase. Specific restrictions by customer type and water use category are summarized below.

In the event that the restrictions described below are deemed insufficient by staff to prevent shortages or other system failures in a persistent or worsening drought emergency, Broomfield Municipal Code chapter 8-32 (Water Emergencies) grants authority to the City Manager and City Council to take additional measures. In the unlikely event of a Drought Emergency that threatens the safety of Broomfield's water supply, the City Manager may declare a temporary water emergency and, according to the procedures outlined in section 8-32-040 of code, may restrict water uses beyond the specific restrictions described below.

Mandatory Water Use Restrictions, Drought Condition III, Potable Water Customers

1. Turf Irrigation on residential and other small parcels (includes Single Family Homes, Townhouses, Duplexes, and small commercial parcels)

Restriction: Turf irrigation is prohibited

2. Turf irrigation on large parcels (including public areas within Homeowner Associations and large commercial parcels)

Restriction: Turf irrigation is prohibited

3. Turf irrigation for Parks and Athletic Fields, including those owned by schools

Water use reduction targets:

- At least 75% reduction from normal daily summer average use

Restriction: Turf irrigation is prohibited except for athletic fields. Actively used athletic fields may be irrigated no more than 0.75 inches of water per week. No turf irrigation is allowed between the hours of 10:00 a.m. and 6:00 p.m. on any day. The City Manager and City Council may further restrict irrigation of athletic fields if drought conditions persist or worsen.

Guidance: Property managers will be expected to adjust irrigation schedules so that total weekly irrigation does not exceed 0.75 inches and only on actively used athletic fields. Broomfield will develop a best practices guide on its water resources website so that it is available to all customers. The guide will include best practices for normal conditions and for drought.

Athletic fields in Broomfield owned parks will be irrigated according to the Parks Department Drought Standard Operating Procedure.

4. Turf irrigation for public and private golf courses

Water use reduction targets:

- At least 75% reduction from normal daily summer average use

Restriction: Only tees and greens may be irrigated. Limit turf irrigation of tees and greens to no more than 0.75 inches of water per week. No turf irrigation is allowed between the hours of 10:00 a.m. and 6:00 p.m. on any day. The City Manager and City Council may further restrict irrigation of golf courses if drought conditions persist or worsen.

Guidance: Property managers will be expected to adjust irrigation schedules so that total weekly irrigation on tees and greens does not exceed 0.75 inches. Broomfield will develop a best practices guide on its water resources website so that it is available to all customers. The guide will include best practices for normal conditions and for drought.

5. Installation and irrigation of new sod and seed

Restriction: Installation of new sod or seed, or re-seeding existing turf is prohibited during drought Condition III.

6. Irrigation of trees, shrubs and gardens on any parcel in the city

Restriction: Irrigation of trees, shrubs and gardens is allowed at any time and on any day if done by hand, with a drip irrigation system, a bubbler irrigation system, or a soaker hose.

Guidance: Hand watering means holding in the hand a hose with an attached positive shutoff nozzle, and does not include operating a hose with a sprinkler or manually operating an irrigation controller.

7. Irrigation system maintenance

Restriction: An irrigation system may be operated at any time for the purpose of repair or regular maintenance, provided that misuse or waste of water does not occur in violation of section 13-24-010, B.M.C.

8. Swimming pools

Restrictions: The city shall not issue building permits for new swimming pools. Private swimming pools may not be filled. Public swimming pools, private club swimming pools, and homeowner's association swimming pools may be filled once per year and levels maintained.

9. Washing of vehicles

Restriction: Personal vehicles may be washed no more often than once each week using a hose with a positive shutoff mechanism. Vehicles in government or commercial operations or fleets may be washed no more often than once a week. Vehicles may be washed at a commercial car wash at any time.

10. Washing impervious surfaces

Restriction: Impervious surfaces, such as sidewalks, driveways, or patios, may not be washed by hoses, except when necessary for public health or safety reasons.

11. Building maintenance

Restriction: Buildings may be washed by a pressure washer to clean the surface in preparation for maintenance, provided that misuse or waste of water does not occur in violation of section 13-24-010, B.M.C.

12. Outdoor water features (including fountains and misting systems)

Restriction: Operation of outside water features, such as fountains or outdoor misting systems, is prohibited, except if such features or systems are used to sustain aquatic life or maintain water quality.

Table 7: Summary of water use restrictions for each drought condition

Drought Condition	Reduction target	Summary of water use restrictions
Drought Watch	5%	Voluntary water use reductions. Request that customers voluntarily limit outdoor irrigation to two days per week and not irrigate between 10:00 a.m. and 6:00 p.m.
Drought Condition I Moderate drought, mandatory restrictions	30%	<ul style="list-style-type: none"> ● Private turf irrigation is limited to two days per week, and allowed only before 10:00 a.m. or after 6:00 p.m., targeting no more than 1.0 inch of irrigation per week ● Parks, golf courses, and school athletic fields must limit irrigation to no more than 1.0 inch per week ● New sod/seed must be installed before June 1 or after September 15th; total irrigation of up to 2 inches per week for two weeks to establish the new turf; after two weeks follow normal turf irrigation limits ● Trees, shrubs, and gardens may be irrigated by hand, drip, bubbler or soaker hose at any time ● No new permits for pools; existing pools may be filled once per year ● Some restrictions on vehicle washing; no restrictions on commercial car washes ● No restrictions on irrigation system maintenance or building washing for maintenance purposes ● No washing of sidewalks or driveways with hoses
Drought Condition II Severe drought, mandatory restrictions	50%	<ul style="list-style-type: none"> ● Private turf irrigation is limited to one day per week, and allowed only before 10:00 a.m. or after 6:00 p.m., targeting no more than 0.75 inches of irrigation per week ● Parks, golf courses, and school athletic fields must limit irrigation to no more than 0.75 inches per week ● Installation of new sod/seed is prohibited; if feasible, golf courses shall not irrigate roughs ● Trees, shrubs, and gardens may be irrigated by hand, drip, bubbler or soaker hose at any time ● No new permits for pools; existing pools may be filled once per year ● Some restrictions on vehicle washing; no restrictions on commercial car washes ● No restrictions on irrigation system maintenance or building washing for maintenance purposes ● No washing of sidewalks or driveways with hoses ● Operation of outdoor water features (e.g., fountains, misters) is prohibited
Drought Condition III Drought emergency, mandatory restrictions	50% to 75% or more	<ul style="list-style-type: none"> ● Turf irrigation is prohibited except parks, golf courses and athletic fields, as described below ● Park and school athletic fields may be irrigate no more than 0.75 inches per week ● Golf courses may irrigate only tees and greens and no more than 0.75 inches per week ● Installation of new sod/seed is prohibited ● Trees, shrubs, and gardens may be irrigated by hand, drip, bubbler or soaker hose at any time ● No new permits for pools; private pools may not be filled; public, club or HOA pools may be filled once per year ● Some restrictions on vehicle washing; no restrictions on commercial car washes ● No restrictions on irrigation system maintenance or building washing for maintenance purposes ● No washing of sidewalks or driveways with hoses

7. Operational and Administrative Framework

This section describes operational and administrative procedures for implementing the drought response plan.

Roles and Responsibilities

Ultimate responsibility for implementing this Plan rests with the Director of Public Works and the Water Resources Manager. The Director of Public Works and Water Resources Manager, supported by other water resources staff, will be responsible for all of the technical and administrative tasks necessary to implement this Plan, including:

- Collecting and monitoring water resources data to assess and describe potential drought conditions
- Tracking water use and conservation to estimate demand each year
- Calculating the Drought Condition Index each spring (or as needed)
- Projecting GWR storage throughout the irrigation season
- Making determinations about drought risk each year
- Formulating Drought Condition recommendations supported by available data and the Drought Condition Index
- Communicating with the Drought Operations Committee (see below) and convening meetings of that committee to review drought condition recommendations
- Administering the process to bring drought recommendations to the City Council for review and approval
- Executing supply augmentation actions summarized in Section 6
- Managing, monitoring and evaluating demand management actions summarized in Section 6
- Managing enforcement and communication tasks for demand restrictions
- Evaluating and updating this plan, especially after drought events

An advisory committee with representatives from across Broomfield's Departments was formed to help guide development of this Plan. Similarly, a Drought Operations Committee has been formed to support implementation of the Plan (see Table 8). The Operations Committee will have the following responsibilities:

- Review and discuss information on drought conditions
- Review and discuss recommendations about declaring official Drought Conditions (including a Drought Watch) and provide input and feedback about whether to proceed with those recommendations
- Coordinate regularly about operational decisions and any necessary deviations from the details of this plan during times when Drought Conditions I, II, or III are in place.
- Communicate as necessary with staff in relevant departments and/or with the City Manager's Office about drought conditions and response actions

Table 8: Members of the Drought Operations Committee

Director of Public Works	Director of Operations and Emerg. Mgmt.
Water Resources Manager	Superintendent of Wastewater
Superintendent of Parks	Director of Communications
Superintendent of Water Treatment	

Monitoring and Coordination Procedures

Water Resources Staff will engage with the Drought Operations Committee each Spring to review conditions and potential drought recommendations. Staff should schedule an April meeting of the committee 1-2 months in advance. The meeting should take place before or after the final C-BT Quota is announced by Northern. If hydrologic conditions and the Drought Index suggest that no drought declaration is necessary, water resources staff can cancel the meeting and update the committee via email. If Water Resources staff conclude that a drought declaration will be necessary (including maintaining an existing drought condition or changing from an existing drought condition), they will proceed with the meeting to present information on drought conditions and recommendations and to gather feedback from the Committee.

As conditions evolve throughout the Winter, Water Resources Staff may have sufficient information to begin coordinating with CMO about potential need for the City Council to consider a declaration of Drought Condition I, II, or III. If a drought declaration becomes necessary, the goal is to have the City Council approve the declaration no later than May 1st, so that communication about restrictions can go out early in the irrigation season.

For the potable water system, several events after May 1st could justify re-evaluating Broomfield's drought status and may require additional coordination with the Drought Operations Committee and the CMO. These events could include:

- New declaration of drought or a change in drought status from Denver Water, especially if Denver Water changes curtailment of deliveries to Broomfield
- A supplemental quota declaration by the Northern Water Board
- Unanticipated pumping of Windy Gap water into Lake Granby adding to Broomfield's total supply (this is particularly relevant before Chimney Hollow Reservoir is operational)

If staff declare a drought watch, it will apply to potable and reuse. If Council declares Drought Condition I, II, or III in the Spring, it may apply only to potable water, but in some cases staff may recommend that the declaration apply to reuse as well. This may occur if conditions in Spring suggest reuse may face shortages during the year as well (e.g., if Chimney Hollow storage is depleted or if Clear Creek snowpack suggests limited raw water from Church Ditch).

If a declaration is not made for the reuse system in the Spring, staff will monitor conditions and GWR storage throughout the summer to determine if and when a drought condition should be declared.

The general timeline and procedure is summarized in Table 9 for the potable system, and in Table 10 for the reuse system.

Drought Communications

Successful implementation of this Drought Response Plan, especially the mandatory water use restrictions in Section 6, will require robust communications to Broomfield's residents and businesses. A standalone communications strategy was developed to guide our communications. That strategy will be a living document, updated each year to reflect new lessons and observations about how best to engage with the Broomfield community. The goals behind Broomfield's drought communications include:

- Communication to help us realize demand reductions as needed to get through severe droughts.
- Increase knowledge and understanding among customers about drought and drought impacts and how Broomfield prepares for and responds to droughts.
- Increase awareness of real-time drought conditions.
- Increase awareness of drought restrictions and enforcement actions during Council-declared drought stages.
- Align with other Broomfield communications about water resources and water conservation.
- Align with other cities and organizations (Northern, Denver Water etc.).
- Measure the effectiveness of our communications actions to determine if we are reaching intended audiences and if we are having the desired impacts.

The communications strategy includes the following major elements:

- Assignment of roles among the water resources and communications staff
- A new drought information section of the Broomfield water resources webpage, with a simple URL of broomfield.org/drought
- Graphics that can be used for a drought watch and each of the Drought Conditions (see sample below). The graphics are tailored to each of several different communication channels, including REACH, Facebook, Instagram and others.
- Segmentation and description of different audiences, including single-family homeowners and commercial property managers.
- Drought communications timeline that lays out key communications tasks from winter through summer.

After the Drought Response Plan is finalized, the team will develop additional communications materials (text, graphics, etc.) to support communication about drought water use restrictions and other drought responses.



Emergency Conditions

Unforeseen infrastructure outages create an immediate emergency situation. Broomfield Code chapter 8-32 provides authority for declaring water emergencies. The associated procedures related to outage or failure of major water supply infrastructure are covered in this section.

Outages that create an emergency situation for the potable or reuse water systems include, but are not limited to, the following:

- Conduit 81, which delivers treated water from Denver Water
- The Southern Water Supply Pipeline, which delivers water from the C-BT and Windy Gap projects
- The wastewater reclamation facility at the wastewater treatment plant, which treats reusable effluent and pumps it to GWR and/or into the reuse distribution system.
- GWR outlet works, which supplies stored reuse water from the reservoir into the reuse distribution system

Upon any infrastructure or system failure associated with the facilities listed above, or any other infrastructure or system failure that threatens Broomfield's ability to meet unrestricted water demand, the Director of Public Works will recommend to CMO that a "temporary water emergency" be declared. The Director will recommend a temporary water emergency if any infrastructure or system failure reduces available water supply such that Broomfield may be unable to meet on-going water demand in either the potable or reuse water systems (failure of other water systems could also lead to a water emergency). According to code, the temporary

water emergency remains in place until the next meeting of the City Council, at which time the Council will decide whether to continue the water emergency.

Broomfield municipal code, section 8-32-040 states that the City Manager (during a temporary emergency) and City Council may invoke the following water use restrictions:

- Class C. Prohibits or restricts watering of lawns, washing of vehicles, ornamental or decorative uses (including, but not limited to display fountains or pools).
- Class B. Prohibits or restricts use of water for commercial or industrial purposes, unless necessary to prevent damage to equipment or injury to people.
- Class A. Prohibits or restricts any use of treated water except for drinking and eating purposes.

When a water emergency is declared due to an outage of major water supply infrastructure, water resource staff will evaluate available supplies (including local storage, if appropriate, and interconnects, if available) and on-going demands to determine whether demand restrictions are necessary. If demand restrictions are necessary, staff will evaluate the provisions of code shown above and the drought restrictions described in this plan to recommend an approach to CMO and City Council. That recommendation will include specific restrictions that the City Manager and City Council can approve to reduce demand to the extent necessary. The goal is to implement water use restrictions only if necessary and with minimal impact to Broomfield's residents and businesses, while avoiding risk of water shortages that may lead to losses of system pressure or other failures.

Table 9: Annual Drought Operations Timeline for Potable Water

Timeframe	Task	Purpose
Ongoing throughout the year	Drought monitoring	Track hydrologic conditions and demand, and calculate the Drought Condition Index to support drought declaration recommendations
February	Schedule Operations Committee Meeting	In case there is a need to review drought conditions and recommendations, find a time on committee members' calendars after expected quota announcement from Northern
By March 15	Preliminary Drought Condition Index	Using all available information and best estimates of the C-BT quota, calculate a range of preliminary Index values to determine if a drought declaration may be needed
By March 15	Drought on City Council Agenda (if needed)	If staff conclude that a drought declaration may be necessary, schedule a time in late April for City Council to consider drought declaration
By March 31	Enforcement training	Conduct 1-hour training with enforcement teams on drought restrictions and monitoring and enforcement practices; can be canceled if no drought declaration is expected
April (immediately after final C-BT Quota)	Drought Condition Index	After Northern sets the C-BT Quota, calculate the Drought Condition Index (including with a potential supplemental Quota)
April (immediately after final C-BT Quota)	Drought Recommendations	Based on updated Drought Condition Index, formulate recommendations for drought declarations; consider delaying this step if a supplemental C-BT quota is expected
April (immediately after final C-BT Quota)	Operations Committee Meeting	Review the drought declaration recommendation and determine whether to proceed. If no drought declaration is planned, the meeting can be canceled
By May 1st	City Council Drought Review	City Council reviews staff recommendation and decides whether to declare Drought Condition I, II, or III
By May 1st	Launch Drought Communications Plan	If and when City Council decides to declare Drought Condition I, II, or III, launch the communications plan to get the message out about mandatory restrictions
By May 15th	Mobilize Enforcement Teams	Communicate with enforcement team; schedule training and coordination meetings

Table 10: Annual Drought Operations Timeline for Reuse Water

Timeframe	Task	Purpose
By June 1st	Update GWR projection tool for the current year	The tool may need updates to incorporate new data on demands or other inputs. Any modifications should be made by June 1st
Weekly after June 1st	Update GWR storage projection	Using updated data on current storage, demand, and raw water pumping project end of season storage and determine whether it will drop below any of the trigger threshold values
Within 1 business day of GWR storage projection	Coordinate with Drought Operations Committee	If staff determine that projected GWR storage will drop below one of the trigger values in Table 6, formulate drought declaration recommendations and share the recommendations with the Drought Operations Committee.
Within 5 business days of GWR storage projection	Meet with the Drought Operations Committee	If staff determine that projected GWR storage will drop below one of the trigger values in Table 6, hold a meeting of the Drought Operations Committee to review projections and drought recommendations.
Within 1 day of Committee meeting	Schedule drought agenda item for City Council Meeting	If the Drought Operations Committee agrees that a drought declaration is warranted, staff will work with CMO to get the drought topic on an upcoming City Council agenda.
Within 1 day of Committee meeting	Ramp up parks irrigation SOP	If the Drought Operations Committee agrees that a drought declaration is warranted, staff will coordinate with Parks to begin reducing irrigation on city owned property irrigated by reuse, per the demand restrictions schedule and parks SOP
Within 14 days of Committee meeting	City Council reviews drought recommendations	City Council reviews staff recommendation to declare Drought Condition I, II, or III for the reuse system and makes final decision
Within 1 day of Drought Declaration	Launch Drought Communications Plan	If and when City Council decides to declare Drought Condition I, II, or III, launch the communications plan to get the message out about mandatory restrictions
Within 3 days of Drought Declaration	Mobilize Enforcement Teams	Communicate with enforcement team; schedule training and coordination meetings

Monitoring and Enforcement of Water Use Restrictions

In addition to effective communications with Broomfield water customers, enforcement of mandatory water use restrictions and prohibition of water waste will be critical for successfully managing a drought and preventing water shortages. Broomfield's primary goal is to encourage compliance through effective communications and setting a positive example on City-owned property. However, available research shows that both communications and enforcement will be necessary for reducing water use.

Monitoring

Broomfield staff will monitor water use during Drought Conditions I, II, and III. In conditions II and III monitoring and enforcement will require additional staff resources (either seasonal hires, or partially re-assigning staff from their normal roles to focus on drought monitoring). The goal is to have Broomfield staff dedicated to monitoring outdoor water use across the city each day of the week when Conditions I, II and III are in place.

Monitoring teams will consist of the following city personnel:

- All staff within the Water Resources Division, including any seasonal hires
- Utilities, Streets, and Parks staff who are regularly out in the field as part of their normal duties
- Other city staff as necessary (e.g., seasonal hires, Open Space staff)

Each year, the Water Resources Division will organize a brief training on water use restrictions and enforcement procedures. Staff who may be part of the enforcement team for that year should participate in the training. If no drought declaration is expected that year the training can be canceled.

During Drought Conditions I, II, or III, staff from the Water Resources Division will go out in the field to monitor water use every business day and as much as feasible on weekends and holidays. Water Resources staff will aim to have at least one person out patrolling for up to two hours each day.

During Drought Conditions II or III, monitoring and enforcement will require staff from other divisions and departments to assist with monitoring. Members of the enforcement team will be asked to observe water use during their normal duties and record violations of restrictions that are in place at the time. If necessary, the Director of Public Works and CMO may formally assign monitoring and enforcement duties to some staff (i.e., make monitoring and enforcement of water use restrictions part of their normal daily duties and temporarily reduce or eliminate other duties).

Violations should be recorded as follows:

1. If staff observe a property irrigating on a day or during a time that is prohibited, or if staff observe another prohibited water use (e.g., cleaning sidewalks with a hose), or if staff

observe clear water waste (such as large volumes of water running off irrigated landscapes onto sidewalks and streets), staff should photograph the violation and address with their phone and record the address, day, time and nature of the violation on paper or electronically.

2. Staff may engage with property owners, tenants or staff managing the property if they are present; such engagement shall be limited to notifying the owner, tenant, or other individuals that mandatory restrictions are in place, provide handouts, and that the property may be in violation. Staff will not communicate or indicate any potential penalty for the specific violation they have observed.
3. Staff who have observed violations and recorded necessary information will provide their documentation to Water Resources Staff.
4. Water Resources Staff will maintain a database of violations, tracking the number of violations by water service account.
5. Every two to three weeks, staff will compile a list of violations and necessary enforcement actions (e.g., notice of first violation, or charges that should be added for subsequent violations). The list will be shared with Utility Billing staff for distribution with monthly invoices.

Penalties for Violations

Broomfield Municipal Code establishes penalties for water waste (13-24-010, 13-24-020) and for violating mandatory water use restrictions (13-36-070). The penalties for violating mandatory water use restrictions are summarized below.

Under Colorado Statute (Sec. 37-60-126 11(c)(I)), HOA rules about watering and landscape maintenance do not supersede mandatory water restrictions set by the City Manager or City Council. Under this statute, HOAs may not require residents to irrigate in violation of city restrictions.

Penalties established in Broomfield Municipal Code: The customer, owner, or occupant of the licensed premises shall be responsible for complying with the drought water use restrictions. City personnel are authorized to monitor customer water consumption via direct observation or through use of billing data to help enforce drought water use restrictions. City personnel may place information fliers on licensed premises or approach property owners or managers to review drought conditions and water use.

For any violation of mandatory water use restrictions, the following charges shall be added to the monthly water service charges of the owner of the relevant water service account(s):

- A. *For the first violation of any drought watering restriction account owner, or occupant will be notified in writing served personally or with the monthly water service invoice.*
- B. *For the second violation of any drought watering restriction at the same premises, \$200.00 shall be added to the monthly water service charges of the account owner for*

single-family dwellings and duplex dwellings and \$400.00 shall be added to the monthly water service charges of all other customer types.

C. For the third violation of any drought watering restriction at the same premises, \$600.00 shall be added to the monthly service charges of the account owner for single-family dwellings and duplex dwellings and \$1,200.00 shall be added to the monthly water service charges of all other customer types.

D. For the fourth violation of any drought watering restriction at the same premises, \$1,000.00 shall be added to the monthly service charges of the account owner for single-family dwellings and duplex dwellings and \$2,000.00 shall be added to the monthly water service charges of all other customer types.

E. For the fifth and any subsequent violation of any drought watering restriction at the same premises, \$2,000.00 shall be added to the monthly service charges of the account owner for single-family dwellings and duplex dwellings and \$4,000.00 shall be added to the monthly water service charges of all other customer types.

Customers can appeal a penalty charge and the charge may be forgiven if the account owner can demonstrate that the excess water use was caused by a major leak or other malfunction of plumbing or irrigation that has since been repaired.

8. Adopting and Updating the Plan

Implementation of this Plan will require development of additional tools and resources, and annual maintenance of those tools and resources. Now that the plan has been approved and adopted, staff will work on developing spreadsheets and other tools, standard operating procedures, additional communications materials and other resources.

Drought mitigation and response planning is an ongoing process. Water Resources staff will continue to coordinate with partners in the region to identify and adopt new practices and tools. Each time a drought occurs staff will write an after-action report to summarize the experience and any lessons learned. As needed, staff will recommend changes or updates to this drought response plan based on experience and lessons learned.