

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

MEETING DATE: April 21, 2014

AGENDA TITLE: Information Item – Drought Response Overview and Water Supply Update

PRESENTERS:

Jeff Arthur, Director of Public Works for Utilities
Joe Taddeucci, Water Resources Manager
Kim Hutton, Water Resources Engineer
Craig Skeie, Water Resources Facilities Manager
Russ Sands, Water Conservation Program Coordinator

EXECUTIVE SUMMARY:

This memo provides an update on 2014 water supply conditions and the city’s drought stage determination procedures as set forth in the Drought Plan (Attachment 3).

BACKGROUND:

The Drought Plan consists of two separate volumes and is intended to provide guidance for recognizing and responding to droughts that will affect water supply availability. Volume I categorizes drought alert levels according to severity and also includes actions that might be taken to respond to each drought alert level. Volume II contains detailed technical supporting information.

During development of the Drought Plan, the city established a formula called the “storage index”. The storage index was derived from statistical analysis and modeling of Boulder’s water system using hundreds of years of tree-ring based historical hydrology. The storage index is basically a ratio of key storage parameters divided by projected demand. Staff applies the formula each year in early May when key water supply information becomes known. The drought alert levels corresponding to various storage index values are shown in Table 1.

The Drought Plan identifies water use reduction goals and response options for each stage of drought. The storage index calculation is one component of staff’s evaluation of water supply conditions and is reviewed in conjunction with other appropriate data and operating experience. While early May is a decision point in Boulder’s drought response analysis, staff is continuously monitoring trends in snowpack, precipitation, runoff, reservoir filling and water system administration throughout the year.

**Table 1: Suggested drought response triggers for May 1
(City of Boulder Drought Plan, Volume 1)**

Projected Storage Index (1)	Drought Alert Stage
Greater than 0.85	None
Between 0.85 and 0.7	I
Between 0.7 and 0.55	II
Between 0.55 and 0.4	III
Less than 0.4	IV

(1) Projected storage index = (projected usable Boulder mountain storage + 40% of Boulder’s portion of projected CBT storage) / Boulder’s unrestrained water demand in non-drought years.

ANALYSIS:

The city’s water supply system includes both native basin (North and Middle Boulder Creeks) and Colorado Big Thompson (CBT) water sources (Attachment 1). As of April 1, 2014, water supply conditions in the city’s source water areas were as follows:

- Mountain reservoir storage levels (Attachment 2) in the North and Middle Boulder Creek basins range from about 70% to 90% of total capacity, prior to significant runoff. Staff anticipates that all reservoirs will fill this year.
- Snowpack is above average for this time of year. As of April 1, 2014, snow water equivalent measurements were 158% of average for the Boulder Falls Snow Course and 178% of median for the University Camp Snotel Site.
- Initial indications from the Northern Colorado Water Conservancy District are that the Colorado Big Thompson (CBT) 2014 allocation¹ will be 50%, although the quota is frequently revised during the month of April. A 50% allocation represents 10,507 acre-feet of water available to the city. The annual CBT allocation is typically about 70%. A lower allocation reflects the expectation that less supplemental, west slope water will be needed because east slope water supplies will be at or above average in 2014.

May 1 is the time of year when the key city water supply factors are the most informative because the snowpack has usually fully developed by this time, and Boulder’s CBT allotment for the year is known. Those two items combined with current reservoir storage levels provide a good indication of the city’s available water supply for the coming year. While the May 1 storage index calculation is still a few weeks away, it is unlikely that a drought response will be triggered.

Spring 2014 flooding is a concern in the city and Boulder County, due to the high snowpack, still elevated groundwater levels and drainageways compromised by flood debris and channel relocation. While the city operates its reservoirs for water supply as opposed to flood control purposes, the city is taking advantage of this year’s rare water supply situation by releasing water from Barker Reservoir for the purposes of generating hydroelectricity at the Boulder Canyon

¹ The city water utility presently owns 21,015 units of CBT water. A 100 percent quota provides one acre-foot of water for each unit for that year. The historical average for the annual quota is about 70 percent or 0.7 acre-foot per unit.

facility. Releases are primarily being made at night so as not to hinder creek clean-up and rehabilitation efforts during the day. This will create some additional storage capacity in Barker Reservoir for runoff which wouldn't otherwise be available, since the city does not generally deplete reservoir storage for the sole purpose of hydropower generation.

The 2013 floods and the high expected 2014 runoff conditions have also raised public questions about Barker Dam's ability to safely pass high inflows². Barker Dam has an engineered spillway which routinely releases water to Boulder Creek in years when the reservoir fills to capacity. The highest recorded inflow to Barker Reservoir since the year 2000 was approximately 700 cfs, which is significantly less than the spillway capacity of approximately 4,500 cfs. While reservoir levels and snowpack are on the high side of normal for this time of year, it would take extreme circumstances for flows to even approach the dam's spillway capacity. The City of Boulder's most significant flood risk is generally considered to be flash flooding associated with thunderstorms, and not annual spring runoff. While Barker Reservoir did refill and release water to Boulder Creek during Sep. 2013, the releases were significantly less than the peak flows generated by rainfall not tributary to the reservoir and occurred after those peak flows had subsided.

NEXT STEPS:

Staff will continue to monitor water supply conditions and will perform the storage index calculation in early May. As in every year, staff will continue to inform the public of the status of the water supply and encourage the wise use of water. The city's Water Conservation Program helps coordinate outreach efforts locally and regionally, working with Water Resources to monitor supply conditions and increase outreach efforts if hot, dry conditions are expected.

ATTACHMENTS:

- 1 – City of Boulder Source Waters
- 2 – City of Boulder Mountain Reservoir 2014 Storage Levels
Middle Boulder Creek (MBC) and North Boulder Creek (NBC) Storage
- 3 – City of Boulder - Drought Plan (electronic links)

² Barker Dam is designed to accommodate what is known in hydrologic terms as the probable maximum flood (PMF). The PMF is the flood that would result from the most severe theoretical combination of critical meteorological and hydrologic conditions. Barker Dam has been evaluated as stable for the PMF, which would overtop the entire dam by 11 feet, including the spillway, and have a peak outflow of roughly 77,000 cfs. By comparison, the estimated 100-year flow rate for Boulder Creek is approximately 12,000 cfs, and the peak flow during the Sep. 2013 flood event was approximately 5,000 cfs.

Protect Your Drinking Water Sources



PROTECT & CONSERVE BOULDER'S WATER



**CITY OF BOULDER
DRINKING WATER
PROGRAM**
5605 NORTH 63RD ST.
BOULDER, CO 80301

FOR MORE INFORMATION CALL:
303-413-7400
OR VISIT OUR WEB SITE AT:
WWW.BOULDERUTILITIES.NET

Watersheds Providing Boulder's Drinking Water

Betasso Water Treatment Facility (WTF)

- 1** Barker Reservoir Watershed
38 sq. miles
- 2** Lakewood Reservoir Watershed
21 sq. miles
- 3** Silver Lake Watershed
Owned by the city of Boulder
10 sq. miles

Boulder Reservoir Water Treatment Facility (WTF)

- 4** Colorado Big Thompson / Boulder Feeder Canal Watershed - 1,004 sq. miles
- 5** Boulder Reservoir Watershed
9 sq. miles
- 6** Watersheds occasionally linked to Boulder's water storage reservoirs
132 sq. miles

- Hydroelectric Facilities
- Water Treatment Facilities
- Canals / Ditches
- Source Water Pipelines
- Treated Water Pipelines

Drinking Water Supply Current Usage (%)

- 40% Barker Reservoir
- 40% Lakewood Reservoir plus Silver Lake Watershed
- 20% Boulder Feeder Canal plus Boulder Reservoir



Area covered by 3D view is approximately 4,200 sq. miles

Approximate Foreground Scale
1:43,500

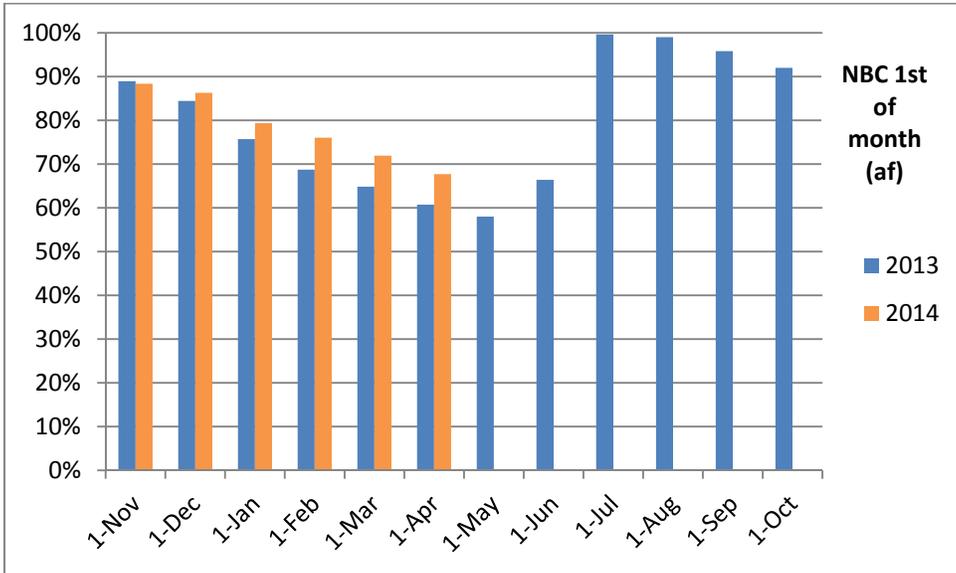
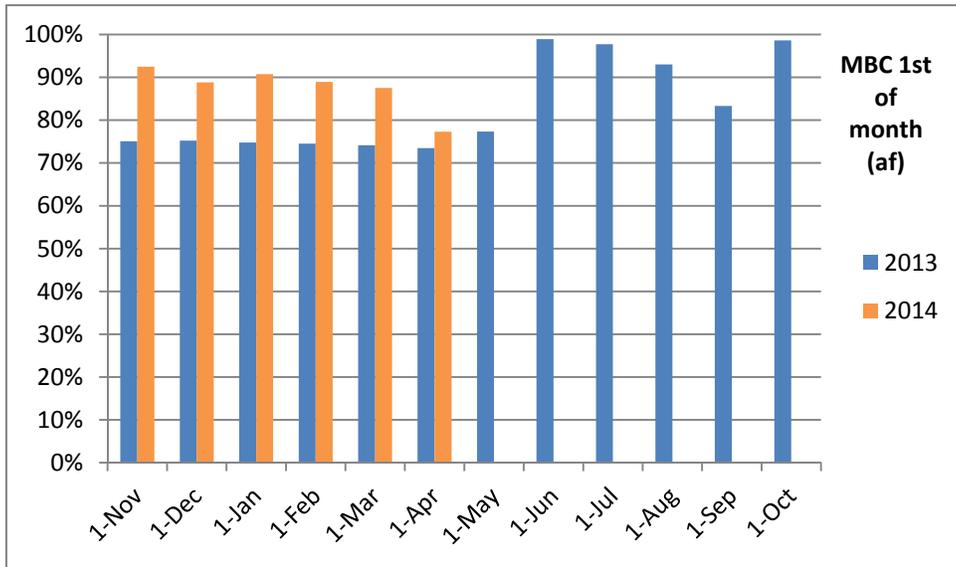
Approximate Horizon Scale
1:79,500

Date: June 2002



Computer Terrain Mapping, Inc.
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www.ctmmap.com • EMAIL: ctm@ctmmap.com
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Attachment 2
City of Boulder Mountain Reservoir 2014 Storage Levels
Middle Boulder Creek (MBC) and North Boulder Creek (NBC) Storage



Attachment 3
City of Boulder Drought Plan (electronic links)

[DROUGHT PLAN - Volume I Drought Planning and Response Plan](#)

[DROUGHT PLAN - Volume II Technical Information and Analysis](#)