

# RECLAMATION

*Managing Water in the West*

## **Windy Gap Firming Project: Purpose and Need Report**

*Prepared for—*

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*and*

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Bureau of Reclamation  
Great Plains Region**

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## ACRONYMS AND ABBREVIATIONS USED IN THIS DOCUMENT

AF	acre-feet
C-BT	Colorado-Big Thompson Project
Corps	U.S. Army Corps of Engineers
CWCWD	Central Weld County Water District
EIS	Environmental Impact Statement
ERO	ERO Resources Corporation
GMA	Growth Management Area
gpcd	gallons per capita per day
LTWD	Little Thompson Water District
MG	Million Gallons
MPWCD	Middle Park Water Conservancy District
NCWCD	Northern Colorado Water Conservancy District
NISP	Northern Integrated Supply Project
Platte River	Platte River Power Authority
Project Participant(s)	Windy Gap Firming Project Participant(s)
Reclamation	U.S. Bureau of Reclamation
Subdistrict	Municipal Subdistrict, Northern Colorado Water Conservancy District
SWSP	Southern Water Supply Pipeline
TE	Tap Equivalent
WGFP	Windy Gap Firming Project
WSSC	Water Supply and Storage Company

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- L Middle Park Water Conservancy District
- M Platte River Power Authority
- N Town of Superior



# **WINDY GAP FIRING PROJECT PURPOSE AND NEED REPORT**

## **1.0 Introduction**

The Municipal Subdistrict, Northern Colorado Water Conservancy District (Subdistrict), acting by and through the Windy Gap Firing Project Water Activity Enterprise, the project proponent, is proposing to improve the firm yield from the existing Windy Gap Project water supply. The original Windy Gap Project was completed by the Subdistrict in 1985. Since that time, the Windy Gap Project has not been able to reliably deliver water supplies to Windy Gap Project unit holders. In addition, the Windy Gap Project does not provide annual carry-over water storage for the Middle Park Water Conservancy District (MPWCD). Because of the deficiency in water deliveries and lack of storage, the Windy Gap Project unit holders and MPWCD have not been able to fully rely on Windy Gap water for meeting a portion of their annual water demand. As a result, a group of the Windy Gap Project unit holders, working through the Subdistrict, have initiated the proposed Windy Gap Firing Project (WGFP) to complete the Windy Gap Project by firming all or a portion of their Windy Gap units to meet existing and future municipal and industrial water requirements. The MPWCD is participating in the proposed WGFP to obtain storage to firm its Windy Gap water, and hence improve the reliability of its Windy Gap water supply for users in Grand and Summit Counties Colorado.

The Subdistrict is currently seeking approval from the Bureau of Reclamation (Reclamation) for additional physical connections to Colorado-Big Thompson Project (C-BT) facilities in order to implement the proposed WGFP. The proposed Firing Project includes additional storage that can only be accomplished through one or more connections to the C-BT Project. A connection to the C-BT Project is necessary to convey Windy Gap water through C-BT Project facilities. This connection would require a permit or license from Reclamation. Since a permit or license from Reclamation is a discretionary federal action and subject to compliance with the National Environmental Policy Act (NEPA), an Environmental Impact Statement (EIS) is currently being prepared. Additional Reclamation actions also may be associated with the proposed project, as well as federal regulatory action by the U.S. Army Corps of Engineers (Corps), if new storage or conveyance facilities affect waters of the U.S..

The original Windy Gap Project was developed, and is owned and operated, by the Municipal Subdistrict, Northern Colorado Water Conservancy District, which is a water conservancy district organized under the Colorado Water Conservancy Act. The WGFP is being developed, and will be owned and operated, by the Municipal Subdistrict, Northern Colorado Water Conservancy District, acting by and through the Windy Gap Firing Project Water Activity Enterprise, which is a water activity enterprise of the Municipal Subdistrict organized under C.R.S. §§ 37-45.1-101 et seq. A water activity enterprise is a government water activity business owned by a government district (in this case the Municipal Subdistrict), which receives less than 10 percent of its annual revenues in grants from all Colorado state and local governments combined and which is authorized to issue its own revenue bonds. For purposes of simplicity in this report, the Windy Gap Firing Project Water Activity Enterprise will be referred to as the

“Subdistrict.” On those rare occasions when the Municipal Subdistrict, Northern Colorado Water Conservancy District (the owner of the Enterprise) is referenced, its full name will be used.

### **1.1 Objective of this Report**

The primary objective of this report is to identify and describe the purpose and need for the proposed WGFP. The Purpose and Need Report was prepared by ERO Resources Corporation and Harvey Economics under the direction of the Bureau of Reclamation and provides an independent evaluation of the estimated current and future water requirements for each Project Participant, a determination of the need for the proposed project, and supporting material for use in the preparation of the purpose and need chapter of the EIS. Cooperating agencies, including the Corps, Grand County, and Western Area Power Administration (WAPA) provided input and review of the report, as did the Subdistrict, and the Project Participants.

### **1.2 Report Organization**

This report is divided into nine sections. Section 1 discusses the objective of this report and provides an overview of the Project Participants. Section 2 provides a concise statement of the purpose and need for the project. Section 3 includes background information on the original Windy Gap Project and its current operations, and the proposed WGFP. Section 4 describes the proposed WGFP. Section 5 provides an overview of the approach used to develop the purpose and need for the project. Section 6 describes the Project Participants’ existing water supply. Section 7 discusses Participant water demand including historical demographic trends and water use and projections of future growth and water requirements. Section 8 summarizes the conservation efforts used by Project Participants to reduce demand and efficiently use available supplies. Section 9 provides a brief summary of the water supply and demands for each of the Project Participants (the appendices provide a more detailed discussion). Section 10 summarizes the additional water needs for the Project Participants.

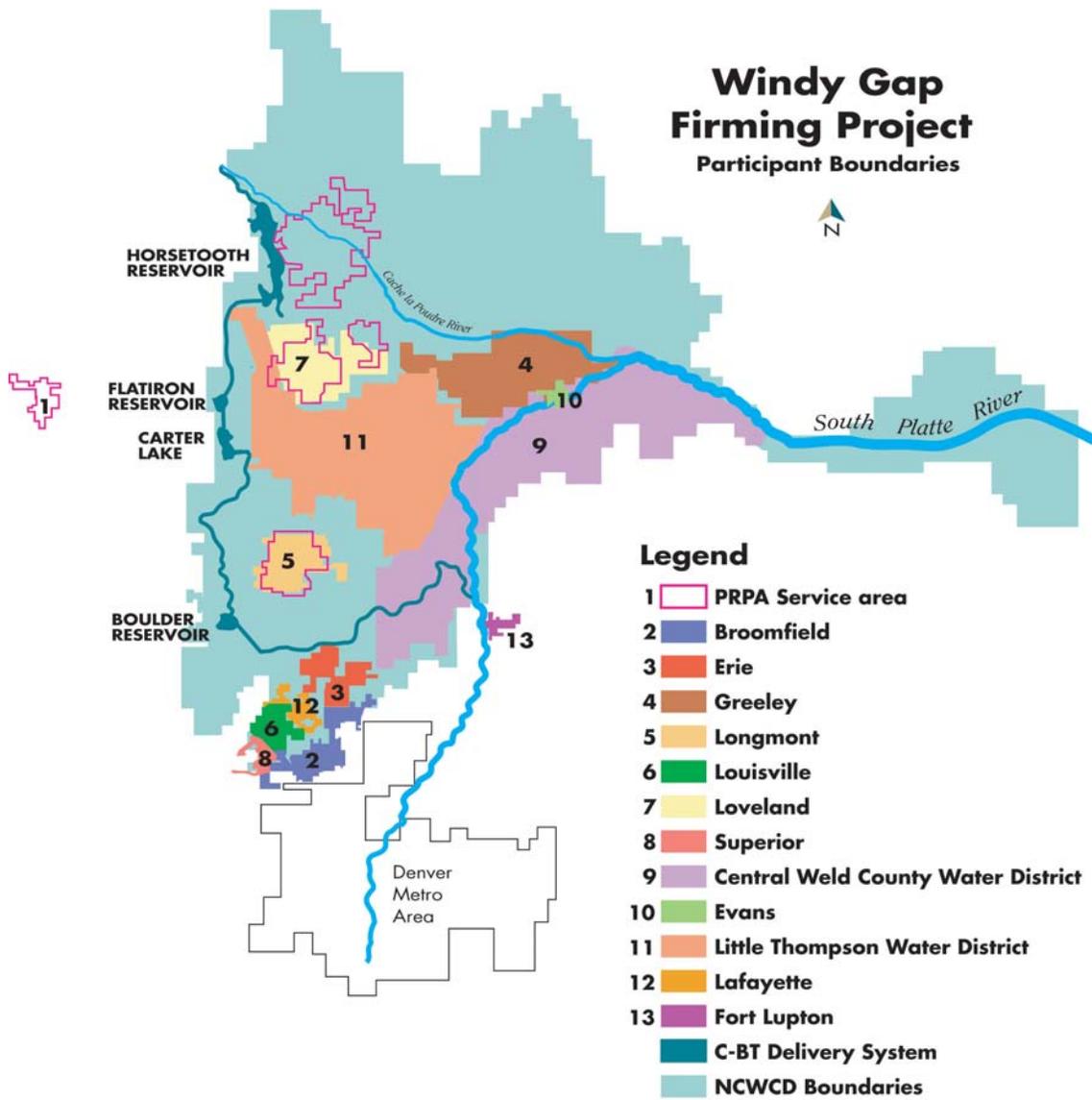
### **1.3 Windy Gap Firing Project Participants**

Project Participants in the WGFP that own, lease, or that are in the process of acquiring units of Windy Gap Project water include municipalities, rural domestic water districts, and an industrial water user. Project Participants include:

- City and County of Broomfield
- Central Weld County Water District
- Town of Erie
- City of Evans
- City of Fort Lupton
- City of Greeley
- City of Lafayette
- Little Thompson Water District
- City of Longmont
- City of Louisville
- City of Loveland
- Platte River Power Authority
- Town of Superior

The service area for these East Slope Project Participants is shown in Figure 1.

**Figure 1. Participant Boundaries for East Slope Project Participants.**



In addition to Windy Gap unit holders, the Middle Park Water Conservancy District (MPWCD) is a Project Participant. The MPWCD also receives Windy Gap water, according to the terms outlined in the 1985 Supplement to the 1980 Agreement Concerning the Windy Gap Project and Azure Reservoir and Power Project, which states, “the Municipal Subdistrict, Northern Colorado Water Conservancy District will dedicate and set aside annually, but non-cumulatively, at no cost to Middle Park, 3,000 acre-feet of water in Granby Reservoir that is produced each year from Subdistrict water supplies and any water so stored in Granby Reservoir shall be the last of any Subdistrict water to be spilled from Granby Reservoir.” This water is for beneficial use without waste, either directly or by exchange or substitution, in the MPWCD. The direct beneficial uses do not

include instream uses or industrial uses. MPWCD's Windy Gap water stored in Lake Granby shall be the last of any Subdistrict water to be spilled if the reservoir is full. MPWCD's Windy Gap water stored in Lake Granby cannot be carried over to the next year. The MPWCD is a wholesale water supplier for 67 water providers and users in Grand and Summit Counties (Figure 2) that have contracts with MPWCD for portions of its 3,000 AF allotment of Windy Gap Project water. The water providers, also known as contractees, include towns, water districts, agricultural water suppliers, consumers, and ski areas. The largest contractees, which account for about two-thirds of the water served by MPWCD, include:

- Grand County Water and Sanitation District
- Town of Granby
- Town of Silverthorne
- Town of Kremmling
- Snake River Water District
- Winter Park Water and Sanitation District
- Town of Frisco
- Town of Fraser
- Three Lakes Water and Sanitation District
- Summit County
- Town of Breckenridge

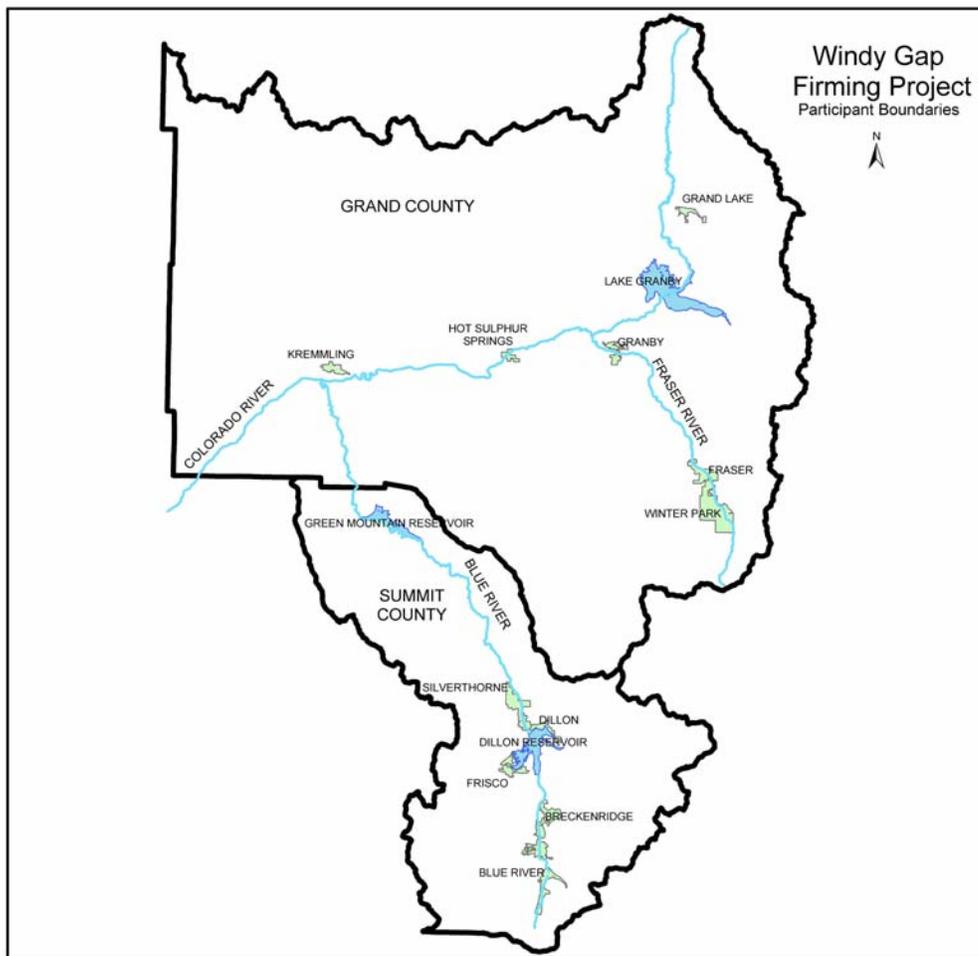
Smaller contract holders include subdivisions, homeowner associations, and private individual homeowners. A complete list of MPWCD Windy Gap Project contractees is included in Appendix L.

Not all of the owners of Windy Gap units are participating in the WGFP. The City of Boulder, the Town of Estes Park, and Left Hand Water District collectively own 41 Windy Gap units, but are not participating in the proposed WGFP because they have other sources of water supply and storage for Windy Gap Project water that currently meet their needs. Delivery of water to Windy Gap unit holders not participating in the WGFP will be similar to current operations, but the amount of deliveries may increase with time as demand grows. The amount of water delivered to these entities will not be expanded or diminished by the WGFP.

All of the Windy Gap Project unit holders participating in the proposed WGFP and the MPWCD are referred to collectively as the Project Participants.

## **2.0 Purpose and Need Statement**

The purpose of the Windy Gap Firing Project is to deliver a firm annual yield of approximately 30,000 AF of water by 2010 from the existing Windy Gap Project to meet a portion of the water deliveries anticipated from the original Windy Gap Project and to provide up to 3,000 AF of storage to firm water deliveries for the Middle Park Water Conservancy District. Firm water deliveries from the Windy Gap Project are needed to meet a portion of the existing and future demands of the Project Participants.

**Figure 2. West Slope Service area for the MPWCD.**

### 3.0 Background

#### 3.1 The Original Windy Gap Project

During the 1960s, the cities of Boulder, Greeley, Longmont, Loveland, Fort Collins, and the Town of Estes Park determined that additional water supplies were needed to meet their projected municipal demands. The Subdistrict, consisting of the incorporated areas of the six entities, was formed in 1970 to develop the Windy Gap Project. Prior to project construction, the Platte River Power Authority acquired all of the City of Fort Collins' allotment contracts, as well as one-half of the City of Loveland's and one-half of the Town of Estes Park's contracts. Windy Gap units, similar to C-BT units or other water rights, can be transferred; thus, the Windy Gap unit holders have changed since the project was completed in 1985.

Windy Gap Project water is stored and conveyed through C-BT Project facilities prior to delivery to Windy Gap Project allottees. The Windy Gap Project consists of a

diversion dam on the Colorado River, a 445 AF reservoir, a pumping plant, and a 6-mile pipeline to Lake Granby. Figure 3 shows existing Windy Gap Project facilities on the West Slope and the C-BT facilities used to deliver water to the East Slope. Because most of the MPWCD contractees on the West Slope utilize Windy Gap water to augment stream flows resulting from their out-of-priority diversions, their Windy Gap water is physically released from Lake Granby and no other delivery structures are required.

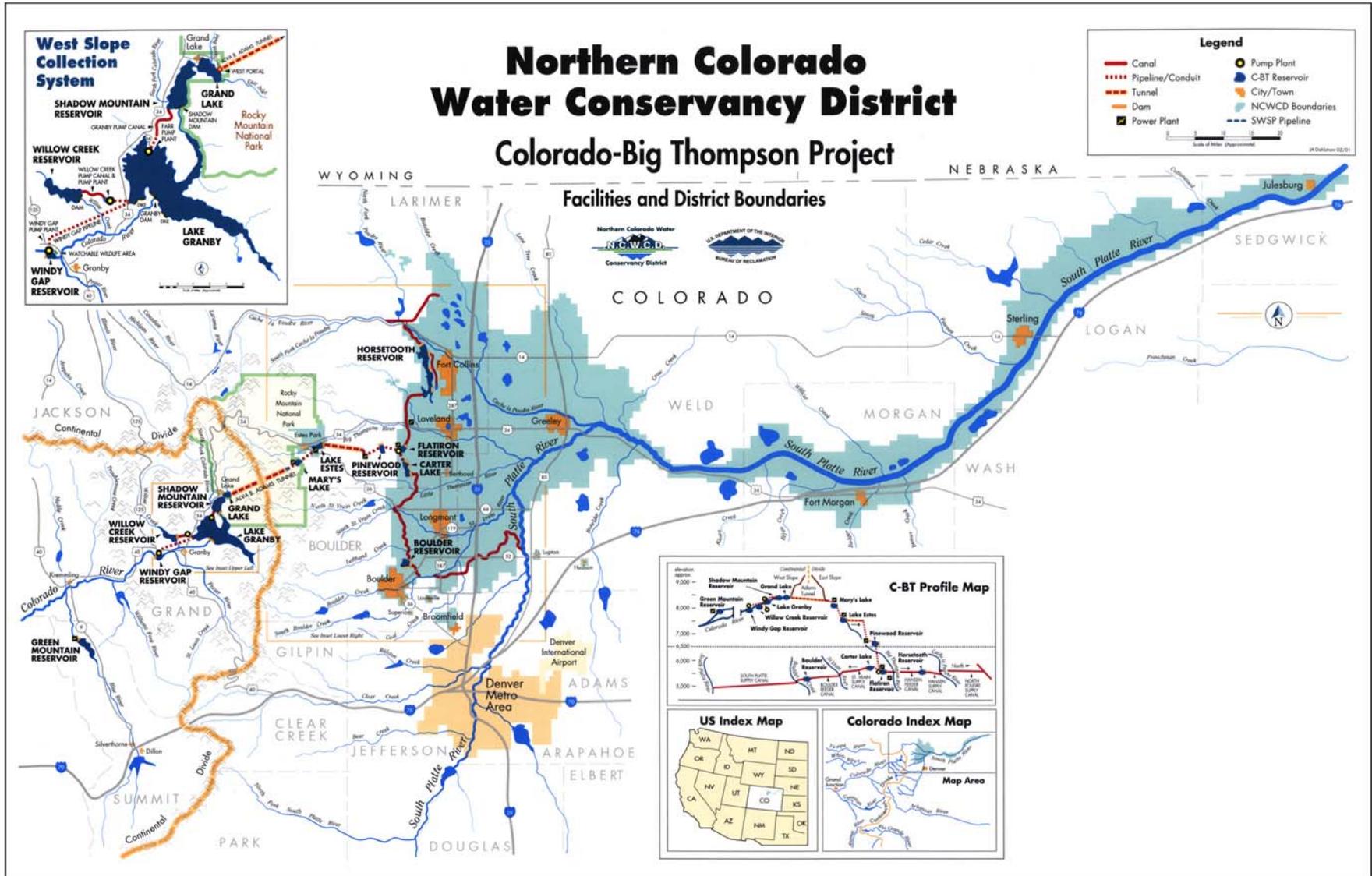
On April 28, 1981, Reclamation completed the Final EIS on the effects of using C-BT Project facilities for the “storage, carriage and delivery” of Windy Gap Project water. The Record of Decision for the original Windy Gap Project EIS allowed Reclamation to negotiate a contract with the Subdistrict and the Northern Colorado Water Conservancy District (NCWCD) for the storage, conveyance, and delivery of Windy Gap Project water using facilities of the C-BT Project. It was anticipated that approximately 56,000 AF could be diverted annually from the Colorado River and that approximately 48,000 AF would be available to east slope Windy Gap unit holders after subtracting 3,000 AF for MPWCD and allowances for various storage and conveyances losses. Diversions are limited to a rate of 600 cfs and occur primarily during the months of April through July. Total Windy Gap diversions are measured at the Adams Tunnel and are limited to a maximum of 90,000 AF in any one year and a maximum of 650,000 AF during any consecutive 10-year period pursuant to the Agreement Concerning the Windy Gap Project and Azure Reservoir and Power Project, dated April 30, 1980 and the Windy Gap water rights.

### **3.2 Current Windy Gap Project Operations and Delivery Shortage**

Windy Gap Project water is diverted from the Colorado River just downstream of the confluence of the Colorado and Fraser Rivers. Once collected, it is pumped to Lake Granby for storage and conveyance through C-BT Project facilities and ultimate delivery to Windy Gap project allottees. As outlined in the 1985 Supplement to the 1980 Agreement Concerning the Windy Gap Project and Azure Reservoir and Power Project, the Subdistrict must dedicate and set aside annually, but non-cumulatively, at no cost to MPWCD, the first 3,000 AF of water in Granby Reservoir that is produced each water year from Subdistrict water supplies. This water is for beneficial use without waste, either directly or by exchange or substitution, in the MPWCD. The direct beneficial uses do not include instream uses or industrial uses. In the event of a spill, MPWCD’s Windy Gap water stored in Granby Reservoir shall be the last of any Subdistrict water to be spilled.

Firm annual deliveries to the allottees of the Windy Gap Project were originally estimated to be about 48,000 AF, following conveyance and evaporation losses and allocations to the MPWCD. Because each unit of Windy Gap water is entitled to 1/480th of the annual yield of the Windy Gap Project, a unit was expected to produce a firm yield of 100 AF per year. Actual Windy Gap yield between 1985 and 2004 averaged less than 10,000 AF per year. Average annual yield to the Project Participants since completion of the Windy Gap Project has been approximately 20 AF/unit, or about one-fifth of the anticipated deliveries (Boyle Engineering 2005). However, Windy Gap diversions were less than allowable immediately following construction because demand was less than available supplies. Had Windy Gap unit holders exercised their full demand for all

Figure 3. Existing Windy Gap and C-BT Project Facilities.



available Windy Gap water, the average long-term yield (1950 to 1996) would have been about 55 to 60 AF per unit (Boyle Engineering 2005).

No Windy Gap water has been diverted in seven out of the past 20 years because of either a lack of available storage space in Granby Reservoir or Windy Gap water rights were not in priority during dry years. In the 1985 to 2004 period that Windy Gap has been operating, there was no Windy Gap pumping in 1986, 1996 through 2000, and in 2002; only 300 AF were pumped in 2004. The lack of pumping in all years but 2002 and 2004 was due to a lack of available storage space in Lake Granby and/or limited demand for Windy Gap water. No Windy Gap water was diverted in 2002 because the junior water right never came into priority and a dry year in 2004 also limited pumping. Because of the inability of the Windy Gap Project to provide reliable yields in both wet and dry years, the firm yield is zero.

Firm annual water storage for use by the MPWCD on the West Slope for the 1950 to 1996 period is essentially zero. Although water may be available for diversion for MPWCD in the early spring, there are a number of years when storage in Lake Granby is not sufficient to hold its supplies. Because MPWCD uses its Windy Gap water for augmentation, releases from Lake Granby typically do not occur until September or October. Consequently, Windy Gap water stored for Middle Park during spring runoff in wet years is often spilled prior to its release for augmentation later in the year.

Windy Gap allottees and the MPWCD have not been able to rely on Windy Gap water for water deliveries in either dry or wet years. The reasons why the annual firm yield and deliveries from the Windy Gap Project have been less than 48,000 AF are summarized as follows:

- In dry years, the Windy Gap Project has not been able to divert water because more senior water rights upstream and downstream have a higher priority to divert water and call out the Windy Gap Project. In addition, the Windy Gap Project is required to bypass water to maintain certain minimum stream flows downstream of the Windy Gap diversion dam. Thus, the Windy Gap Project cannot divert if stream flows immediately below the diversion dam on the Colorado River are less than 90 cfs, if flows at the Williams Fork confluence are less than 135 cfs, or if flows at the Troublesome Creek confluence are less than 150 cfs.
- Under the contract between the Subdistrict, the NCWCD, and Reclamation, water conveyed and stored for the C-BT Project has priority over water conveyed and stored for the Windy Gap Project. In wet years, when the C-BT system is full, there is no conveyance or storage capacity in the C-BT system for Windy Gap Project water. Windy Gap Project water stored in the C-BT system is sometimes spilled from the system to make room for C-BT Project water. Thus, water cannot be stored or carried over in some wet years.
- Windy Gap was built to meet both current and future needs of the Project allottees. During the years immediately after construction, some of the Project allottees' demands did not require the full use of their Windy Gap Project water. As demand increased, their need for full use of the Windy Gap Project also increased.

While the inability to divert water in dry years was anticipated when the Windy Gap Project was constructed, the inability to divert and store during wet years was not. Because of the deficiency in deliveries, Project Participants have requested that the Subdistrict pursue measures through a cooperative project to firm Windy Gap water deliveries.

## **4.0 Proposed Windy Gap Firing Project**

### **4.1 Participant Water Supply Planning**

Project Participants are responsible for developing and acquiring safe and reliable water supplies to meet the needs of the cities, water districts, and industrial operations they serve. Acquiring adequate water supplies to meet anticipated future needs requires long-term planning because of the time often needed to secure water supplies, construct infrastructure, and satisfy permitting and regulatory requirements. Project Participants in the WGFP have conducted a multitude of studies and investigations as part of their individual water planning processes. For municipalities, this typically begins with the planning department, which prepares a comprehensive plan to provide direction for growth and development within a community including the anticipated types of land uses and population forecasts. Typically, these comprehensive land use plans undergo some form of public review and are formally adopted by a city council or other elected body. Public works and water utility departments respond to the comprehensive plan by seeking to secure reliable sources of water and the efficient use of this water to meet community needs. Water resource studies used to plan, operate, and provide service to water customers include water master plans, water demand studies, drought studies, water reuse plans, conservation programs, and other investigations. Commercial water users likewise develop operational plans and demand estimates to identify existing and anticipated water requirements. Section 5 provides discussion on the methods used to forecast future water demands for this analysis.

To meet identified current and future water demands, Project Participants are proposing to improve yield from the existing Windy Gap Project. The proposed WGFP is limited to the existing water rights associated with the original Windy Gap Project and does not expand on those rights or the amount of water that was approved in the original EIS. The proposed WGFP does not necessarily meet all the future water requirements for each Participant, but rather seeks to improve the yield of each Participant's Windy Gap water delivery. Project Participants may seek additional water supplies through other projects, but the intent of the WGFP is only to improve the yield of existing Windy Gap water rights.

### **4.2 Project Participant Firm Yield Goals**

The proposed WGFP would not firm all of the original 480 Windy Gap units because some Windy Gap owners are not participating in the project. In addition, some WGFP Participants are not firming all of the units they own because they do not have a current need for the water (e.g., Platte River Power Authority) or they have other options for the storage of the remainder of their Windy Gap units (e.g., Longmont). Project Participants also must decide on how much storage to request in the Firing Project, which affects the amount of yield per Windy Gap unit. Table 1 indicates the approximate firm annual yield goal for each of the Participants based on the number of Windy Gap units in the

WGFP. Thus, about 31,575 AF of the 48,000 AF of water in the original Windy Gap Project could be firmed by the proposed project. The MPWCD does not own Windy Gap units, but has requested 3,000 AF of storage in a new firming project reservoir.

**Table 1. Windy Gap Firming Project Firm Annual Yield Goal.**

Participant	Approximate Firm Annual Yield Goal (AF)
Broomfield	5,600
Central Weld County Water District	100
Erie	2,000
Evans	500
Fort Lupton	300
Greeley	4,400
Lafayette	800
Little Thompson Water District	1,200
Longmont <sup>1</sup>	5,125
Louisville	900
Loveland	4,000
Middle Park Water Conservancy District <sup>2</sup>	[3,000]
Platte River Power Authority <sup>3</sup>	5,150
Superior	1,500
<b>TOTAL</b>	<b>31,575</b>

<sup>1</sup> Longmont plans to firm about 51 of the 80 Windy Gap units that it owns with 13,000 AF of storage in the WGFP and firm the remainder of its units with their own operations and/or future projects.

<sup>2</sup> The MPWCD does not own Windy Gap units, and is only requesting firming storage. MPWCD does not have carry-over capacity from year to year, but receives the first water available each year. Actual firm yield could be less than 3,000 AF per year. MPWCD firm yield is not included in the firm yield total with Windy Gap Project unit holders.

<sup>3</sup> Platte River plans to firm 51.5 of the 160 Windy Gap units that it owns.

While theoretically each unit of Windy Gap Project water would provide a yield of 100 AF, the actual firm yield depends on the amount of storage volume constructed and the actual project operation. Because the Windy Gap Project water rights are junior to many water rights in the Colorado River Basin, the WGFP would not be able to divert and store water every year. Diversions during wet years would be stored for use during dry years. As more water is stored, the firm yield approaches 100 AF per unit. Each Participant is evaluating its storage request based on the anticipated firm yield for each alternative and the cost of storage. Hydrologic modeling conducted in the analysis of alternative in the EIS will be used to estimate the actual firm yield for each of the Project Participants based on their individual storage request and the alternative. Preliminary estimates indicate that to provide a firm annual yield of about 30,000 AF, the WGFP would require approximately 90,000 AF of new storage. The actual firm yield for the project also depends on future water development in the Colorado River Basin and its effect on Windy Gap water rights, so actual firm yield may differ from firm yield goals.

## **5.0 Methods for Need Assessment**

### **5.1 Study Team**

The study team responsible for preparation of the Purpose and Need Report included ERO Resources Corporation (ERO) and Harvey Economics. ERO is the third-party contractor selected by Reclamation to prepare the EIS. Harvey Economics is a subconsultant to ERO. ERO was responsible for development of the supply information and overall coordination and document production. Harvey Economics was responsible for the evaluation of water use, water demand forecasts, and compilation of conservation data for each Project Participant.

### **5.2 Study Approach**

Information on the existing water supplies and future needs for each Project Participant was compiled from numerous sources, including Project Participants' published reports and studies, unpublished water data, and responses to a questionnaire sent to each Project Participant. In addition, the study team conducted personal interviews with each Project Participant and follow-up interviews for further data collection to fill in missing information or to resolve any inconsistencies. Where necessary, the study team gathered independent information from local, regional and state planning agencies to verify or evaluate the applicability of the information received from the Project Participants.

Existing firm water supplies for each Project Participant were tabulated for each of the water supply sources as described in Section 6. Water yields from common sources such as the C-BT Project were adjusted for consistency across all Project Participants, based on the best information available.

Harvey Economics reviewed and evaluated the water demand projections for each Project Participant to determine the appropriateness of the projections in assessing the water need. The process for determining the water demand projections entailed the following steps:

- The study team gathered water demand projections and supporting economic and demographic data from each Project Participant.
- The study team evaluated the information supplied by the Project Participants, gathered additional data from local and state government agencies, and determined whether the water demand projections, forecasting methods and supporting economic and demographic data were reliable for the purposes of this analysis and the EIS.
- The study team prepared historical, current, and future demand forecasts, either relying on a Project Participant's information or developing independent forecasts, as necessary.
- The historical and projected water demand information was reviewed with each of the respective Project Participants.

In each instance, Harvey Economics evaluated the growth projections and demand forecasting methods, either accepting the Project Participants' information, supplementing that information, or substituting new demand estimates. As a result of this study process, the demand estimates presented in this report do not necessarily match information previously published by individual Participants. Based on Harvey Economics' findings, the water demand values included in this report provide a reasonable estimate of present and future needs for each Project Participant.

A number of the Project Participants provide water treatment service or use their distribution systems to convey water to other water suppliers or large industrial consumers. These other water suppliers or industrial users are responsible for providing their own raw water source for treatment and delivery. For example, the City of Greeley treats the Town of Evans' and Kodak's water supplies, but Evans and Kodak provide the raw water to Greeley's water treatment facility. Only the Participant's water supply and demand are used in the evaluation for this report, not the supply and demand associated with contracted water treatment or delivery services for others.

Standard data sets across all Project Participants were unavailable. For example, rural water districts do not typically report population estimates on a consistent basis; rather, they keep track of their customer base by the number of taps, sometimes by type of tap or type of customer. Depending on the rate schedule, Project Participants may or may not keep track of water use by type of customer. Although historical record-keeping practices are not the same from Participant to Participant, individual practices may serve each Project Participant's water planning purposes well. To address this issue, the study team worked with the water use and supply records that were available for each water provider.

Just as the historical demand data were not standardized among Project Participants, projections of water demand also were not standardized. Methods for projecting future water demand differ substantially from Participant to Participant, and these methods are often determined by the historical foundation of information, different methods employed by different consultants, the size and technical capabilities available to a Project Participant, and the nature of the Participant's service area. Further, Project Participants adopt projections of demographic change from different sources and focus on different measures, such as population, housing units, and number of taps or land uses. The study team determined that no single forecasting method was necessarily more acceptable than others and, similarly, data sources and information driving those projections might come from different sources, but are still the best information available and the most reliable as they pertain to that Project Participant. Under conditions of rapid change, local information is preferred.

The water demand forecasting methodologies employed by the individual Participants generally fell into one of three categories:

- a) The gallons per capita per day (gpcd) approach—This simple method requires an assumption of total potable gpcd and then the application of population projections to that assumption. This approach is more common among incorporated cities and towns.

- b) The water use per tap approach—This method requires an assumption of total water use divided by total number of active water taps, applied to a projection of future taps to be added to a system. This method is common among water districts.
- c) Water use per acre of land—Usually applied by type of land use, this method requires an assumption of water use per acre applied to a projected number of acres to be developed over time.

Each of these methods has variants. For instance, where large water users were identified, their consumption was excluded from the assumed per unit factors and each was forecasted separately. The study team took care to see that the water use per unit assumptions were developed on a sound basis with reliable data and that, no matter which method was used, the application of that method was carried out correctly. The appendices describe the forecasting method used by each Project Participant and how it was applied by the study team.

Future water demand projections were made to the year 2050 if sufficient information was available. For some Participants, a shorter planning horizon was used because projected buildout was reached prior to 2050 or although the estimated buildout population was known, the year of buildout was unknown. Table 2 indicates the year used in demand projections for each Project Participant.

**Table 2. Water Demand Forecast Years by Participant.**

Participant	Year Used in Demand Projection	Participant	Year Used in Demand Projection
Broomfield	2035	Little Thompson Water District	2050
Central Weld County Water District	2050	Longmont	2048 <sup>1</sup>
Erie	2025 <sup>1</sup>	Louisville	2050
Evans	2050	Loveland	2050
Fort Lupton	2050	Middle Park Water Conservancy District	2030
Greeley	2050	Platte River Power Authority	2005 <sup>2</sup>
Lafayette	2026 <sup>1</sup>	Superior	2014 <sup>1</sup>

<sup>1</sup> Projected year of buildout.

<sup>2</sup> Platte River is trying to secure a firm water supply to meet the current and future demand of their existing Rawhide Energy Station.

The results of the water supply and demand investigations were reviewed by each Project Participant. The study team and Project Participants agree that the representations about their individual supply and demand circumstances are reliable for the purposes of this analysis and the EIS. Project Participant water supplies and future needs were then used to estimate the amount and timing of water shortages independently for each Project Participant.

### **5.3. Special Treatment of Two Project Participants**

Although the supply and demand of each Project Participant was examined individually and is addressed individually in the appendices, the discussion of aggregated data for all of the WGFP Participants in the main body of this Purpose and Need chapter is not possible for two Participants with unique characteristics. Both the Platte River Power Authority and the Middle Park Water Conservancy District have sufficiently different characteristics from the others that they may not be compared except that they need Windy Gap water firmed. For instance, the MPWCD does not deliver a potable water supply and Platte River water use is primarily for power plant use.

Platte River is an electric utility. It wholesales power to its member cities, which distribute energy and bill the end users. Characteristics of the end users, such as water use, have no bearing on Platte River's need for the Project. Platte River's water requirements are related to present and future water needs for power generation purposes. As described in the appendices, Platte River's current and future water supply for power generation is not reliable in some wet and very dry years, a problem that can be resolved by the WGFP.

MPWCD is a wholesale water supplier to 67 water providers in Grand and Summit Counties, referred to as contractees. Each year, the contractees have the right but not the obligation to seek Windy Gap water from MPWCD. The contractees are highly varied in nature, from ski towns to rural providers, and each may obtain water from a host of sources, including MPWCD. As described in the appendices, the need for Windy Gap is established in a regional context, considering the growth of the two counties as a whole.

Because of these differences, these two Project Participants are excluded from the summary tables, figures, and discussions of demand and supply when it is appropriate. Footnotes to each table and figure indicate when these entities are omitted from the aggregate information.

## **6.0 Sources of Supply**

Each Project Participant has developed a unique portfolio of water supply sources to meet existing and anticipated water needs. A diversity of water supply sources is generally preferred to ensure reliable deliveries. Water supplies for East Slope Project Participants generally include multiple sources, such as direct flow diversion rights from the Big Thompson River, St. Vrain River, and Cache la Poudre River, ownership of shares of ditch water from various irrigation companies, storage rights in existing reservoirs, ground water, and transbasin water imported from the West Slope.

Transbasin water primarily includes ownership of units in the C-BT Project, which diverts water from the West Slope, stores it in several principal reservoirs including Lake Granby on the West Slope, and Carter Lake and Horsetooth Reservoir on the East Slope, and then delivers the water through pipelines, canals, and discharges to streams to C-BT unit holders. Project Participants that own units of the Windy Gap Project likewise receive delivery of water when available through the C-BT delivery system. Unlike C-BT water, Windy Gap water can be used to extinction, thus allowing this water to be captured and reused multiple times.

The MPWCD is the only West Slope Project Participant in the WGFP. As a conservancy district, MPWCD's role is to contract and allocate delivery of water from the Windy Gap Project to various water users in Grand and Summit Counties. Thus, the source of supply for the MPWCD consists of diversions from the Colorado River at the Windy Gap pump station, which is then stored in Lake Granby. Windy Gap water primarily supplements other water supply sources for Grand and Summit County water users, although some small water users rely exclusively on Windy Gap water. MPWCD also allocates water from Wolford Mountain Reservoir located north of Kremmling, Colorado.

Estimates of the firm yield water supply, sometimes referred to as the dry year yield, indicate the amount of water that is available during a defined period or condition. Often this encompasses a 50-year historical record that includes several dry years. Extreme droughts are excluded from firm yield planning because the amount of water and cost associated with meeting these needs are typically not feasible. Because water yield from the various water supply sources can fluctuate substantially from year to year, water providers require adequate storage to capture flows during wet years, to meet their dry year water needs.

Firm annual water supply deliveries from streams, ditches, and reservoirs depend on each year's precipitation and any carryover reservoir storage. Annual deliveries of C-BT Project water also vary from year to year depending on available water supplies, the needs of shareholders, and the annual quota established by the NCWCD Board of Directors. The C-BT Project was established to provide a supplemental water supply to East Slope water users within the boundaries of the NCWCD. Historically, C-BT quotas have ranged between 0.5 and 1.0 AF per unit; however, quotas are adjusted to actually deliver more water in dry years. This is the opposite situation from most water rights in Colorado because the C-BT Project was designed to provide supplemental water in dry years when native water supplies yield less water. Historically, the C-BT Project has delivered 1 AF in dry years and as little as 0.5 AF in wet years or in extremely dry years, such as the drought of 2002-2004, when the C-BT Project was limited by the physical supply of water that it could actually deliver. Based on analysis of hydrology and C-BT operations through historical drought periods from 1950 to present, NCWCD has determined that the firm yield of the C-BT project is 0.6 AF per unit.

Many of the Project Participants reuse or are planning to reuse available water supplies to minimize the acquisition of new supplies. Colorado water law allows for the reuse of transbasin imports such as the Windy Gap Project. The Repayment Contract between the NCWCD and Federal government (Reclamation) specifies that C-BT Project water can be used once by the allotment contract holder and all return flows after the first use are returned to supplement the streamflows for diversions downstream. In some cases, a portion of South Platte Basin native water transferred from agricultural to municipal use can also be reused, depending on the conditions in the water rights decree.

Water reuse may include either the capture and treatment of effluent for direct reuse or the use of an effluent supply to meet return flow obligations or augmentation requirements. Direct reuse typically involves diversion from the wastewater treatment plant and conveyance to storage or distribution as non-potable reuse for irrigation of parks, golf courses, and landscaping. Water reuse allows a portion of outdoor water uses

to be met without using raw water treated to drinking water standards (potable water). Several Project Participants, including Broomfield, Louisville, and Superior, have developed water reuse treatment facilities, including conveyance and storage. The Platte River Power Authority relies on reuse water to meet the cooling needs of the Rawhide Energy Station. Because consumptive use is less in the winter, reusable water is often captured and stored for summer irrigation. None of the Project Participants reclaim water for potable uses. For some Participants, effluent is reused to meet downstream augmentation or return flow obligations. Reuse for these purposes does not directly satisfy non-potable demands identified for a Participant, but it helps meet other legal or contractual needs for the Participant.

Table 3 provides a compilation of the current annual firm water supply for each Project Participant. The Appendices provide additional detail on the individual components of each Participant’s water supply.

**Table 3. Summary of Participant 2005 Annual Firm Water Supply (Potable and Non-potable).**

Participant	Annual Firm Yield (AF)	Participant	Annual Firm Yield (AF)
Broomfield	13,739	Little Thompson Water District	5,510
Central Weld County Water District	2,786	Longmont	30,963
Erie	2,145	Louisville	5,063
Evans	9,298	Loveland	17,792
Fort Lupton	3,538	Middle Park Water Conservancy District	0
Greeley	43,850	Platte River Power Authority	0
Lafayette	4,534	Superior	1,544
<b>TOTAL</b>			<b>140,762</b>

## 7.0 Water Demand

The study team reviewed, evaluated, and ultimately determined water demand projections for the Project Participants from 2005 through the year 2050 or project buildout to compare future water requirements with existing supplies. A detailed examination of historical and projected water demand data for each Project Participant is provided in the Appendices. A summary of the water demand forecasting results is provided below.

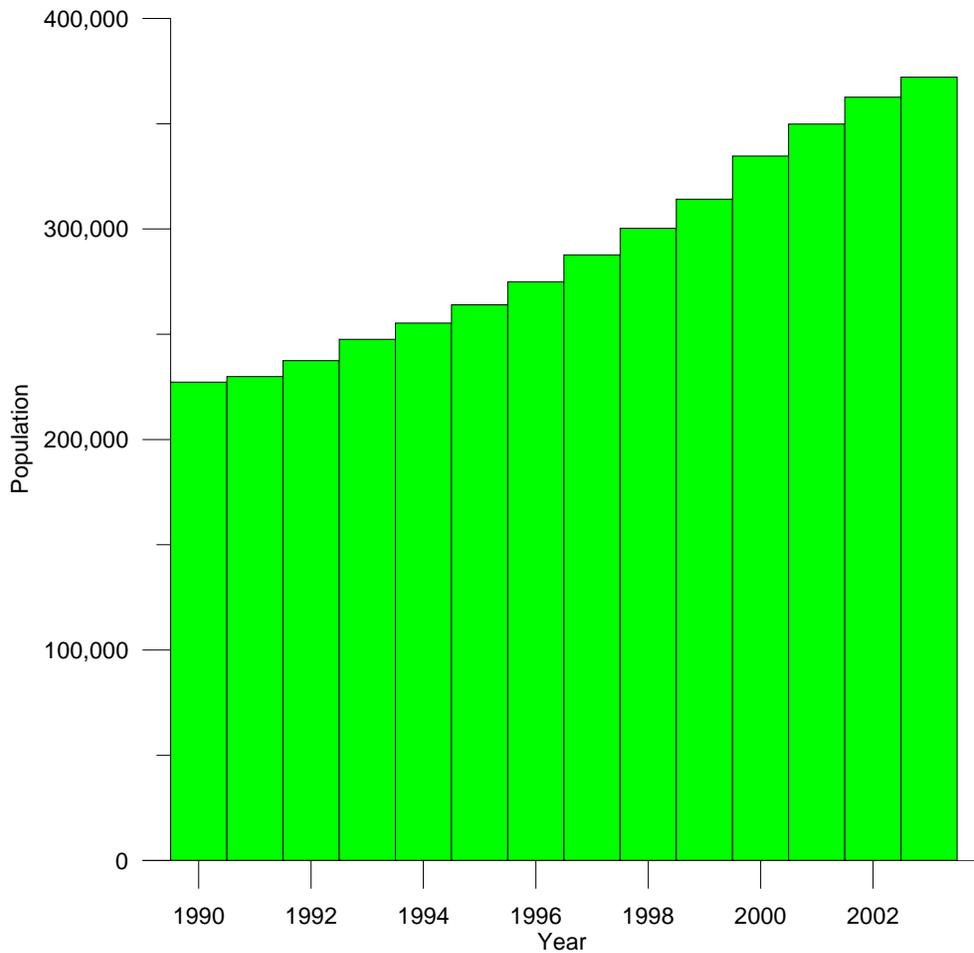
### 7.1 Historical Demographic Trends

The 14 WGFP Participants include a variety of water providers and users including cities, towns, rural domestic water districts, a wholesale water supplier, and an electric utility. These water providers and users are located in the counties of Broomfield, Boulder, Larimer, Grand, Summit, and Weld. The water consuming groups served by these providers are equally disparate, composed of residential, commercial, industrial, agri-business, agricultural, recreational, campus-based educational institutions, and

power generation. As stated earlier, those large, mostly industrial water users that supply their own water are excluded from the analyses, but other industrial or large users served by the Participants are included in the projections. Given the unique nature of each supplier, separate demand evaluations were performed for each Project Participant.

The study team gathered historical population, housing unit and water tap information from the Project Participants as available and applicable. Population data were the most complete demographic data set. The study team supplemented this information with census data and extrapolated water tap information to estimate historical population from 1990 to 2003 as exhibited in Figure 4. Water taps were used for those water districts that do not correspond to census-designated places where accurate published census counts are unavailable.

**Figure 4. Population Growth for the Windy Gap Participants, 1990 to 2003.<sup>†</sup>**



<sup>†</sup>This graph excludes MPWCD due to lack of historical data, and Platte River Power Authority because it does not directly serve a population.

Source: Harvey Economics 2004.

These data indicate a combined average annual population growth rate for Project Participants of 3.9 percent from 1990 through 2003. This very rapid increase in population, from 227,251 in 1990 to 372,151 in 2003, is characteristic of the economic development that occurred in northern Colorado during this period.

During the 1990s, Colorado's economy was in the top five nationally, driven by the technology sector, tourism and economic diversification.<sup>1</sup> From 1990 to 2000, the state added one million residents to its population. About 60 percent of this growth was attributable to in-migration.<sup>2</sup>

The region where the Windy Gap Participants are located was a large part of the growth that occurred in the period between 1990 and 2002. Boulder County experienced a 23 percent increase in population while Larimer and Weld Counties grew 41 and 54 percent, respectively. Some of the Larimer and Weld County growth was due to relatively higher housing costs in adjacent areas, particularly Boulder and Denver.

There are a variety of economic drivers within these areas. Weld County is a leading producer of cattle, oil and gas. Larimer, Weld and Boulder Counties have strong technology sectors and universities. From 1990 to 2002 employment growth in Boulder, Larimer and Weld Counties was 34, 62, and 50 percent, respectively.<sup>3</sup> Per capita income increased at an even greater rate: Boulder County, 83 percent; Larimer County, 79 percent; and Weld County, 56 percent. Housing prices have seen an even more dramatic increase, although they remain lower than the Boulder and Denver area. For example, from 1992 to 2002, the average residential home sale price in the Loveland/Berthoud area grew from \$84,571 to \$218,034, or 158 percent. The Windy Gap Participants in Boulder County and Broomfield averaged an increase in median single family home price of 123 percent from 1990 to 2000.

## **7.2 Historical Water Requirements**

Past and future water requirements for the Project Participants are composed of potable water deliveries to end users, non-potable deliveries to end users and water losses from the point of raw water diversion to the individual water taps. MPWCD does not deliver potable water supplies and Platte River only provides a small amount of potable water for use at the Rawhide Energy Station. All of the other Participants provide potable water deliveries to customers. Potable water deliveries are typically made to residential, commercial and industrial customers as well as parks, golf courses and other public uses, depending on the economic and demographic makeup of the water provider. The larger cities serve a diversified base of customers that include residential and various commercial and industrial uses such as food processors, high-tech firms and others, whereas the smaller communities primarily serve residential customers.

Historical potable delivery data indicate the effect of weather, especially drought and the impact of drought response measures on the part of these water providers. Peak potable water use of 25.1 billion gallons was realized in the year 2000 (Table 4).

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<sup>1</sup> [www.parkercolorado.org/coloradoeconomy](http://www.parkercolorado.org/coloradoeconomy)

<sup>2</sup> [http://www.state.co.us/oed/bus\\_fin/Databook2003/DB2004-Pop.pdf](http://www.state.co.us/oed/bus_fin/Databook2003/DB2004-Pop.pdf)

<sup>3</sup> <http://www.bea.doc.gov/bea/regional/reis/default.cfm#a>

**Table 4. Total Water Requirements for Windy Gap Participants, 1998 through 2003.**

Year	Millions of Gallons			AF	
	Potable Deliveries	Non-Potable Deliveries	Total Deliveries	Total Deliveries	Total Requirements with Losses
1998	21,334	3,402	24,736	75,913	88,539
1999	20,512	3,524	24,036	73,764	85,839
2000	25,058	3,992	29,051	89,154	103,804
2001	24,312	3,969	28,281	86,791	100,879
2002	23,276	4,515	27,791	85,287	98,839
2003	21,299	4,026	25,325	77,719	89,571

As of 2004, 10 of the 14 Project Participants deliver non-potable water to customers for outdoor irrigation. Non-potable deliveries are typically conveyed through existing ditch systems that previously served agricultural lands. Parks, school grounds, golf courses and open space are increasingly served by non-potable water systems, if they are large enough or accessible, to avoid drinking water treatment costs and to take advantage of available water resources. As a relatively new practice, non-potable delivery systems do not have a long track record in northern Colorado; only three Participants served non-potable water in 1990. As of 2003, the 10 Project Participants with non-potable systems delivered 4,000 million gallons of non-potable water to end-users.

Total potable and non-potable water requirements for 12 of the 14 Participants are summarized in Table 4. For these 12 Project Participants (excluding Platte River and MPWCD), combined water requirements reached a maximum of approximately 103,800 AF in the year 2000 and decreased to less than 90,000 AF in 2003. The wide variations in total water requirements for these Project Participants is indicative of the effects of drought and the drought response measures imposed by Participants in order to ensure that essential water needs were met.

Total system water losses amount to 13.2 percent in 2003, or 11,853 AF. There are several types of system losses:

- The most common losses occur between the point of diversion from stream courses or reservoirs and the water treatment plant due to evaporation and transit losses in streams and canals. Ranging from 7 to 15 percent, these losses are incurred by water carriers such as ditch or irrigation companies and charged to the Project Participants who do not have control over these raw water systems or the amounts they are charged for the losses.
- Treatment plant losses range from 1 to 5 percent, depending upon the age and design of the treatment plant facilities.
- Distribution system losses typically range from 2 percent to 10 percent. The range of system losses is explained by the age of the water system, the spatial distribution of customers, and the accounting for public water uses such as fire hydrants and construction water uses.

A perspective on water losses points to a highly variable attribute that is very much system dependent, although national research and experience in other communities is instructive. It suggests that the Participants are in the range of many other utilities, but that the lack of uniform measurement in the water utility industry precludes any definitive conclusion.

At the outset, water losses are not universally measured, nor is common terminology applied.<sup>4</sup> Whereas some utilities refer to losses as only leakage, others will include unbilled water for fire protection, hydrant flushing, construction water, and even irrigation of parks or other public uses. System losses are referred by some utilities as only including distribution shrinkage, while others include treatment or even conveyance losses from the point of diversion. Other terms used include water accountability, non-revenue water, non-account water, and uncompensated usage. Benchmarks or standards become variable under these circumstances.

Nevertheless, the American Water Works Association (AWWA) has attempted to determine what standards exist and what they should be. In 2002, the AWWA published a survey of water loss standards published by state agencies with some regulatory power over water.<sup>5</sup> Results from 23 states, which did not include Colorado, show a range of 10 percent to 25 percent. Most states use 10 percent to 15 percent as a target. Some states have higher standards for small water utilities. Some states have two agencies with different standards. Each was asked about “unaccounted for water” and left to interpret what that meant.

The record of unaccounted for water actually experienced by utilities suggests a wide range, but a central tendency of 15 percent to 16 percent. A survey of 520 water utilities indicates that an average unaccounted for water estimate is 16 percent in 1996.<sup>6</sup> The USGS gathers and reports data through its national Water-Use Information Program, which indicated in 1995 a “public use/loss” of 15 percent. Again the definitions applied in gathering these data are unknown.

In sum, the Windy Gap Participants appear to be in the range of water losses experienced by other water utilities, although the data measurement are likely to be inconsistent and therefore the applicability to Northern Colorado is unclear. Participants with higher system losses are those that receive water from stream diversions, ditches, and reservoir storage because of transmission and evaporative losses. More recently developed communities that have newer distribution systems and receive water via pipelines have lower system losses.

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<sup>4</sup> AWWA Water Loss Control Committee, “Applying World wide BMPs in Water Loss Control,” Journal AWWA, August 2003, pp. 65-79.

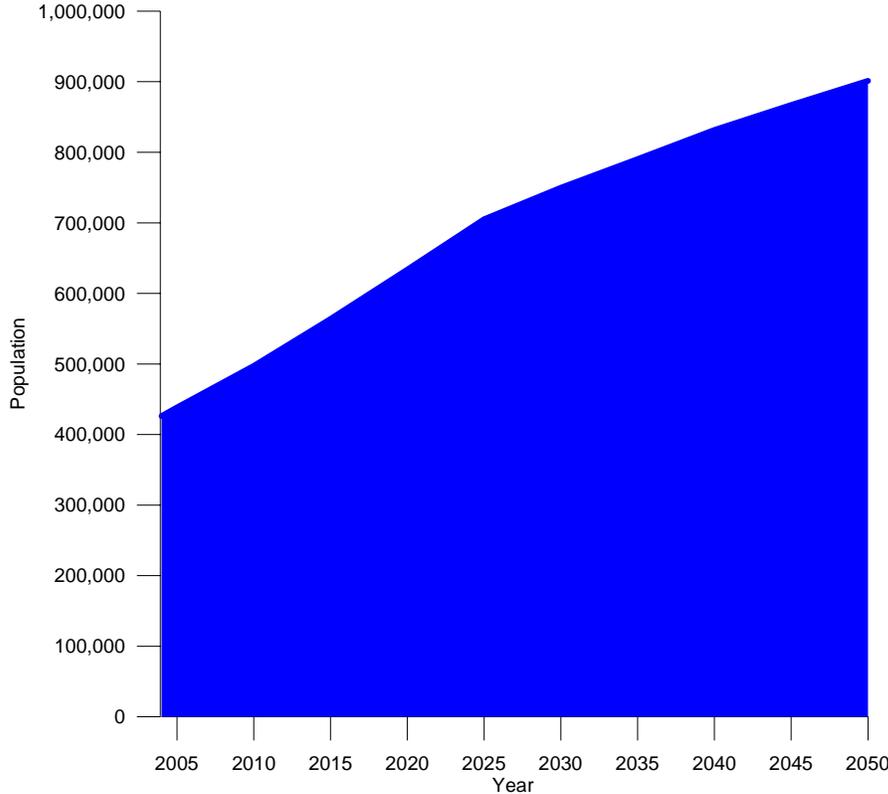
<sup>5</sup> Janice Beecher, “Survey of State Agency Water Loss Reporting Practices,” AWWA, January 2002, pp 1-29.

<sup>6</sup> George Kunkel, “Using the AWWA Water:Stats Distribution Survey to Assess Water Loss in Drinking Water Utilities,” AWWA, 2003, ppg.1-13.

### 7.3 Demographic Projections

Population for the Project Participants is projected to range from about 426,000 for 13 Project Participants (excluding Platte River Power Authority) in 2004 to approximately 749,900 persons by the year 2030 and 901,300 persons by the year 2050. The combined population projections for the Project Participants are illustrated in Figure 5.

**Figure 5. Population Projections for Windy Gap Firing Project Participants, 2004-2050.**



Note: Platte River is excluded from the above figure.

The projected population increase of the combined Participants indicates an increase of 324,000 persons, or 76 percent, through 2030. This amounts to an average annual growth rate of about 2.2 percent per year during this period. By comparison, the Colorado State Demographer projects population growth rates through the year 2030 for counties within which these Participants are located, as reported in Table 5.

**Table 5. State of Colorado Demographer Average Annual Growth Rate Projections for Selected Colorado Counties, 2003 through 2030.**

County	Projected Population Growth Rate
Boulder	1.1%
Broomfield	1.6%
Grand	2.8%
Larimer	1.9%
Summit	2.3%
Weld	3.1%

These data would suggest that the Project Participants' population projections are generally within the range of official State of Colorado projections. One would expect Participant population projections to be different than county-wide projections which would include areas such as older cities that have slower growth rates. Project Participants in most instances represent a small portion of the counties. Project Participant growth projections are considered more reliable for the purpose of this analysis because they are more site specific and much more current, a major advantage in such a dynamic growth environment.

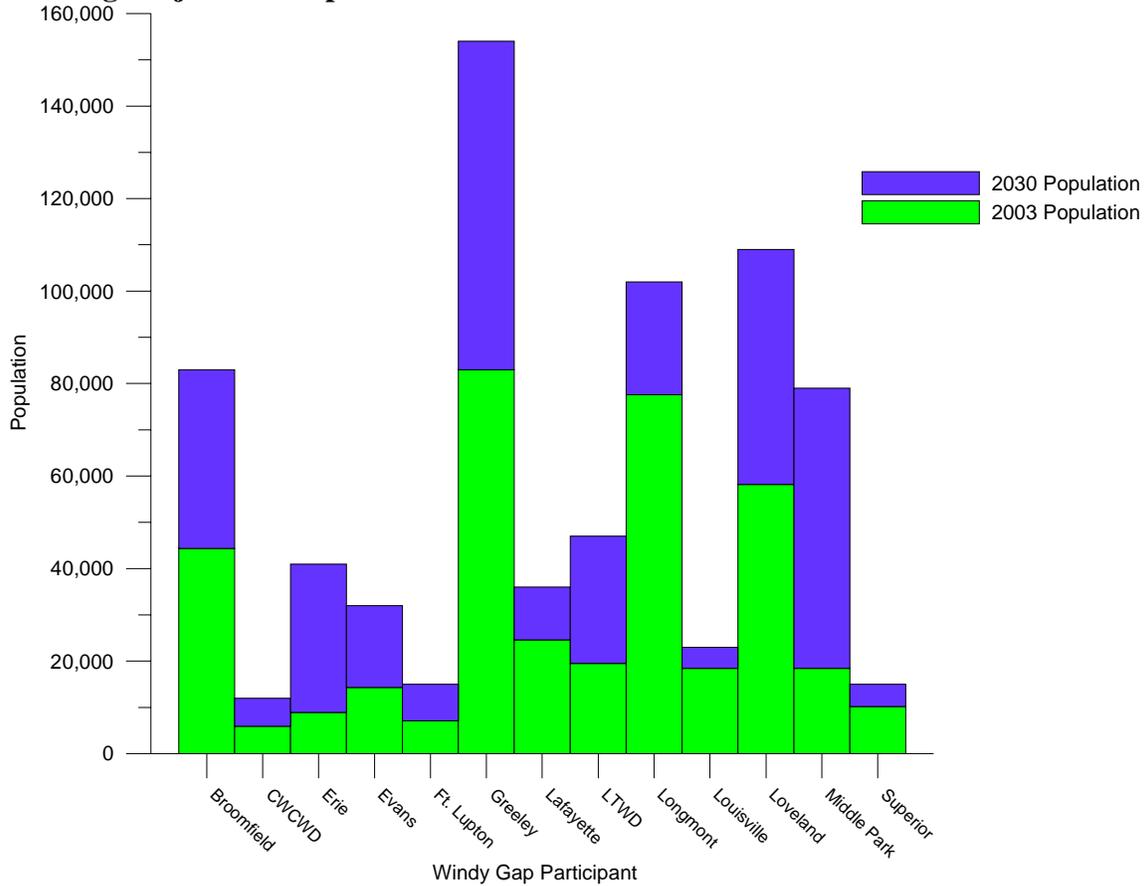
As might be expected, population growth rate projections for the 13 Project Participants, excluding Platte River, are estimated at 1.6 percent from 2004 through 2050, which is less than the 2.2 percent from 2004 through 2030. This indicates a slow-down in growth rates as the Participants get larger and as some approach build-out. Half the Project Participants reach residential population build-out before 2050, although commercial and industrial growth will continue for these communities beyond 2050. Further, it is quite common for a community's growth rate to slow as it becomes larger, one reason being the statistical reality that the same numerical increase in population numbers over time produces a decreasing growth rate as the population growth increases. Figure 6 depicts 2003 and 2030 population projections for the Project Participants, excluding Platte River Power Authority because it is a power utility.

Broomfield, Greeley, Longmont, and Loveland were the four largest cities and water providers among the Project Participants in 2003 and they will remain the largest by 2030. By the year 2030, Greeley, Loveland, Longmont, and Broomfield will represent the majority of population among the Project Participants, accounting for about 60 percent of total population. Each Participant anticipates considerable growth.

#### **7.4 Future Water Requirements**

Projected water requirements for the years 2005 and 2030 are approximately 115,000 AF and 200,000 AF, respectively, excluding MPWCD and PRPA. By 2050, a projected water requirement of about 246,000 AF is indicated for those same Project Participants. The combined average annual increase in water demands for the Project Participants is about 3 percent from 2004 through 2030 and about 2 percent from 2004 through 2050. Water demands increase at a somewhat higher annual rate than population, since population build-out often occurs long before build-out of commercial and industrial activity, according to the Participants. Increasing non-potable water use also drives total water requirements beyond population growth rates, as evidenced in the Participants' non-potable demand projections. Because Windy Gap water can be reused, Participant's need Windy Gap water to help meet non-potable irrigation and augmentation requirements and thus extend available water supplies.

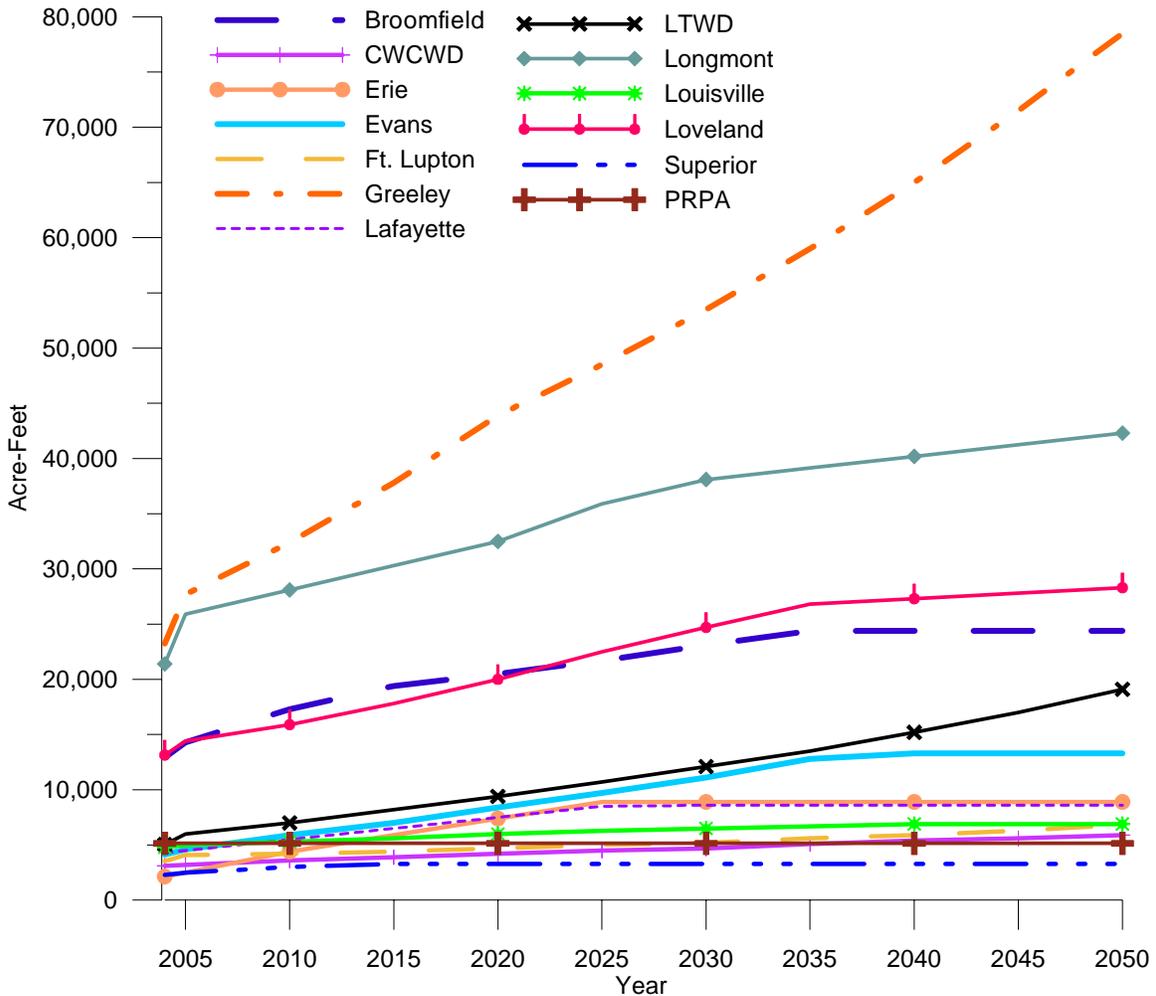
**Figure 6. Estimated 2003 and Projected 2030 Population for Individual Windy Gap Firing Project Participants.**



Note: The population values for Middle Park indicate Grand and Summit Counties.  
 Source: Harvey Economics 2004.

Figure 7 indicates total projected water requirements for individual Project Participants from 2004 through 2050. The most rapid percentage increases in water requirements are expected to occur for the Town of Erie, City of Evans, and Little Thompson Water District. Platte River water needs to meet the existing power facility requirement of 5,150 AF per year is expected to remain constant, but additional power generation in the future is possible.

**Figure 7. Projected Total Water Requirements for Individual Windy Gap Firing Project Participants, 2004 through 2050.**



Notes: These total water requirements are compared with supplies later in this report. MPWCD is excluded from this graphic.

Source: Harvey Economics 2004.

## 8.0 Water Conservation

The conservation of water through the efficient use of water supplies and demand management programs is becoming standard operating practice among water providers and consumers in Colorado. Recent drought conditions in Colorado emphasize the need to continually evaluate methods to conserve water resources not only during droughts, but also during “normal” years. Colorado has implemented several measures to assist in the state-wide implementation of conservation measures. In 1991, the Colorado Water Conservation Act created the Office of Water Conservation within the Colorado Water Conservation Board. This Act requires water providers delivering more than 2,000 AF annually to develop water conservation programs by 1996. An amendment to this Act in 2004 includes additional provisions for financial and technical assistance to promote

efficient water use. Additionally, in 2003, the state passed legislation that prohibits the use of residential subdivision covenants that restrict the use of low water landscaping.

Drought response measures are distinguished from conservation measures in this analysis. Actions taken by Project Participants in response to drought are temporary, whereas conservation measures are applicable under all hydrological conditions. Only conservation measures can be assumed to save water over the long term, relevant to a future water supply evaluation such as this.

Water conservation includes both supply-side and demand-side management. Supply-side conservation includes a variety of measures to make the most of existing supplies, including detection and repair of leaks to reduce losses, metering of water use, and reuse. Demand-side conservation includes changes in landscaping and watering, use of water efficient indoor appliances, education, water rate structure incentives, and other programs.

### **8.1 Participant Water Conservation Practices**

Water conservation is an important strategy used by the Project Participants to improve the efficiency of water use and delivery to reduce overall demand. All Participants have an incentive to use water efficiently, which leads to reduced costs associated with the supply, treatment, and distribution of water. Common measures by Project Participants to reduce household water use include requirements and rebates for water efficient fixtures and appliances, and regulations or incentives to reduce outdoor water use including limits on the number of watering days and the times of the day, xeriscape programs, and educational programs. All of the municipal Project Participants will be 100 percent metered by the end of 2005 to encourage reduced water use. Most Project Participants use an increasing block rate structure to promote conservation. Other Project Participants have found that a uniform water rate in combination with other conservation measures effectively reduces water use. Industrial water users served by municipalities and water districts are likewise encouraged to implement measures to reduce demand. The Platte River Power Authority conservation effort includes use of effluent for all of its cooling needs and the reuse and recycling of water to extinction.

Project Participants also have implemented a number of measures to improve the efficiency and delivery of water supplies. A number of the Project Participants have experienced rapid expansion of their systems in recent years; therefore, because the majority of their transmission and distribution systems are new, system losses are minimal. Supply-side measures include leak detection, pipe replacement and lining, and monitoring. Technological improvements at water treatment and wastewater facilities also contribute to water savings.

In evaluating the effectiveness of the Participant conservation programs, it is important to recognize that each Participant applies a unique mix of conservation measures. Participant conservation plans have incorporated a variety of conservation measures suitable to the particular conditions in their community and the operation of their water system. A brief overview of Participant conservation measures is provided below. A more detailed description of each Participant's conservation program is included in the appendices.

- *Broomfield* – The City and County of Broomfield established a conservation program in 1996. The current program includes an extensive public education effort and demand-side efforts such as broad-based residential landscaping restrictions and low-flow plumbing fixtures. Broomfield also emphasizes supply-side conservation in its program, including audits, meter replacements, and leak detection. Broomfield’s water reuse system became operational in 2004 and will be used to provide up to 3,100 AF of non-potable water for irrigation of parks, golf courses, and schools.
- *Central Weld County Water District (CWCWD)* – CWCWD implemented its water conservation plan in 2003, emphasizing a diverse public education effort. CWCWD encourages its dairies and other agricultural businesses to use non-treated water when possible. CWCWD utilizes an advanced computer leak detection system, which monitors inflows and outflows every 2.5 minutes, facilitating rapid system repair.
- *Town of Erie* – Erie also has a diverse public education program that includes a six-part series on the local television station related to water conservation. Erie’s conservation program emphasizes low water use landscaping for open space and parks. Other components of the Erie conservation plan include leak detection on a continuous basis, an irrigation audit program, and an increasing block rate structure. Reusable effluent is used for golf course irrigation and landscape irrigation.
- *City of Evans* – The City of Evans conservation program emphasizes ongoing, outdoor watering restrictions. In addition, Evans recently implemented an increasing block rate structure, billed monthly instead of quarterly. Evans promotes non-potable water use for residential irrigation and has an active leak detection program. Evans intends to upgrade its public education effort regarding water conservation through such efforts as targeting high water users, hiring staff to educate the public and monitor water use, and providing more sources of education material in mailings and on the web. Non-potable water sources are used for irrigation of rural property, city parks, schools, open space, and residential landscaping.
- *City of Fort Lupton* – As part of its 2003 Drought Response Plan, the City of Fort Lupton set a long-term conservation goal of 15 percent reduction in water usage. To achieve this goal, Fort Lupton is committed to a diverse public education program that includes monthly monitoring of water savings and a public display of the results. Fort Lupton applies specific water conservation measures to golf courses, restaurants and car washing, along with outdoor watering restrictions, all enforced by police and code enforcement employees. In June 2004, Fort Lupton instituted a large rate increase, including a surcharge for water use above a set supply allotment.
- *The City of Greeley* – As one of the largest communities among the WGFP participants, Greeley has an extensive and highly structured water conservation program. The public education effort includes public information, targeted outreach to specific water users, adult and school

education, and research that Greeley funds to find new conservation techniques. Greeley offers incentive programs including residential sprinkler audits, subsidies of low water use plumbing devices, and other give-aways. Through local regulation, Greeley applies landscape standards, plumbing standards, and enforcement of codes relating to proper water use. Greeley offers a leak detection program and recently completed its universal metering effort. The City also promotes water reuse and recently installed a control system to improve efficiency at its 35 parks. Greeley requires proof of soil amendment before granting any waiver of water restrictions related to new sod or lawns. The City monitors high water usage accounts.

- *City of Lafayette* – Lafayette’s conservation program emphasizes an increasing block rate structure and substantial present and future rate increases. Lafayette’s conservation program also focuses on reducing system losses through an extensive refurbishment program, which has yielded a 15 percent reduction in system losses. Lafayette’s public education program includes access to free material, newsletters, xeriscape seminars, and irrigation audits. Effluent exchanges allow for reuse of part of its water supply and the City is considering implementation of a reclaimed water system for irrigation or exchanges.
- *Little Thompson Water District (LTWD)* – The LTWD water conservation program emphasizes price incentives through an increasing block rate structure and providing educational material on conservation and xeriscaping. Monitoring customer use and controlling system losses are promoted through universal metering, pressure regulation, and a telemetry system. LTWD’s monthly utility bills show comparative usage and savings. LTWD also encourages non-potable water use through a separate delivery system for its new developments.
- *City of Longmont* – Longmont’s conservation program emphasizes water rates and price signals. The City instituted an increasing block rate structure with a 30 percent overall increase in 1989. The City will complete universal metering in 2005 and instituted cost of service rates for commercial and industrial customers. Longmont’s monthly utility bills show comparative usage and savings. Longmont’s public education program targets xeriscape and water conservation techniques by customer type. Longmont has a retrofit program for city buildings and irrigation systems and regulatory measures for low-flow plumbing devices in new construction and the prohibition of water waste. Reusable effluent is used for non-potable demands.
- *City of Louisville* – Louisville’s conservation program emphasizes an increasing block rate structure with a surcharge for excess use. Rebates are offered for low-flow plumbing and other water efficient devices. Louisville encourages water reuse of its non-potable wastewater effluent, has a leak detection system and a public education program. Reusable water supplies are used for irrigation of golf courses, parks, and sports fields.

- *City of Loveland* – Loveland has had a water conservation program since 1893. The City estimates that the implementation of universal metering in 1980 caused a 20 percent decline in water usage. In 1996, Loveland adopted a water conservation program that includes diverse public education programs targeted at different consumer groups, including newspaper articles, television programs, water conservation kits, and xeriscape seminars. The City also has an active leak detection program and infrastructure upgrade program to reduce system losses. Exchanges of reusable effluent have allowed the City to meet some of its water supply obligations.
- *Middle Park Water Conservancy District (MPWCD)* – The 67 water providers in Summit and Grand Counties are required to have water conservation plans. MPWCD is in a unique position with respect to water conservation given that: (a) the return flows of any water use for the headwater counties become water supplies for downstream users; (b) MPWCD has no apparent authority to control the water policy of its members; and (c) the transient population in Summit and Grand Counties is difficult to reach in terms of water conservation signals and programs. Most of the larger water providers in Summit and Grand Counties are fully metered, have increasing block rates, leak detection programs, as well as a public education program. Many of the water providers also require low-flow plumbing devices.
- *Platte River Power Authority (Platte River)* – Platte River’s Rawhide Power Plant site accomplishes its conservation through 100 percent water reuse to extinction. Platte River also recycles water used in other facility components onsite and monitors for unnecessary seepage at its reservoir. Platte River is considering future water conservation at its Rawhide facility, but is unsure about the technical feasibility of those options at present.
- *Town of Superior*—Superior’s conservation program emphasizes an increasing block rate structure and water reuse to the maximum extent feasible. The town has ongoing outdoor watering restrictions and requires new homes to have low water use plumbing devices. Superior is essentially a new town and it encourages high density dwellings and small lawns as well as water efficient systems to conserve water. Superior’s reuse water and non-potable water supplies are used to irrigate parks and greenways.

Project Participants were unable to estimate the amounts of water each of their conservation programs have saved in past years. Quantifiable reductions in water use from implementation of water conservation measures are not always immediately measurable because many of the conservation measures have only been recently implemented and because weather and other variables influence water use. Water savings from conservation vary according to the intensity of respective programs, the combination of programs offered, existing water use patterns of the water utility consumers and socioeconomic factors. All 14 Project Participants have diversified, substantive, and active conservation programs and they continue to evaluate opportunities to strengthen those programs. For example, a number of Project Participants are considering new, more conservation-oriented rate structures and various conservation

incentive programs for different customer groups. Other conservation programs under consideration include native grass seeding and xeriscaping for open space and new parks.

In 2005, the cities and towns of Broomfield, Lafayette, Longmont, Louisville, and Superior signed the Denver Metropolitan Local Governments’ Water Stewards Memorandum of Understanding (MOU), a commitment to water conservation and stewardship. The Boulder based Center for Resource Conservation offers a water conservation program that includes an irrigation audit program and suggestions for irrigation improvements. Erie, Lafayette, Greeley, Longmont and Louisville participate in this program.

The NCWCD has long been a leader in agricultural water conservation; however, in recognition of the growing municipal water use within its boundaries, NCWCD has become much more active in urban water conservation.<sup>7</sup> With a special emphasis on potential savings from turf watering, NCWCD has established the Turf and Urban Landscape Water Management and Conservation Program. This program focuses on education and training of turf professionals, groundskeepers, and all persons responsible for turf care. NCWCD’s program is grounded in horticulture research and scientific approaches to irrigation system design and practice. The educational component includes a host of fairs and other outreach efforts, while serving as a resource to homeowners.

A useful measure of the degree and effectiveness of water conservation programs is an evaluation of customers’ water use rates as expressed in gallons per day of use per customer. The study team gathered water use data from Project Participants and found the most consistent database to be total potable water use per capita per day. A comparison of the Project Participants’ water use rates with Denver Water for the period 1998 through 2003 is provided in Table 6.

**Table 6. Potable Water Use in gpcd for the Windy Gap Firing Project Participants and Denver Water, 1998 through 2003.**

Year	Simple Average of Project Participants	Population Weighted Average	Denver Water Service Area
1998	203	193	213
1999	194	180	204
2000	206	201	220
2001	203	191	211
2002	188	176	192
2003	171	N.A.	166
Average	194	188	201

Note: MPWCD and Platte River are excluded from these data. 2003 data for Greeley and Longmont was unavailable.

Source: Information provided by Project Participants, 2004.

<sup>7</sup> Northern Colorado Water Conservation District, Water Conservation and Management Plan

The comparisons between the simple average of gpcd for Project Participants with the weighted average based upon population indicate that the larger communities among the Participants typically have lower gpcd figures. Excluding water districts serving large agricultural and industrial entities might be expected because these cities would have more customers in multifamily dwellings compared with more rural and larger lot circumstances of the smaller Participants.

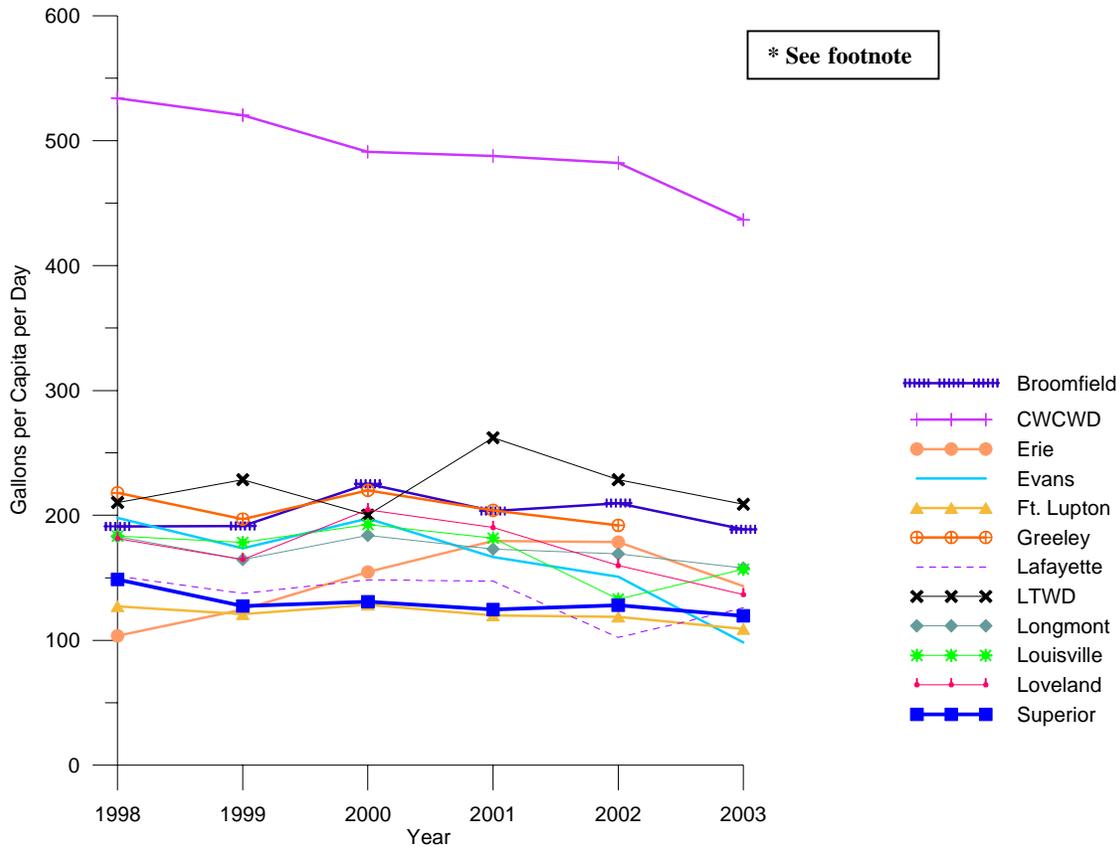
Overall, the Project Participants exhibit lower water use rates per capita compared with Denver Water. Although each water provider's circumstances are unique from one another, Denver is a useful benchmark because its conservation program is well established and has been scrutinized by federal agencies as part of the Foothills Agreement and during the Two Forks deliberations. Further, Denver has a climate similar to the northern Front Range where the Participants are located. However, the characteristics of water consumers in the Denver metropolitan area are different in many respects from the Participants. Differences in gpcd might be explained by Denver Water's relatively larger industrial base compared with smaller communities, although some Participants have a diversified customer base as well. Denver Water gpcd figures do not include non-potable use, nor do the Participant gpcd figures. Water use rates for individual WGFP Participants are illustrated in Figure 8.

The two rural water districts, Central Weld County Water District and Little Thompson Water District, exhibit higher water use rates than other Project Participants, owing to their special characteristics. Both serve rural households with larger lots. Little Thompson Water District and Central Weld serve dairies as well as agricultural customers. With a small population base, these water intensive customers tend to inflate gpcd figures.

## **8.2 Evaluation of Water Use Rates**

The evaluation of Participant water use rates is intended to answer this question: Are Participants' levels of water use and associated water conservation efforts reasonable, or should additional conservation efforts be assumed when considering the need for the WGFP? This evaluation begins with a historical look at water use rates in northern Colorado to identify what progress has been made in the area of water conservation. Next, this evaluation focuses on establishing a reasonable average of water usage for comparison with the Participants' current water use rates. This evaluation then focuses on Participants whose water use rates exceed the average.

**Figure 8. Total Water Use Rates for Individual Windy Gap Firing Project Participants, 1998 through 2003.**



Notes:

MPWCD and Platte River are excluded from these data.

\* CWCWD per capita use appears high compared with other water providers because non-residential demands, including agricultural and dairy users account for nearly two-thirds of total CWCWD demand. Residential water use for CWCWD is about 185 gpcd. The LTWD acquired the Arkins Water Association in 1999 and the Town of Mead in 2001 and 2002, which temporarily increased per capita use.

**Historical Water Use Rates in Northern Colorado.** Two sources of information offer a comparison of historical water use with current water use rates in Northern Colorado: the original Windy Gap EIS, which was prepared in the late 1970s and early 1980s; and the Northern District’s Regional Water Supply Study, prepared in 1991.

The Windy Gap EIS defined water use rates for the original participants of that project: Boulder, Estes Park, Greeley, Longmont, Loveland and the Platte River Power Authority. Four of these six original participants are WGFP Participants. In Table 1-1 of that EIS, the average water use of the Windy Gap participants, excluding Platte River Power Authority, was 250 gpcd. Compared with the simple average gpcd for the WGFP Participants from 1998 through 2003 of 194 this is a 22 percent decrease in water use.

The Northern District’s 1991 Regional Water Supply Study included estimates of water use rates for water providers in Northern Colorado and projections of future water use for municipal and industrial water providers from the Northern Denver Metropolitan area through Boulder, Larimer and Weld Counties, including many of the Participants. The water use rates of the WGFP Participants expressed in gpcd, according to the 1991 Regional Study, are presented in Table 7.

**Table 7. 1988 Water Use Rates for Selected WGFP Participants.**

WGFP Participant	1988 gpcd
Broomfield	154
Central Weld County Water District	395
Erie	389
Evans	216
Fort Lupton	326
Greeley	288
Lafayette	167
Little Thompson Water District	328
Longmont	255
Louisville	254
Loveland	193
Superior	192
<b>AVERAGE</b>	<b>263</b>

*Source:* Northern Colorado Water Conservancy District and Municipal Subdistrict, Regional Water Supply Study 1991.

The simple average gpcd for these WGFP Participants for 1998 through 2003 is 37 percent less than the average for Participants in 1988. This significant reduction in water use indicates that the conservation efforts already undertaken by Participants have been effective. It also suggests that additional savings might be more difficult to achieve.

**Water Use for WGFP Participants.** A regional water use average may be useful for comparison to the Participants’ existing water use rates; however the establishment of a comparable average is a challenge because:

- (1) Many measures of water use exist, and the calculation of water use is performed differently by agencies and jurisdictions. For example, water use can be measured by gpcd, gallons per tap per day, gallons per household per day, residential water use per capita per day, and so on. Further, the point of measurement (i.e., at the tap or at the treatment plant, or population within the city limits versus service area population) is also not uniform.
- (2) Averages for this application are best established by following comparability criteria as outlined by the EPA in its water conservation guidelines.<sup>8</sup> To

<sup>8</sup> Environmental Protection Agency, accessed at [http://www.epa.gov/owm/water-efficiency/wave03\\_19/inform3.htm](http://www.epa.gov/owm/water-efficiency/wave03_19/inform3.htm).

accurately compare cities' water use rates and conservation programs, a myriad of factors driving water demand would need to be accounted for. Collecting such extensive data, even if it were available, was beyond the scope of this inquiry.

In sum, establishing an average for the purposes of this report requires judgment based upon comparable areas and an understanding of the site-specific circumstances of the Participants.

Regional average gpcds provide a starting point for establishing a water use average for comparison with the WGFP Participants. The Statewide Water Initiative (SWSI) found that Colorado statewide gpcd averaged between 206 and 332, with the South Platte Basin as the lowest average in the state at 206 gpcd.<sup>9</sup> The SWSI average for all the Colorado River basins was reported as 210 gpcd. The EPA reports an average water use of 242 gpcd for the entire upper Colorado River Basin.<sup>10</sup> This same EPA report assigns a 194 gpcd to the Platte River Basin. A Western Resource Advocates report indicates an average gpcd for 13 large western U.S. cities of about 229 gpcd in 2001.<sup>11</sup> Yet another measure of water use can be extracted from U.S. Geological Survey data produced in the year 2000. This Federal agency gathers water supply, demand and population data for counties throughout the U.S. every five years. In the year 2000, average gpcd for Colorado's portion of the South Platte Basin amounted to about 200. As previously discussed, Denver Water exhibited an average potable gpcd usage of 201 gpcd between 1998 and 2003. Although Denver is a much larger metropolitan area with financial resources different than the Participants' financial resources, Denver is considered to have a well developed water conservation program and is considered by many to be an example of strong conservation along Colorado's Front Range.

One of the more useful sources of information for establishing a water use average comes from a study entitled, *Water Use and Residential Rate Structures in the Intermountain West*, State of Utah, published in 2005. In that study, the authors provide water use information for 25 cities in the western U.S. of various sizes and locations. The average gpcd for these 25 cities was 243. However, this study also provides information about the size of each of the communities and their average precipitation and temperature. In isolating cities of less than 301,000 in population and cities with precipitation and average temperature within plus or minus 25 percent of the Fort Collins-Loveland area, a total of nine cities are identified including the Fort Collins-Loveland area. The average gpcd for these communities was 224, as shown in Figure 9.

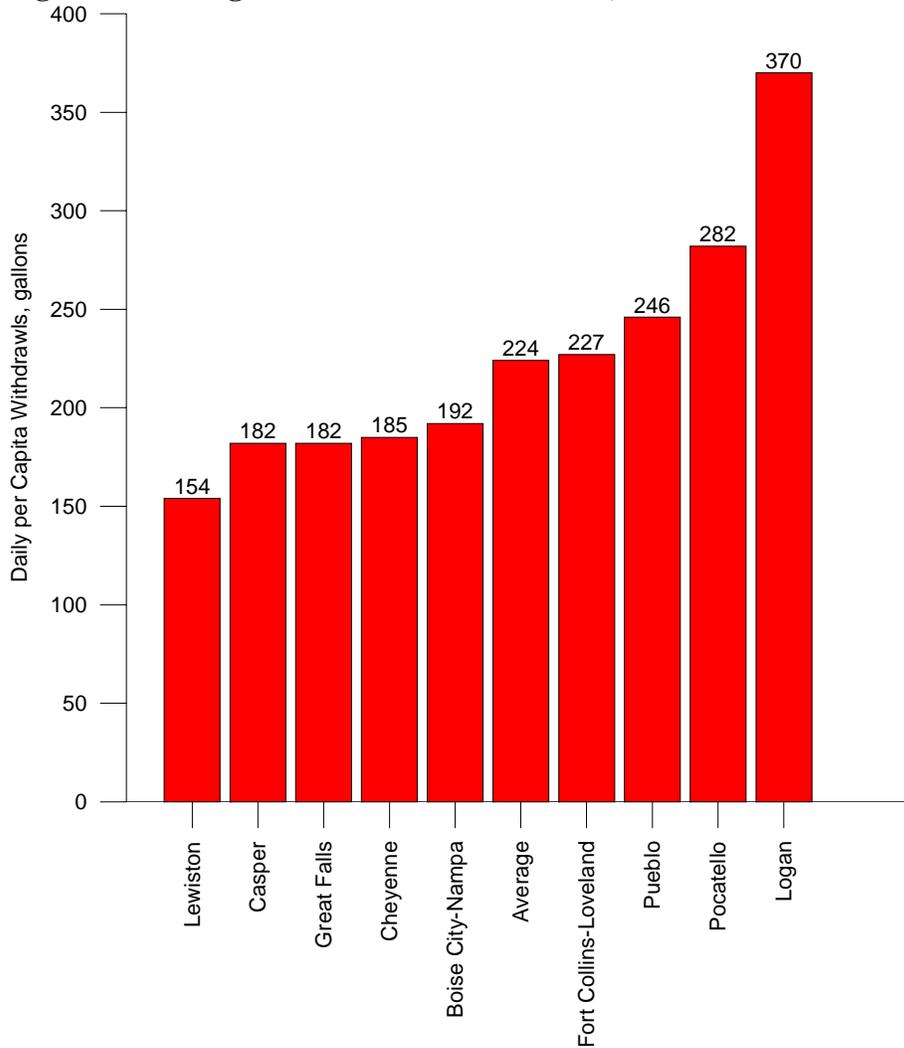
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<sup>9</sup> CDM, Statewide Water Supply Initiative, Executive Summary, Page ES-9.

<sup>10</sup> Environmental Protection Agency, accessed at [EPA.gov/watrhome/use/cap1.html](http://EPA.gov/watrhome/use/cap1.html).

<sup>11</sup> Western Resource Advocate, Smart Water.

**Figure 9. Average GPCD for Selected Cities, 2000.**



Source: State of Utah, Water Use and Residential Rate Structures in the Intermountain West, 2005

The study team used a single average gpcd from these various data sources as a basis for comparison to the water use of the WGFP Participants. Based upon the foregoing data, and using its professional judgment, study team found that the SWSI Colorado statewide average of 210 gpcd and the recent State of Utah study average (224 gpcd) of nine cities comparable to the Participants provided the best means of deriving an average for the purposes of this study. The SWSI study is both recent and Colorado-specific, and the Utah study looks at cities with some comparability to the WGFP Participants in size and climate. Both of these data sources have shortcomings: the Colorado average includes highly variable climates and communities, and the Utah case study cities might include special conditions or conservation programs which set them apart from the WGFP Participants. Given the advantages and disadvantages of these two data sources, the study team determined that the average of these two data points, or 217 gpcd, provided a reasonable average for the basis of comparison in this evaluation.

**Comparison of Regional Average Water Use to WGFP Participant Usage.** The study team compared the average regional water use value of 217 gpcd to the average gpcd from 1998 to 2003 for each Participant. Two WGFP Participants—CWCWD and LTWD—have water use values greater than the regional average. The study team examined the water use characteristics of these water providers to understand why they exceeded the water use average utilized for comparison purposes in this study.

As discussed earlier in this section, CWCWD provides water to various agricultural and dairy users, such as Aurora Dairy, as well as the Fort St. Vrain Power Generation Station. Total water use averaged 492 gpcd from 1998 through 2003. Non-residential water demands account for almost two-thirds of the total water CWCWD water demands. The residential gpcd for CWCWD reflects water use rates that typically average below 165 gpcd. CWCWD encourages dairy and other agricultural businesses to use non-treated water when possible.

The LTWD water use averaged 223 gpcd for 1998 to 2003, as compared with the regional average of 217 gpcd. Residential gpcd for LTWD since 1998 is comparable with other Participants at about 174 gpcd on average. LTWD also serves dairies and other agricultural uses, which tend to drive up its gpcd figures. In addition, LTWD acquired the Arkins Water Association and began serving the Town of Mead, which temporarily increased water use for several years. The LTWD conservation program includes encouragement of dual water systems for new developments.

In summary, water conservation is actively practiced among the Participants, and the current level of water conservation is built into the water demand projections. Water use as measured by total gpcd has declined in the last 15 years and the demand projections assume that the recent lower levels will continue. Total potable water use per capita per day variations from year to year are heavily influenced by weather and drought related restrictions.

The effectiveness of water conservation measures are best evaluated over the long-term. It is possible that per capita water use will continue to decline in the future as recent conservation measures are fully implemented and the public becomes more educated in the efficient use of water. Drought restrictions, which clearly have an effect on water demand patterns, are not assumed to be in place in the future as more normal hydrologic conditions resume.

Compared with the regional water use average selected for this study, water use rates of the Participants are reasonable. The relatively higher water using Participants are rural water districts that serve large agribusinesses whose effects on water use are magnified by a relatively small population base. This finding suggests that a reasonable level of efficient water use is being practiced by most Participants' customers. Although future additional water conservation savings are anticipated for Project Participants, the water demand projections have not considered potential incremental increases in water savings. Regardless, conservation alone would not meet the projected water requirements of Project Participants.

## 9.0 Participant Water Supply and Demands

This section discusses the existing water supply, growth and population trend, water demand, and need for water for each Project Participant. A more detailed discussion is included in the Appendices.

### 9.1 City and County of Broomfield

The City and County of Broomfield is located north of Denver and borders the intersection of Adams, Boulder, Jefferson, and Weld counties. Until the 1950s, only 100 people lived in the area. By 2004, Broomfield's population exceeded 46,000. In November 2001, Broomfield citizens voted to establish the City and County of Broomfield.

**Water Supply.** Broomfield relies primarily on C-BT Project water and Denver Water for its potable water supply. The City owns 56 units of Windy Gap water, which is used when available or through the C-BT in-lieu program. Broomfield non-potable water supply includes flows from Clear Creek, Coal Creek, Walnut Creek, and Big Dry Creek and reuse of Windy Gap effluent when available. Broomfield also owns ditch and reservoir shares that are used outside the City and County boundaries for non-potable uses including drought-tolerant sod production and biosolid disposal in Weld County. Broomfield recently completed a water reuse system that allows the capture of Windy Gap effluent to assist in meeting non-potable irrigation needs. Although the current firm yield of this reuse water is zero, it is projected to provide 3,100 AF of reuse water if the WGFP is implemented. Broomfield's current firm water supply is 13,739 AF.

**Growth and Population Trend.** Broomfield experienced steady growth in population and employment from 1980 through 1990, but the pace of that growth accelerated from 1990 through the year 2004. Population almost doubled from 24,640 in 1990 to 46,400 in 2004—an average annual growth rate of almost 5 percent. Employment rose three-fold from 1990 to the year 2004, experiencing an average annual growth rate of 9 percent. Broomfield's employment growth has benefited from its location along a major highway between Denver and Boulder.

**Current Water Demand.** The City and County of Broomfield Water Department service area includes the entire County, plus the Jefferson County Airport and the Mile High Water District. Total potable water use for the City and County of Broomfield peaked at about 3,290 MG or 10,100 AF in 2002, dropping in 2003 due to drought and related water use restrictions. Potable residential water deliveries nearly doubled between 1992 and 2003. Residential water use comprises an average of about 70 percent of total use. Commercial water use represents approximately one-fourth of total Broomfield water use; these water demands have been growing at a slightly slower pace than residential water use. Total water use per capita per day has varied within a fairly narrow range during the 1990s, averaging 188 gpcd. Residential gpcd have averaged 132 gpcd from 1992 through the year 2003.

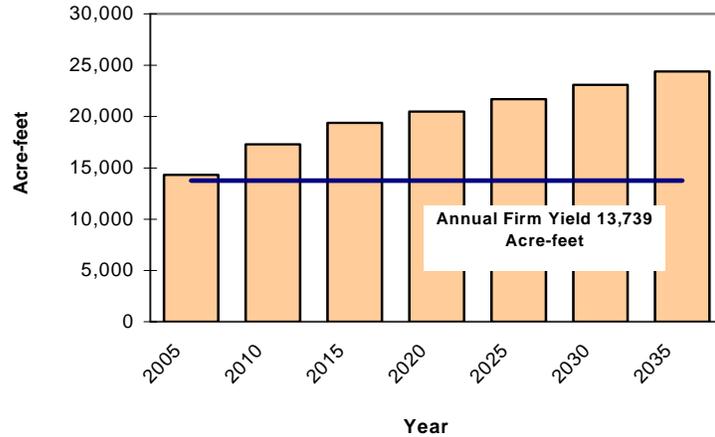
**Projected Water Demand.** Broomfield's population is projected to peak at 83,300 residents in the year 2025 based on a 2.9 percent annual increase from 2004 through buildout. This indicates an 80 percent increase in population in 20 years. Employment in Broomfield is expected to grow faster than population, doubling by 2025 and continuing to grow beyond that. Total firm water requirements are projected to increase from 14,300

AF in 2005 to 24,400 AF in the year 2035. About 86 percent of future demand is for potable needs and the remainder for non-potable uses.

**Water Need.**

Broomfield’s existing water supplies are sufficient to meet current water needs during average years of precipitation. Beginning in 2005, water demand is expected to exceed available firm water supplies during dry years, depending on C-BT deliveries. Broomfield’s projected 2035 water requirements exceed available firm supplies by about 10,700 AF. Firing Broomfield’s Windy Gap water would provide a firm annual yield of about 5,600 AF to meet potable needs plus sufficient reusable effluent (3,100 AF) to meet the majority of anticipated non-potable demands. A firm Windy Gap water supply would provide Broomfield about 23 percent of the City’s 2035 water supply requirement, not counting the potential reuse of Windy Gap water.

Comparison of Future Water Demands with 2005 Annual Firm Yield - Broomfield



Annual firm yield does not include reuse water.

**9.2 Central Weld County Water District**

Central Weld County Water District (CWCWD) was created in 1965 to serve a large rural portion of Weld County. The CWCWD’s total service area is about 250 square miles generally located south of Greeley and spanning along the South Platte River to the area along I-25 south of Dacono.

**Existing Water Supply.** The CWCWD’s water supply consists of two main water categories: water owned by CWCWD which is treated and delivered to rural customers; and water that is transferred to CWCWD, treated, and delivered to towns in the service area. The primary source of water owned by CWCWD is C-BT Project water, a small number of ditch shares in the Greeley-Loveland Irrigation Company, and 1 unit of Windy Gap water. The CWCWD does not have a firm source of supply for reuse because 99 percent of its water supply is from the C-BT Project, which is not reusable. Additionally, because CWCWD serves primarily rural customers with its Windy Gap water and CWCWD does not operate a wastewater facility, there are no plans for reuse of Windy Gap water. CWCWD firm water supply is 2,786 AF. In addition to the water owned by CWCWD, it receives, treats, and delivers C-BT water to eight small communities—Dacono, Kersey, Milliken, LaSalle, Gilcrest, Platteville, Left Hand, and Aristocrat. In 2005, CWCWD began providing water to the communities of Firestone and Frederick. The water supply and demand for Firestone and Frederick were not included in the

evaluation because CWCWD’s 1 unit of Windy Gap water is used to treat the needs of existing rural customers.

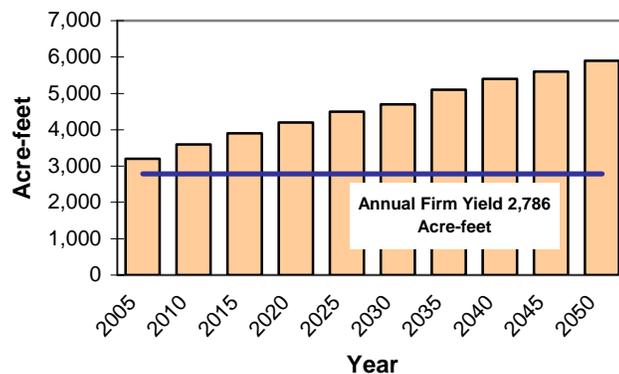
**Growth and Population Trend.** Between 1990 and 2000 the CWCWD service population grew at an average annual rate of 2.6 percent, or a total of slightly less than 30 percent. In 2002, the CWCWD served an estimated 24,000 people, up from 17,050 people in 1999, not including the communities that provide raw water to CWCWD for treatment.

**Current Water Demand.** CWCWD supplies water to rural customers within District boundaries. Non-residential demands accounted for nearly two-thirds of total CWCWD demand in 2002. Non-residential demand is mostly attributable to various agricultural and dairy users, with Aurora Dairy and Fort St. Vrain Power Generation representing the largest users. Total 2002 water demand was about 2,800 AF. Residential water use within the CWCWD service area was about 162 gpcd from 1999 to 2002. The CWCWD also treats water for the communities previously mentioned. Because the CWCWD is only responsible for providing treatment and not the raw water, these communities were not included in the demand evaluation. Total water use averaged almost 500 gallons per day for the same period, but two-thirds of CWCWD water demand was for agricultural and industrial users.

**Projected Water Demand.** To arrive at projected residential demand, historical residential use patterns were analyzed. Residential taps are expected to grow at an annual rate of about 4.5 percent until 2010 and then decline over time to about 1.2 percent by 2050. Projections of future non-residential demands are based on the continuation of the historical average of 3.5 new taps per year. Total water requirements for the CWCWD are estimated to be 5,900 AF per year by 2050.

**Water Need.** CWCWD existing water supplies are sufficient to meet current water needs during average years of precipitation. Beginning in 2005, water demand could exceed available firm water supplies during dry years, depending on C-BT deliveries. Projected water demand exceeds the firm supply by about 1,900 AF in 2030 and by 2050 a shortage of about 3,100 AF is anticipated. Firing CWCWD’s single Windy Gap unit would provide about 100 AF of water, or less than 2 percent of its 2050 water supply.

Comparison of Future Water Demands with 2005 Firm Annual Firm Yield - CWCWD



### 9.3 Town of Erie

The Town of Erie is located in Boulder County, Colorado just north of the City of Lafayette. Prior to 1995, the Town of Erie was small and rural in nature; considerable growth occurred after 1997 and continues through 2004. Currently, Erie is a bedroom community for the Denver metropolitan area.

**Water Supply.** Erie's water supply has grown sharply over the last 10 years to keep pace with population growth. Erie has purchased C-BT Project water since 1992 to the present, which currently provides more than 90 percent of Erie's water supply. Other water sources include the ownership and planned acquisition of 20 units of Windy Gap water, reservoir storage rights, and various ditch shares. Erie does not currently have a firm supply of water for reuse. When available, effluent from Windy Gap water is used via an exchange to irrigate parks and open space. Erie estimates about 50 percent of its Windy Gap water could be reused if the WGFP is implemented. The current estimated firm annual water supply for the Town of Erie is 2,145 AF.

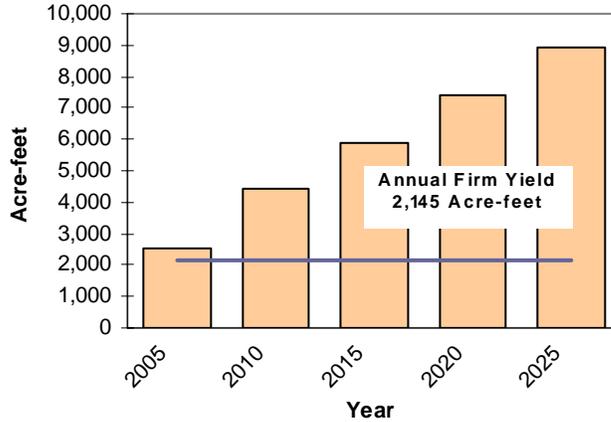
**Growth and Population Trend.** Erie's population has grown from about 1,260 in 1990 to 6,300 in 2000; population in 2004 is estimated at 10,390. From 1990 to 2004, Erie's population grew substantially as indicated by a population increase of 729 percent and a 744 percent increase in the number of housing units.

**Current Water Demand.** Encompassing about 14 square miles, the Town of Erie and its water department serve most customers within its service area. Left Hand Water District is temporarily serving a portion of Erie's service area. No large industrial or other water users were served as of mid-2004. From 1997 through 2003, total water deliveries for the Town of Erie increased by a factor of 6.4. In 2002, residential water use comprised 76 percent of total water sales, and residential use has averaged 88 percent of total water sales from 1997 through 2004. In 2003 and 2004, commercial water sales accounted for more than 15 percent of total water sales. The Town of Erie initiated non-potable water use in 2001 and averaged about 80 AF of deliveries between 2001 and 2003. Total water requirements for the Town of Erie increased from 229 AF in 1995 to a high of 2,025 AF in 2002. From 2000 to 2003, total water use averaged 164 gpcd and residential water use averaged 129 gpcd.

**Projected Water Demand.** Buildout population is estimated to occur in the year 2025, with a population of about 40,700 and 14,600 housing units. Growth rates are assumed to decline as the population grows. Total Erie water requirements are expected to increase from about 2,500 AF in the year 2005 to 8,900 AF in the year 2025. This represents about a 260 percent change over that period of time. About 96 percent of future water demand is needed for potable uses and the remainder for non-potable irrigation.

**Water Need.** Existing water supplies are currently sufficient to meet Erie’s water needs during average years of precipitation. Beginning in 2005, water demand could exceed available firm water supplies during dry years, depending on C-BT deliveries. A firm water supply shortage of about 6,800 AF is estimated by buildout in 2025. Firing Erie’s Windy Gap Project water supply would provide up to 2,000 AF of water, or about 22 percent of the Town’s 2025 water supply, not including the reuse of about 50 percent of the Windy Gap yield to meet irrigation demands.

Comparison of Future Water Demands with 2005 Annual Firm Yield - Erie



Annual firm yield does not include reuse water.

**9.4 City of Evans**

The City of Evans is located in south-central Weld County just south of the City of Greeley. Evans is a highly diversified and stable community experiencing significant growth and development.

**Existing Water Supply.** The City of Evans currently relies on transbasin water from the C-BT Project and five local ditch companies for its potable water supply. Evans recently completed a lease/purchase for 5 units of Windy Gap water. All of Evans’ potable water is treated by the City of Greeley. Evans provides raw water to Greeley each year equal to Evans’ projected water demand, plus an additional amount to account for shrinkage losses incurred by Greeley. Evans’ non-potable water supply includes the Evans Town Ditch, which currently exceeds the City’s non-potable demand. The current firm annual water supply available to Evans is about 9,298 AF. In addition, Evans receives return flow credit from native water sources, which provide a variable supply of about 400 AF of reuse water for meeting return flow obligations. Evans estimates up to 85 percent of its Windy Gap water could be reused if the WGFP is implemented.

**Growth and Population Trend.** Between 2000 and 2002, the City of Evans ranked among the fastest growing cities in Colorado. Over this period, Evans grew at an average annual rate of 7 percent. Between 1990 and 2004, Evan’s population grew from about 5,900 to 15,000.

**Current Water Demand.** The City of Evans is responsible for providing water to the residential, commercial, industrial and public users located within its service area. Approximately 95 percent of Evans’ customers are residential. Evans currently serves 14,860 residents within the city limits and provides water to 2,394 residents within the Arrowhead and Hill-N-Park subdivisions. Currently no large water users are served by

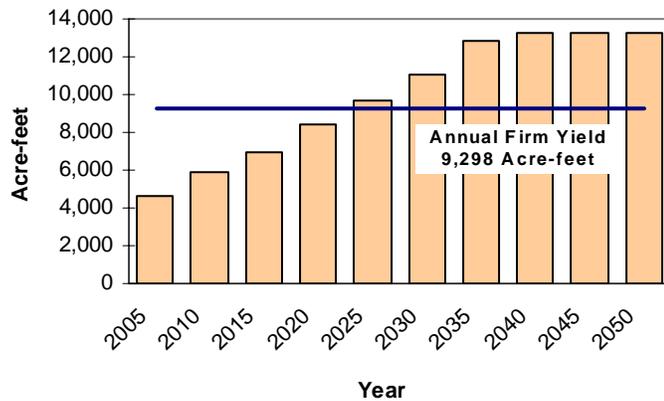
the City. Total water requirements to meet potable water and non-potable water needs since 2000 have ranged from about 3,700 to 4,600 AF per year. Over the period 1990-2002, total water use averaged 188 gpcd and residential water use averaged 157 gpcd.

**Projected Water Demand.** The projected population forecast for Evans is based on an assumed annual rate of growth of 4 percent through 2010, 3 percent through 2020, and 2.5 percent thereafter. The City of Evans service area population is expected to peak at about 40,000 residents by 2037. Total raw water requirements to meet this anticipated population is about 13,300 AF per year.

**Water Need.** Evans’ existing total firm water supply exceeds current demand during average years of precipitation; however, not all water supplies are currently available for meeting potable water needs. Water demand is expected to exceed available firm water supplies by about 2025, which would affect the ability of Evans to meet dry year water needs, depending on C-BT deliveries. However, the Evans Town Ditch, which is included in Evans’ total water supply, currently can only be used for non-potable uses because the source of water is located well downstream of Greeley’s water treatment plant, who treats water for Evans.

Thus, a shortage in firm potable water supplies may occur much sooner. Based on total water supply, without accounting for source of water, a firm water supply shortage of about 4,000 AF is anticipated by about 2040 when demand is expected to peak. Firming Evans’ 5 Windy Gap units will provide the City with about 500 AF of water or about 4 percent of the City’s 2050 water supply requirement, not including the reuse of about 85 percent of the Windy Gap yield to meet return flow obligations.

Comparison of Future Water Demands with 2005 Annual Firm Yield - Evans



Annual firm yield does not include reuse water.

### 9.5 City of Fort Lupton

The City of Fort Lupton is located in south-central Weld County about 25 miles north of Denver. Nearby cities include Brighton, Platteville, Firestone, Frederick, and Dacono. Fort Lupton began as a trading fort in 1836; since that time the community has expanded with its business, agriculture, and oil and gas based economy.

**Existing Water Supply.** Historically, the City relied on groundwater to meet its municipal water needs. With increasing growth and development along the Front Range, the quality of the groundwater from Fort Lupton’s wells in the South Platte River alluvium has gradually declined. For this reason, the City decided to acquire C-BT Project water in 1997 and blend this water with groundwater to maintain acceptable water quality. Fort Lupton recently purchased 3 units of Windy Gap Project water from

Greeley. In addition, Fort Lupton owns shares in the Fulton Ditch, which provides water for irrigation. Fort Lupton does not currently have any sources of water available for reuse, but estimates that up to 80 percent of its Windy Gap water could be reused if the WGFP is implemented. Firm annual water supplies currently available to Fort Lupton total 3,538 AF.

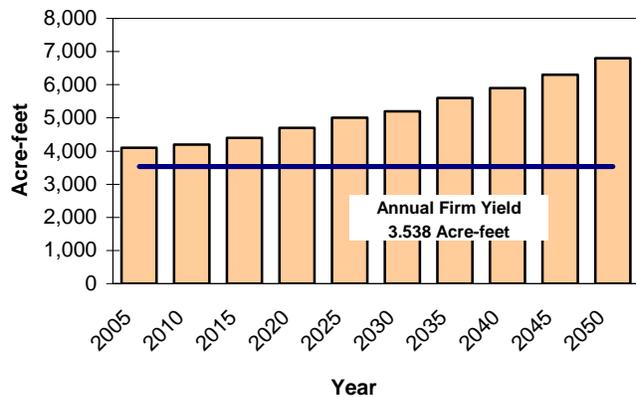
**Growth and Population Trend.** The City of Fort Lupton’s current population is estimated at 7,071, and the City’s service area is coincident with its city limits. From 1990 through 2003, population grew at an average annual rate of 2.5 percent. Total water taps increased by an average annual rate of 2.9 percent from 1997 through 2003. Annual growth rates have fluctuated since 1990, with the most significant growth occurring in 2000 and 2001.

**Current Water Demand.** Residential use has traditionally comprised the majority of potable water demands in the City of Fort Lupton, accounting for an average of 77 percent during the 1997 to 2003 period. A large portion of the remainder of Fort Lupton’s water demand comes from non-potable water needs. From 1997 through 2003, Thermo Cogeneration power plant used, on average, 1,625 AF of water annually, while other non-potable users, including the City’s parks and schools, outdoor irrigation and golf course, used 550 AF annually on average. Total water demand for Fort Lupton has ranged from about 3,000 to 4,000 AF per year over the past 5 years. Total potable water use has averaged 123 gpcd and residential water use has averaged 97 gpcd from 1997 to 2003.

**Projected Water Demand.** Based on an annual growth rate of 2.5 percent, the City of Fort Lupton is expected to reach nearly 24,000 people by 2050. Residential, commercial, industrial, schools, city parks and irrigation water usage are all expected to track population growth. Thermo’s usage and future usage for golf course irrigation are expected to remain steady from 2003 to 2050. Total raw water requirements of about 6,800 AF are projected by 2050, of which about 60 percent will meet potable water demand and 40 percent will meet non-potable water needs, including the Thermo Cogeneration facility.

**Water Need.** Existing water supplies are currently sufficient to meet Fort Lupton’s water needs during average years of precipitation. Beginning in 2005, water demand could exceed available firm water supplies during dry years, depending on C-BT deliveries. By 2030, Fort Lupton’s firm water demand is projected to exceed supply by about 1,700 AF; by 2050 about 3,300 AF of additional water will be needed to meet Fort Lupton’s water needs. Firing Fort Lupton’s 3 units of Windy Gap water will provide Fort Lupton with

Comparison of Future Water Demands with 2005 Annual Firm Yield - Fort Lupton



about 300 AF of water, or about 5 percent of its 2050 water supply, not including reuse of up to 80 percent of Windy Gap water.

## 9.6 City of Greeley

Greeley is the largest city in Weld County and is located about 50 miles north of Denver. The City is located in a semi-arid environment that receives only about 12 inches of precipitation annually. Greeley was originally an agricultural based community, but continues to diversify and support a variety of businesses and commercial industries.

**Existing Water Supply.** Greeley's water supply system is diverse and complex, and uses carryover storage from existing reservoirs, proactive water management, conservation, and system integration to increase the efficiency and yield of the City's water rights. Primary sources of water include C-BT Project water, direct flow rights from the Cache la Poudre River, irrigation ditch shares, and mountain reservoir storage. Although legally available, approximately one-third of Greeley-Loveland System supplies are currently in agricultural leases and not available for immediate potable or non-potable use. Greeley owns 64 units of Windy Gap water. As outlined in Greeley's Water Master Plan, Greeley has been pursuing the potential sale/lease of 20 of its Windy Gap units as a way to help fund storage for the remaining Windy Gap units retained by Greeley. Greeley's current firm water supply is about 43,850 AF, which does not include any return flow obligations (RFOs) or wholly consumable supply, native or Windy Gap water, to meet RFOs. However, the 43,850 AF does include about 2,350 AF of non-potable water used for irrigation. Greeley estimates that it will be able to reuse about 80 percent of Windy Gap water if firmed not as a potable supply, because of the geographical and physical constraints, but as a supply to meet Greeley's RFOs.

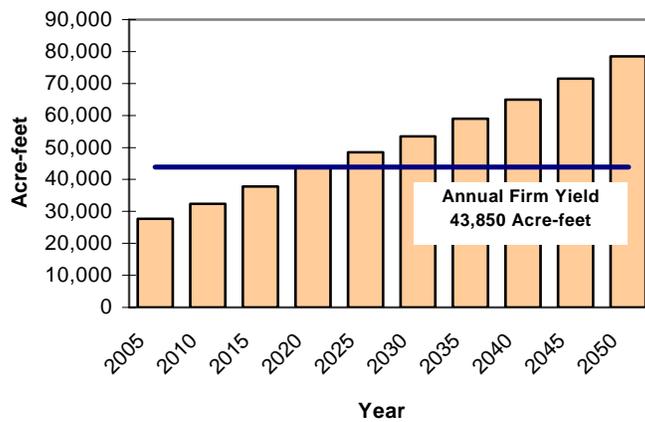
**Growth and Population Trend.** The City of Greeley has grown from a rural community of 20,400 in 1950 to the second largest city in northern Colorado, with a population of 83,000 in 2003. Greeley's population doubled from 1960 to 1980, and population growth from 1970 to 1990 averaged about 2.2 percent per year. Population growth during the 1990s was approximately 2.5 percent per year.

**Current Water Demand.** Greeley delivers water to residential and commercial users within its service area in addition to deliveries and water treatment contracts with entities outside of its service area. Greeley provides wholesale water to the City of Evans, a Kodak plant, part of the Town of Windsor, part of the Town of Milliken, plus Garden City. These entities provide Greeley with raw water and associated water rights and Greeley treats and delivers potable water to the respective customers at master meters. The water demands associated with these customers are excluded from consideration in this analysis because Greeley is not responsible for providing any future water requirements. Greeley continues to provide water to other customers outside the City in the Greeley service area that have historically been served. This includes customers along Greeley's water transmission lines and certain agricultural customers. Greeley's water demands between 1993 and 2003 have ranged from about 19,000 to 25,000 AF. Total water use per capita, excluding wholesale accounts and those outside city limits, averaged 202 gpcd from 1993 to 2002. Single family residential water use per capita inside Greeley city limits averaged 194 gpcd between 1993 and 2002.

**Projected Water Demand.** Greeley’s population forecast indicates an increase from 83,000 in 2003 to 126,300 in 2020, at the historical growth rate of 2.5 percent per year. By the year 2050, Greeley’s population is projected to be 228,800 based on a 2 percent growth rate between 2020 and 2050. A total raw water requirement of about 53,500 AF is estimated by 2030, and a need of 78,500 AF is estimated by 2050 to meet potable and non-potable water demand.

**Water Need.** Greeley’s existing water supplies are currently sufficient to meet water needs during average years of precipitation, as well as dry years. By about 2020, Greeley’s water demand is expected to exceed available firm water supplies. A water supply shortage of about 9,700 AF is anticipated by 2030, and a shortage of about 34,700 AF is anticipated by 2050. Firing 44 units of Greeley’s Windy Gap water would provide an annual yield of up to 4,400 AF, although preliminary model results indicate yields closer to 2,900 AF. In the near term, the City needs the reusable effluent from Windy Gap water to meet return flow obligations and augmentation for existing operations and for added flexibility in managing its water portfolio. An annual Windy Gap water supply of 4,400 AF would provide Greeley about 6 percent of its 2050 water supply requirement. In addition, about 80 percent of Windy Gap water could be reused if firmed to meet Greeley’s return flow obligations and augmentation requirements.

Comparison of Future Water Demands with 2005 Annual Firm Yields - Greeley



Annual firm yield does not include reuse water.

**9.7 City of Lafayette**

The City of Lafayette is located just east of the City of Boulder on the eastern edge of Boulder County. Bordering communities include the cities of Louisville and Broomfield, and the towns of Superior and Erie. Like many communities along the rapidly growing US Highway 36 corridor, the City of Lafayette experienced significant growth in population over the last decade.

**Existing Water Supply.** The City of Lafayette’s raw water supply is primarily based on shared ownership in several ditch and reservoir companies with diversions from Boulder Creek and South Boulder Creek. Lafayette’s ownership in three reservoirs also provides storage capacity prior to water treatment and delivery. In addition, Lafayette recently joined the NCWCD and has acquired C-BT units. Lafayette is in the process of acquiring 8 units of Windy Gap water. The City is evaluating implementation of a reuse program for landscape irrigation and currently exchanges effluent for diversions from

South Boulder Creek. Reuse of existing native water provides an average yield of about 200 AF. Lafayette plans to fully utilize all available effluent associated with Windy Gap water if firmed, which, accounting for consumptive use and losses, typically is about 80 percent depending on season of use and the reclaimed water system. The estimated current firm annual water supply for the City of Lafayette is currently 4,534 AF not counting reuse water.

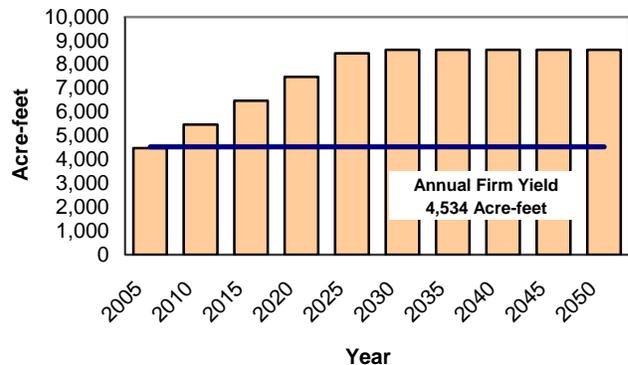
**Growth and Population Trend.** Lafayette’s current service area population is estimated at about 25,500 persons. From 1979 to 2002, the City’s population grew at an average annual rate of 4.6 percent. Annual growth rates for both population and the number of residential units have fluctuated. Significant growth, ranging from 8 to 10 percent per year, occurred during the early 1980s and mid 1990s, followed by periods of slower growth. In 1995, Lafayette imposed growth restrictions that limited the number of new residential dwelling permits.

**Current Water Demand.** The City of Lafayette is responsible for providing water to residential, commercial, industrial, and irrigation users within the City’s boundaries. In addition, the City also provides water to the East Boulder County and Baseline Water Districts to serve certain rural residential customers. As of 2004, Lafayette did not serve any large water users. Current total water demands of 4,079 AF per year serve a population within the City of 24,637 people and an additional 359 residential taps outside the City’s limits. Total water use has averaged 134 gpcd and residential water use has averaged 108 gpcd for 1993 to 2003.

**Projected Water Demand.** Projected future growth rates of less than 2 percent indicate a buildout population estimate of about 36,000 in 2026. Future water demand projections are estimated at a rate consistent with population growth. Total raw water requirements by 2026 are estimated to be 8,600 AF, of which about 87 percent meets potable water demand and the remainder is used to meet non-potable use requirements.

**Water Need.** Existing water supplies are currently sufficient to meet Lafayette’s water needs during average years of precipitation. Beginning in 2005, water demand could exceed available firm water supplies during dry years, depending on C-BT deliveries. By buildout in about 2026, Lafayette’s water demand is expected to exceed firm water supply by about 4,100 AF. Firing 8 units of Lafayette’s Windy Gap water would provide a firm annual yield of about 800 AF, of which about 80 percent could be reused for non-potable irrigation requirements. A firm Windy Gap water supply would provide Lafayette about 9 percent of the City’s 2030 water supply requirement, not counting the reuse potential.

Comparison of Future Water Demands with 2005 Annual Firm Yield - Lafayette



Annual firm yield does not include reuse water.

## 9.8 Little Thompson Water District

The Little Thompson Water District (LTWD) provides treated water to homes and businesses in northern Colorado. LTWD is a special governmental water district with customers in Larimer, Weld, and Boulder counties. The 300-square mile LTWD service area is generally bounded by the City of Loveland on the north, Longs Peak Water District on the south, the City of Greeley, the South Platte River and the St. Vrain River on the east, and the foothills on the west.

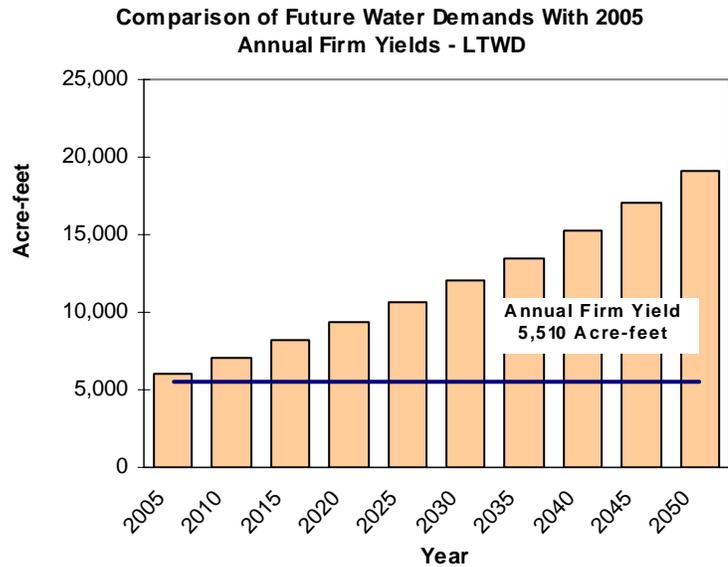
**Water Supply.** Currently, the LTWD relies almost entirely on C-BT water to meet its municipal and commercial water requirements. Ditch shares and direct flow rights do not provide any firm yield. The LTWD is in the process of acquiring 12 units of Windy Gap water from the City of Greeley. LTWD does not currently have any sources of water that can be reused, but projects about 80 percent of Windy Gap water could be captured and reused if the project is firmed. The LTWD current firm water supply is 5,510 AF.

**Growth and Population Trends.** The population in the LTWD has almost doubled from about 10,800 in 1991 to 19,500 in 2003. During this time, the number of taps increased about 3.9 percent annually, excluding the LTWD expansion to become the primary service provider for the Arkins Water Association and the Town of Mead.

**Current Water Demand.** The LTWD provides treated water to nearly 20,000 persons in its service area. LTWD also provides treated water as a wholesale distributor to the North Carter Lake Water District, Long Peaks Water District, Town of Berthoud, and the City of Loveland. Because the LTWD is not responsible for providing the raw water for these customers, these deliveries were not included in the demand evaluation. The LTWD also serves an estimated eight to ten large agricultural and dairy water users. Total raw water requirements for the LTWD have ranged from 4,000 to 5,000 AF per year between 2000 and 2003. Residential water use per capita per day averaged 174 gallons between 1991 and 2003. Total water use per capita per day for the same period was 224 gallons and is influenced by the presence of dairies and other agricultural users in the LTWD service area. In addition, LTWD acquired the Arkins Water Association and began serving the Town of Mead, which temporarily increased water use for several years.

**Projected Water Demand.** Between 2005 and 2050, the total number of taps is projected to increase by 26,700, or an average annual rate of 2.8 percent, driven by growth in the number of residential taps. Projected demands were calculated by multiplying per tap use by the total number of taps. Total raw water requirements for the LTWD are expected to reach about 12,000 AF by 2030, and 19,000 AF by 2050.

**Water Need.** Existing water supplies are currently sufficient to meet the LTWD’s water needs during average years of precipitation. Beginning in 2005, water demand could exceed available firm water supplies during dry years, depending on C-BT deliveries. Projected 2030 water requirements exceed available firm supplies by about 6,600 AF. By 2050, demand is estimated to exceed current firm water supplies by about 13,600 AF excluding the St. Vrain Lakes Development. Firing LTWD’s Windy Gap water would provide a firm annual yield of about 1,200 AF for potable needs plus about 80 percent would be available as reusable effluent to meet a portion of non-potable demands. A firm Windy Gap water supply would provide the LTWD about 6 percent of the District’s 2050 water supply requirement.



**9.9 City of Longmont**

The City of Longmont is the second largest and fastest growing city in Boulder County. Longmont is located about 16 miles northwest of the City of Boulder. The City was founded in 1871 and was named after the nearby Longs Peak. Similar to most urban areas along the Front Range, Longmont has experienced steady growth over the past 20 years.

**Water Supply.** Longmont’s raw water sources come from the St. Vrain Creek Basin and from the Colorado River Basin. St. Vrain Basin water resources include Ralph Price Reservoir, the North Pipeline on North St. Vrain Creek, and the South Pipeline on South St. Vrain Creek. Other St. Vrain Basin resources include ownership in mutual and private ditch and reservoir companies that divert from St. Vrain Creek east of Lyons, Colorado. Colorado River Basin resources consist of water available for delivery to Longmont from two trans-mountain diversion systems, the C-BT Project and 80 units of Windy Gap Project water. Longmont’s total current firm annual water supply is 30,963 AF. In addition, non-Windy Gap reusable effluent currently provides about 1,000 AF on average for non-potable uses and the City estimates they would be able to reuse about 62 percent of Windy Gap water.

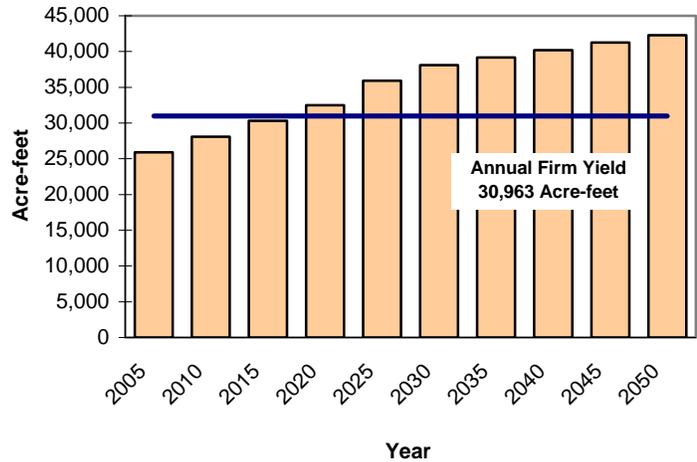
**Growth and Population Trend.** Longmont’s population has grown from about 43,000 persons in 1980 to an estimated 77,300 persons in 2002. Between 1990 and 2000, the increase was about 39 percent, for an average annual rate of 3.4 percent

**Current Water Demand.** The City of Longmont supplies potable water inside its city limits, outside the city limits to a limited degree, and to non-potable customers. In

addition, Longmont treats water for the Town of Lyons, but this water is supplied by Lyons and is, therefore, not included in the historical demands or projections. Single family metered residential use accounts for about 80 percent of total metered residential water use inside the city, on average. Three large industrial water users—ConAgra, Amgen, and Royal Crest Dairy—represent approximately one-third of commercial and industrial water use. Their use has been relatively steady in recent years. In 2003, total Longmont water demand from all sources amounted to 20,900 AF. Longmont’s water requirements have increased by 25 percent since 1990. Longmont’s water use has averaged about 190 gpcd from 1994 to 2003, but excluding large commercial and industrial demands reduces total water use to about 175 gpcd.

**Projected Water Demand.** Projections of total raw water requirements indicate an increase from approximately 25,900 AF in 2005 to 38,100 by the year 2030, and 42,300 AF at buildout. The increase in water use from 2005 to 2030 is about 47 percent, or an average annual rate of 1.6 percent. This compares to an average annual growth rate of 1.7 percent from 1990 through 2003 for Longmont treated water deliveries. This projection is in line with recent population projections in the City’s Comprehensive Plan and is less than recent historical growth rates. In addition to large water users ConAgra and Royal Crest Dairy, commercial and industrial water use is expected to grow disproportionately as Longmont builds out. Longmont’s non-potable water demands are expected to increase almost 50 percent by 2030.

Comparison of Future Water Demands with 2005 Annual Firm Yield - Longmont



Annual firm yield does not include reuse water.

**Water Need.** Longmont’s water demand is expected to exceed available firm water supplies by about 2017, which would affect the ability of the City to meet dry year water needs depending on C-BT deliveries. A shortage in annual firm yield of about 7,000 AF is projected by 2030 and about 11,000 AF in 2050. Firing Longmont’s Windy Gap water supply would provide about 5,125 AF of water based on the City’s storage request and preliminary modeling, or about 12 percent of the City’s 2050 firm water supply. Firing Windy Gap water would provide reusable effluent of about 62 percent, which would contribute to meeting non-potable water demand.

**9.10 City of Louisville**

The City of Louisville is located in Boulder County about 6 miles east of the City of Boulder and 25 miles northwest of Denver. Louisville supports a residential community

and associated commercial and industrial businesses. Louisville city limits cover an area of about 8.6 square miles including 1,700 acres of designated open space.

**Existing Water Supply.** The City of Louisville's primary sources of water supply include direct flow rights from South Boulder Creek and C-BT Project water. Ownership of shares in Marshall Division of the Farmers Reservoir and Irrigation Company also contributes to the firm water supply. Louisville owns 9 units of Windy Gap water. . Louisville's current firm water supply is 5,063 AF. In addition, about 300 AF of water is currently available for non-potable reuse from native sources, and this could increase incrementally up to 900 AF in the future. Reuse water from the wastewater treatment plant is used for golf course and sports field irrigation. Louisville would reuse about 45 percent Windy Gap for irrigation.

**Growth and Population Trend.** The City of Louisville's 2003 population was estimated at 18,387 persons. From 1990 through 2003, population grew 49 percent, or at an average annual rate of 3.1 percent. The average annual growth rate for the total number of residential water taps was just 0.2 percent from 1998 through 2003, and commercial water taps increased at an average annual rate of 7.1 percent in the same period. Population grew most significantly in the early and mid-1990s, while residential water taps have remained almost stagnant since 1998. Commercial growth has been considerable since 1998. The commercial sector is anticipated to generate the majority of future growth in water taps and usage in the City of Louisville.

**Current Water Demand.** The City of Louisville is responsible for providing water to residential, commercial, industrial, and irrigation users within the City's boundaries. The City also provides water to several residential and one commercial customer just outside the city limits. Louisville's largest water user is StorageTek. Residential users have historically accounted for the majority of total deliveries at 66 percent; commercial users accounted for an average of 23 percent of total potable water use. Louisville's total water requirements have ranged from about 4,300 to 6,300 AF per year from 1998 to 2003. From 1998 through 2003, residential water use averaged 112 gpcd. Total water use per capita per day averaged 171 gallons.

**Projected Water Demand.** A 1 percent growth rate in population and a 1.5 percent growth rate in commercial square footage were used to estimate future water demands. The City anticipates that commercial square footage will remain stable for the next two years, and then increase at an annual growth rate of 1.5 percent. Based on the projected rate of growth, the City of Louisville will reach residential buildout by 2025 and commercial buildout by 2045. A total raw water requirement of about 6,900 AF per year is estimated for 2050. Total water requirements are anticipated to increase by 38 percent from 2003 through 2050, or at an average annual rate of 0.7 percent.

**Water Need.** Existing water supplies are currently sufficient to meet the Louisville's water needs during average years of precipitation. Beginning about 2006, water demand could exceed available firm water supplies during dry years, depending on C-BT deliveries. The City of Louisville is estimated to reach residential buildout by 2025 and commercial buildout by 2045. In 2050 a firm water supply shortage of about 1,800 AF is anticipated. Firing Louisville's 9 Windy Gap units will provide the City with up to 900 AF of water, or about 13 percent of the City's 2050 projected water supply need. Reuse

of native water supplies up 900 AF and capture and reuse of Windy Gap effluent also would contribute to meeting non-potable demands.

**9.11 City of Loveland**

The City of Loveland is located 50 miles north of Denver in southeastern Larimer County. Loveland has experienced rapid population growth between 1990 and 2003 within the 23.5 square miles of the city limits.

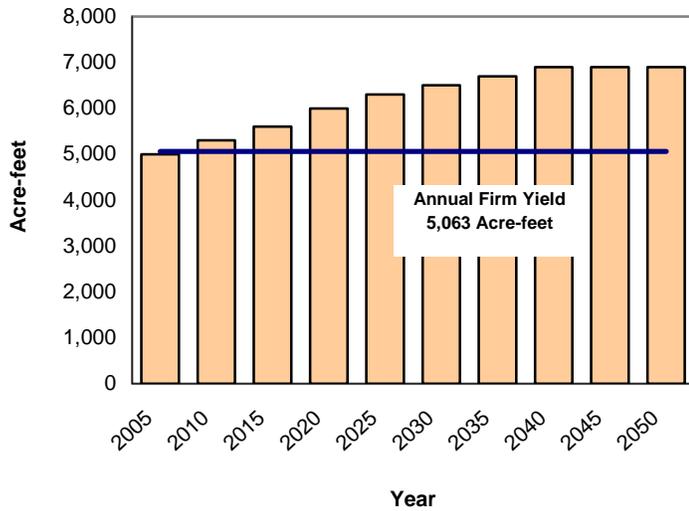
**Existing Water Supply.**

The City of Loveland has two categories of water supply—transbasin supplies and transferred native ditch water rights. Transbasin supplies consist of C-BT and Windy Gap water. Transferred native ditch rights are diverted directly from the Big Thompson River to the water treatment facility for use in meeting potable water demand. A portion of the ditch shares not transferred for municipal use currently provides a non-potable water source for meeting park and golf course irrigation needs. Loveland owns 40 units of Windy Gap water. Loveland’s current firm water supply is 17,792 AF including about 1,000 AF of non-potable water. In addition, the City has limited capability for reuse of native water and is evaluating options for the potential reuse of a firm Windy Gap supply.

**Growth and Population Trend.** In 2003, the City of Loveland had a population inside its city limits of 58,170 persons, but the Loveland Water Utility also serves over 5,000 additional customers within Loveland’s Growth Management Area (GMA). From 1990 through 2003, Loveland gained more than 20,800 persons, or more than a 50 percent increase.

**Current Water Demand.** The City of Loveland potable water demand includes residential and non-residential water use inside and outside the City, ranch water picked up by water haulers, construction water delivered through fire hydrants, and wholesale water marketed to the Little Thompson Water District, Fort Collins-Loveland Water District, and the City of Greeley. Total potable water sales to Loveland service area end users increased by 3,250 AF between 1990 and 2002, or about 50 percent. About 80 percent of Loveland’s total water deliveries were dedicated to residential use over this time period. Commercial water use accounted for 15 percent of water use, while the remainder was accounted for by industrial, city, ranch water, construction water and wholesale water deliveries. Total water requirements, including potable and non-potable demand and system losses, increased from 9,200 AF to 13,167 AF between 1990 and 2002. Residential gpcd has fluctuated within a narrow range from 1990 to 2003, with an

**Comparison of Future Water Demands with 2005 Annual Firm Yield - Louisville**



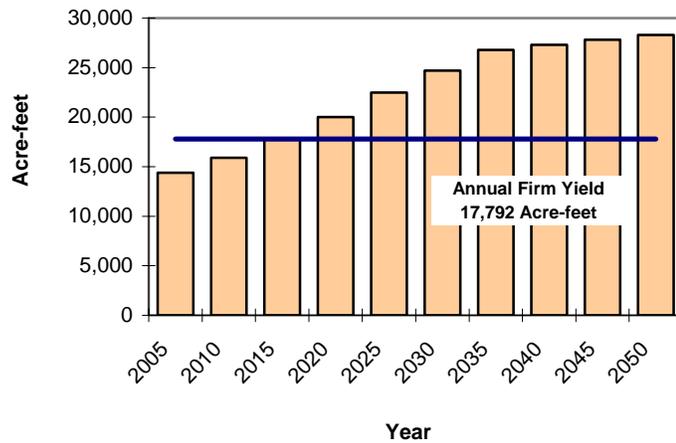
Annual firm yield does not include reuse water.

average over that period of 117 gpcd. Total gpcd averaged 172 gpcd during the same period. Loveland serves industrial and commercial users outside its service area, which drives up gpcd. Loveland also has sold wholesale water in the past, although it is greatly reduced as of 2003.

**Projected Water Demand.** Population forecasts for the City of Loveland indicate an annual growth rate within a range of 1.74 percent to 2.66 percent after 2004. This rate of population change is well below the historical growth rate experienced from 1990 to 2003, but compares well with Larimer County growth projections. Employment projections range between 1.3 and 2.6 percent from 2005 to 2030. Water demand projections indicate an ultimate water demand estimate for the Loveland Water Utility of about 28,300 AF by the year 2050.

**Water Need.** Loveland’s existing water supplies are currently sufficient to meet water needs during average years of precipitation, as well as dry years. Loveland’s water demand is expected to exceed available firm water supplies by about 2015, which may affect the ability of the City to meet dry year water needs depending on C-BT deliveries. A firm yield shortage of about 6,900 AF in 2030 and about 10,500 AF in 2050 is projected, if the Loveland Water Utility relies only on existing usable supplies. Firing the Windy Gap water supply would provide Loveland about 4,000 AF of water, or about 14 percent of the City’s 2050 water supply. Reuse of Windy Gap water also would contribute to meeting non-potable demands.

Comparison of Future Water Demands with 2005 Annual Firm Yield - Loveland



Annual firm yield does not include reuse water.

**9.12 Middle Park Water Conservancy District**

The Middle Park Water Conservancy District was formed in 1950 as a direct result of the development of the C-BT Project. The MPWCD serves as a representative of water interests in Grand and Summit counties and administers distribution of water from several projects to a variety of water users including municipal, private, and water and sanitation districts. MPWCD currently allocates water supplies from the Windy Gap Project and Wolford Mountain Reservoir.

**Existing Water Supply.** Agreements resulting from the construction of the original Windy Gap Project allow the MPWCD to receive the first 3,000 AF of water produced each year from the Windy Gap Project for use within MPWCD. These agreements require that the Subdistrict dedicate and set aside annually, but non-cumulatively, the first 3,000 AF of water in Granby Reservoir that is produced each water year from Subdistrict

water supplies, for beneficial use without waste, either directly or by exchange or substitution, in MPWCD. Any water so stored in Granby Reservoir shall be the last of any Subdistrict water to be spilled from Granby Reservoir if such spill is required. If MPWCD's Windy Gap water is not used in the year it was diverted, it cannot be carried over for the following year.

**Growth and Population Trend.** In 2000, the population of Grand County was 12,900 and Summit County had 25,700 residents. Population projections indicate a Grand County population of 28,800 and a Summit County population of 50,400 by 2030. These figures do not include seasonal residents or visitors to either county, both of which have substantial recreation tourism in the summer and winter.

**Current Water Demand.** The MPWCD is a wholesale water supplier for 67 water providers and users in Grand and Summit counties. These water providers have contracts with MPWCD to use Windy Gap water, as requested and as available, on an annual basis. The water providers, also known as contractees, include towns, water districts, agricultural water users, consumers and ski areas. The MPWCD contractees use MPWCD water for augmentation purposes in conjunction with other supplies. Some of the larger contract holders of MPWCD Windy Gap water rely on a variety of other primary sources of water to meet their total demand including surface water diversions, ditches, exchange agreements, and alluvial groundwater. In addition, the MPWCD uses its water supply for exchanges, trades, and other agreements with other Colorado water providers. Currently, MPWCD's Windy Gap water is a supplemental supply to contract entities and only a portion of each individual entity's water supply. However, MPWCD water is the sole source of water for a number of small private augmentation water users, such as subdivisions and private landowners. Delivery of Windy Gap water to the MPWCD has historically ranged from 0 to 624 AF, although 2,680 AF was requested by contractees in 2004. Estimated water demand totaled 11,159 AF in 2000 for both Grand and Summit counties—3,132 AF in Grand County and 8,027 AF in Summit County.

**Projected Water Demand.** The MPWCD does not prepare its own water demand projections. MPWCD's role is simply to respond to the needs of its contractees to the limit of its water supplies. Future water demand or allotment needs for MPWCD are based on previous studies and an examination of the overall future water resource requirements for Grand and Summit counties as an indication of contractees' demands.

By 2030, Summit County year-round population is projected to increase by 96 percent from the year 2000, and Grand County year-round population is expected to increase by 123 percent over that same 30-year period. Summit County employment is expected to increase by 138 percent, or 29,900 employees, between the year 2000 and 2030. Grand County employment is expected to increase by 144 percent, or 12,000 employees, during that same period. Water used for snowmaking and livestock is not anticipated to change substantially in the future. Summit and Grand counties are likely to experience substantial increases in water demand between the years 2000 and 2030, primarily from residential and commercial growth. Total potable demand by 2030 is projected to increase by about 17,000 AF, including 13,500 AF for residential use and 3,750 AF for commercial use. The *Upper Colorado River Study* has projected total demand at buildout of about 32,000 AF.

**Water Need.** The MPWCD is anticipating needing additional reliable sources of water supply to meet both current demand and anticipated future demands. While actual use has varied from year to year, the projected future increase in residential and commercial demand of about 17,000 AF by 2030 indicates a substantial shortage. A firm Windy Gap water supply would provide the MPWCD with a reliable annual supply of about 3,000 AF of water to meet existing and future demands. Currently almost 90 percent of the Windy Gap Project water is contracted for. Additional sources of water will be needed to meet the remainder of future demands.

### **9.13 Platte River Power Authority**

Platte River Power Authority (Platte River) is a joint action governmental entity owned by the municipalities of Estes Park, Fort Collins, Longmont, and Loveland. Platte River was established in 1973 to meet the wholesale electric energy requirements of these municipalities. The Rawhide Energy Station (Rawhide) is owned and operated by Platte River and provides a net output of 270 megawatts from Rawhide Unit 1, a coal-fired generating unit. Four gas-fired, simple cycle combustion turbine (CT) units, also located at Rawhide, provide peaking power and backup for the Platte River Power Authority energy sources.

**Existing Water Supply.** Platte River owns 160 units of Windy Gap water. Platte River's raw water supply is based on Windy Gap water and a Reuse Agreement with Fort Collins and the Water Supply and Storage Company (WSSC). Up to 4,200 AF of reusable effluent is delivered from the City of Fort Collins for use at Rawhide under the Reuse Agreement. In return Platte River provides Fort Collins with an equivalent amount of Windy Gap water. Platte River direct flow rights, reservoir storage rights in Hamilton Reservoir, and a limited number of native ditch shares in Larimer County Canal No. 2 provide other minor sources of water. In addition, Platte River takes delivery of 950 AF of its Windy Gap water directly from Horsetooth Reservoir via an existing 10-inch pipeline when water is available. Platte River's water reuse program has two components: 1) the majority of the water used for cooling is effluent supplied by Fort Collins under the Reuse Agreement; 2) Platte River continues to recycle and reuse this cooling water to extinction.

**Growth and Population Trend.** Platte River is primarily seeking to firm 51.5 of the 160 Windy Gap units that it currently owns to meet the current needs of the existing power facility. Future water demands will be based upon increased power requirements and related generating facility development to meet those electricity demands. Energy load projections for Platte River indicate a continued increase for demand for electric power within Platte River's owner municipalities as these areas continue to grow.

**Current Water Demand.** Platte River's current operational water demand for the 270-megawatt Rawhide Unit 1 averages about 4,520 AF per year. This includes 3,261 AF on average of effluent from the City of Fort Collins for use primarily for cooling, and 950 AF of relatively cleaner water taken directly from Horsetooth Reservoir and used for boiler make-up water and potable water. About 630 AF of water provides an operational reserve to meet fluctuations in water demand, or if not required, the water is leased. Platte River has an additional need for 309 AF to meet well and ditch augmentation requirements and a long-term lease obligation with Larimer County.

**Projected Water Demand.** Additional power generation is likely to be needed within the next 15 years. Platte River is currently evaluating options for this new generation. Water demands for Platte River's portion of new thermal power generation will be approximately the same proportion as that used for current coal-fired generation. A location for the future generation facility has not yet been determined. Platte River's Windy Gap Project units not included in the proposed WGFP may be used to help meet the water requirements of such new generation. Future demand projections will be continually updated by Platte River to determine the timing of power generation needs and the associated water requirements.

**Water Need.** Platte River needs a firm annual supply of 5,150 AF of water to meet its obligations under the Reuse Agreement that supplies the current operational needs for the Rawhide Energy Station. The Reuse Agreement between Platte River, Fort Collins, and WSSC requires the availability of Windy Gap water. There are numerous scenarios, i.e., drought, under which there is no assurance that Platte River's water supplies will be sufficient or available when needed. Without the firming of the Windy Gap units, the ongoing operation of the Rawhide Energy Station is vulnerable to curtailed operations.

#### **9.14 Town of Superior**

The Town of Superior is located in southeast Boulder County and northern Jefferson County and is considered part of the greater Denver Metropolitan Area. The Town of Superior was founded in 1896 and remained small until the early 1990s when the Rock Creek Ranch residential development began construction. The Town has grown rapidly during the past decade, but residential growth has tapered off.

**Water Supply.** Currently, the Town of Superior relies primarily on C-BT water and local ditch water to meet its municipal and commercial water requirements. The Town of Superior currently owns 22 units of Windy Gap water, but is in the process of selling 7 units to the City of Erie. Windy Gap water, when available, is also used to meet potable water needs and is captured and reused for non-potable irrigation. If Windy Gap water is firming, the City estimates that about 32 percent could be reused for irrigation. Superior's current firm annual water supply is 1,544 AF.

**Growth and Population Trend.** As population growth commenced in the early 1990s, average annual growth became extraordinary, with an average population increase of 33 percent from 1990 through 2004. The Town's population tripled in 1993. Since 2000, the average annual population growth has slowed in relative terms but still exceeds 5 percent on an annual basis. The growth in the number of water taps also slowed after the year 2000, but still grew more than 20 percent between the year 2000 and 2003. As of 2004, the Town of Superior's population was estimated at 11,000.

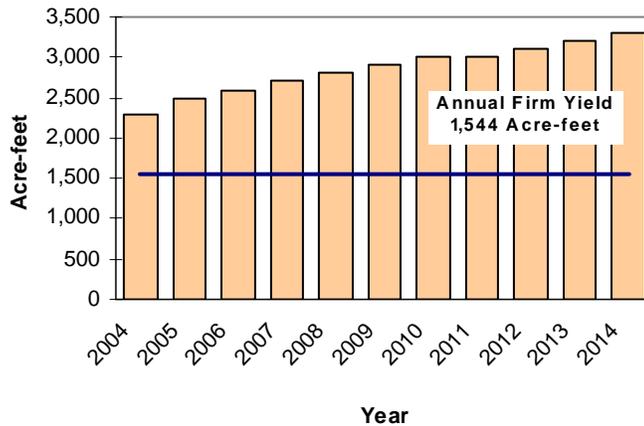
**Current Water Demand.** Superior does not serve any other communities with water nor does it receive water from other communities. Superior's total water deliveries more than tripled between 1995 and 2003, and average annual growth in water deliveries was 33.5 percent from 1995 through 2003. Total water requirements have increased from 1,127 AF in 1997 to 2,277 AF in 2003. From 1995 to 2003, Superior's total gpcd averaged 135.

**Projected Water Demand.** The Town of Superior is projected to reach buildout in the year 2014, when the population of the town reaches 15,400. Compared with the 2004

population estimate of 11,000, the Town is expected to experience an average annual growth of 3.4 percent. Potable water deliveries are expected to increase by 211 AF from 2004 through 2014. Total potable water usage is projected to exceed 1,700 AF by the year 2014. The Town of Superior plans to maximize the use of non-potable water for outdoor uses in the future. Total increases in non-potable use call for a doubling from 2004 level of 700 AF to 1,400 AF at buildout. Total water requirements are projected to increase from 2,500 AF in 2005 to 3,300 AF in 2014.

**Water Need.** Superior’s existing water supplies are sufficient to meet current water needs during average years of precipitation. Beginning in 2005, water demand could exceed available firm water supplies during dry years, depending on C-BT deliveries. A shortage in firm yield of about 1,800 AF is anticipated by buildout in 2014 if the WGFP is not completed. Firing Superior’s Windy Gap water supply would provide up to 1,500 AF of water, or about 46 percent of the Town’s 2014 water supply. Reuse of Windy Gap water also would contribute to meeting future non-potable water demand.

**Comparison of Future Water Demands with 2005 Annual Firm Yield - Superior**



Annual firm yield does not include reuse water.

## 10.0 Windy Gap Firing Project Participant Water Needs

### 10.1 Projected Shortages in Firm Yield

The evaluation of the water supplies and demands for each Project Participant indicates that projected water demand is expected to exceed available firm yield in the near future. Project Participants have a firm water supply of about 141,000 AF and a demand of about 120,000 AF in 2005. Table 8 indicates the projected total raw water requirements for each of the Participants over the next 50 years. Table 9 shows the projected shortages in firm water supply over the same period of time. By 2030, the cumulative water demand for all East Slope Project Participants is projected to reach about 205,000 AF, which would result in a shortage in firm yield of about 64,000 AF. Water demand for East Slope Participants is projected to increase to about 251,000 AF by 2050 and shortages in firm yield at that time would increase to about 111,000 AF. An additional water demand of up to 17,000 AF is projected for West Slope water users partially served by the MPWCD by 2030. The lack of a reliable firm water supply would affect the ability of all of these entities to meet water needs.

Existing water supplies will meet the current water needs for most Project Participants during average years of precipitation, but supply shortages in dry years are expected to occur within the next 20 years for all of the Project Participants. For 7 of the East Slope Participants, a deficit in firm yield could occur as early as 2005, depending upon C-BT yields, so development of a firm water supply is needed soon (Table 9). Other Project Participants have a foreseeable future need for their Windy Gap water supply between 2005 and 2025. Most East Slope Project Participants would begin taking Windy Gap deliveries as soon as available (and have been taking Windy Gap water when available, as evidenced by Windy Gap diversions of 60,000 AF in 2003) because Windy Gap Project water can be effectively combined with other water supplies and is reusable. Some MPWCD contractees would use Windy Gap water as soon as it is available to meet current water needs and others would use this water to meet anticipated future needs in Summit and Grand Counties.

## **10.2 Windy Gap Firing Project Contribution to Firm Yield Deficit**

The proposed WGFP is estimated to provide about 31,575 AF of firm yield for the Project Participants and an additional 3,000 AF for MPWCD (Table 10). Actual yield will depend on the final amount of storage volume constructed and the actual project operations. Estimated WGFP yield would meet from 5 to 100 percent of the 2030 projected water demand for the individual Project Participants and collectively would meet about 49 percent of the total 2030 deficit, not counting the MPWCD. By 2050, the firm yield from the WGFP would meet about 29 percent of the combined deficit. The remaining deficits in 2030 and 2050 water supply would need to be met with the reuse of Windy Gap water as described below, reuse of other available supplies, additional conservation, new water supplies, and other measures as discussed in Section 10.3.

On the East Slope, Windy Gap water can be captured and reused to extinction, which greatly enhances the efficiency of Project Participants' water supply systems and the conservation of available water supplies. The amount and ability to reuse Windy Gap water varies by Project Participant and most Participants are currently reusing Windy Gap water in some capacity when it is available. Some Project Participants have reuse systems in place that allow them to capture and reuse Windy Gap effluent multiple times to meet non-potable demands. Others may be able to reuse Windy Gap water only once to meet augmentation requirements or other obligations. Several Project Participants are considering expansion of reuse capabilities if Windy Gap water is firmed. The amount of Windy Gap future reuse that will occur is difficult to quantify at this time, but Participants currently estimate that from about 32 to 85 percent of the first use of Windy Gap water could be reused to meet non-potable water requirements and other delivery obligations. It is expected that each Project Participant will continue to explore the most efficient way to reuse Windy Gap water within the physical and financial constraints particular to each water system. Reuse of Windy Gap water extends available water supplies and reduces the need for development of new sources of water, but does not affect the size or need for the proposed WGFP.

On the West Slope, the MPWCD also will maximize its efficiency in the use of Windy Gap water by using releases of Windy Gap water from storage in Lake Granby or a new reservoir to augment the consumptive use from groundwater withdrawals or other diversions.

### **10.3 Other Sources of Water to Meet Firm Yield Deficit**

For most Project Participants, firming the Windy Gap water supply will satisfy only a portion of their anticipated future water requirements. Firming the Windy Gap water supply will provide from 3 to 85 percent of the 2050 (or sooner if buildout occurs) future water supply requirement for Project Participants, with the exception of Platte River, which is totally dependent on Windy Gap water. Besides Windy Gap water and existing supplies, new sources must be acquired or developed in the future to meet projected demand. Because Windy Gap units and the associated storage can be transferred between entities for use within NCWCD boundaries, it is possible that some redistribution of Windy Gap water would occur in the future. Water providers also may pursue other opportunities to meet water supply needs including the purchase of units in the C-BT Project, acquisition of agricultural water rights for conversion to municipal use, and reuse of available water supplies. Six Project Participants — Erie, Evans, Central Weld County Water District, Fort Lupton, Lafayette, and Little Thompson Water District — also are participating in the Northern Integrated Supply Project (NISP), a regional water supply project that is proposing the storage and delivery of water from the Cache la Poudre River and South Platte River. The City of Greeley and other northern Colorado water suppliers are evaluating expansion of Seaman and Halligan Reservoirs to provide additional water storage. Project Participants have demonstrated a need for the WGFP, as well as additional supplies to meet future needs.

Several Participants have current sources of supply other than Windy Gap that can be reused. Effluent from these water supplies will continue to provide a source for meeting non-potable water requirements for irrigation of parks and landscaping, return flow obligations, augmentation requirements, and exchanges. Although reuse water can help to meet non-potable water demands, Project Participants still need to secure raw water supplies suitable for meeting potable water needs.

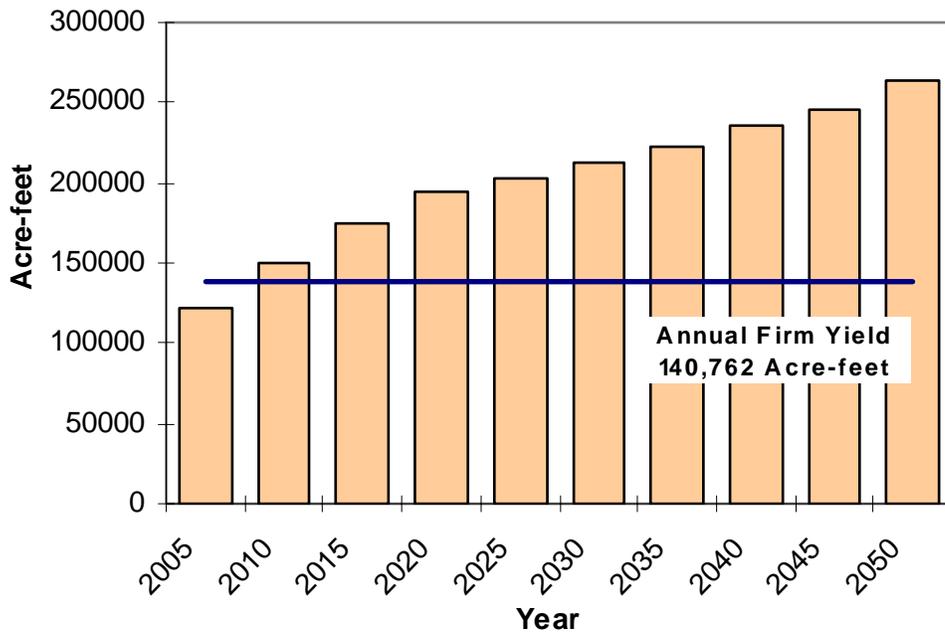
Project Participants have implemented a variety of effective conservation measures to reduce water demand. Improvements in the efficiency of water use and delivery systems for all Participants are expected to continue in the future. This includes reductions in water demand from conservation practices such as the use of more efficient plumbing fixtures, completion of metering, education, rate schedule adjustments, lower water use landscaping, and the numerous other conservation measures that Project Participants have implemented to reduce water use. The existing conservation measures used by Project Participants have reduced current demand and are incorporated into future demand projections. Additional conservation savings are expected to continue in the future as Participant conservation programs are expanded and refined. Improvements in delivery system efficiency including leak detection, pipe replacement, and technological improvements in the delivery and treatment of water supplies are also likely to provide additional reductions in demand. Project Participants' commitments to conservation measures are an important component in meeting future water supply requirements. Improved efficiency will reduce future shortages, but will not eliminate the need for firming of Participants' Windy Gap water or meet the near-term water requirements.

### **10.4 Conclusion**

Projected future water demands indicate that the Project Participants individually and collectively will have a shortage in annual firm yield in the near future (Figure 9). The

projected shortage in firm water supply supports the purpose and need of the proposed WGFP to firm approximately 30,000 AF of Windy Gap Project water for East Slope Project Participants and provide up to 3,000 AF of firming storage of Windy Gap water for the MPWCD. Because a firm reliable supply of water is needed in the near term for many of the Project Participants, the need to complete the project by 2010 is also fully supported.

**Figure 10. Combined Future Total Water Raw Water Requirements and Current Annual Firm Yield for Project Participants.**



**Table 8. Projected Total Raw Water Requirements.**

Participant	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Broomfield	14,300	17,300	19,400	20,500	21,700	23,100	24,400	24,400	24,400	24,400
CWCWD	3,200	3,600	3,900	4,200	4,500	4,700	5,100	5,400	5,600	5,900
Erie	2,500	4,400	5,900	7,400	8,900	8,900	8,900	8,900	8,900	8,900
Evans	4,600	5,900	7,000	8,400	9,700	11,100	12,800	13,300	13,300	13,300
Fort Lupton	4,100	4,200	4,400	4,700	5,000	5,200	5,600	5,900	6,300	6,800
Greeley	27,700	32,400	37,800	43,900	48,500	53,500	59,000	65,000	71,500	78,500
Lafayette	4,500	5,500	6,500	7,500	8,500	8,600	8,600	8,600	8,600	8,600
LTWD	6,000	7,000	8,200	9,400	10,700	12,100	13,500	15,200	17,000	19,100
Longmont <sup>1</sup>	25,900	28,100	30,300	32,500	35,900	38,100	39,150	40,200	41,250	42,300
Louisville	5,000	5,300	5,600	6,000	6,300	6,500	6,700	6,900	6,900	6,900
Loveland	14,400	15,900	17,800	20,000	22,500	24,700	26,800	27,300	27,800	28,300
MPWCD <sup>2</sup>	N.A.									
Platte River <sup>3</sup>	5,150	5,150	5,150	5,150	5,150	5,150	5,150	5,150	5,150	5,150
Superior	2,500	3,000	3,300	3,300	3,300	3,300	3,300	3,300	3,300	3,300
<b>Total</b>	119,850	137,750	155,250	172,950	190,650	204,950	219,000	229,550	240,000	251,450

<sup>1</sup> Longmont projects a buildout demand of 42,300 AF by buildout in 2048.

<sup>2</sup> An incremental increase in water demand for Grand and Summit County of 17,000 AF by 2030 above existing use is projected.

<sup>3</sup> Platte River Power Authority needs 5,150 AF of reusable water to meet existing needs. Future water needs are expected to increase with the demand for additional power generation, but these amounts have not been determined.

**Table 9. Projected Shortages in Firm Annual Supply.**

Participant	Firm Supply	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	Year of Projected Shortage
Broomfield	13,739	-561	-3,561	-5,661	-6,761	-7,961	-9,361	-10,661	-10,661	-10,661	-10,661	2005
CWCWD	2,786	-414	-814	-1,114	-1,414	-1,714	-1,914	-2,314	-2,614	-2,814	-3,114	2005
Erie	2,145	-355	-2,255	-3,755	-5,255	-6,755	-6,755	-6,755	-6,755	-6,755	-6,755	2005
Evans	9,298	4,698	3,398	2,298	898	-402	-1,802	-3,502	-4,002	-4,002	-4,002	2025
Fort Lupton	3,538	-562	-662	-862	-1,162	-1,462	-1,662	-2,062	-2,362	-2,762	-3,262	2005
Greeley	43,850	16,150	11,450	6,050	-50	-4,650	-9,650	-15,150	-21,150	-27,650	-34,650	2020
Lafayette	4,534	34	-966	-1,966	-2,966	-3,966	-4,066	-4,066	-4,066	-4,066	-4,066	2006
LTWD	5,510	-490	-1,490	-2,690	-3,890	-5,190	-6,590	-7,990	-9,690	-11,490	-13,590	2005
Longmont	30,963	5,063	2,863	663	-1,537	-4,937	-7,137	-8,187	-9,237	-10,287	-11,337	2017
Louisville	5,063	63	-237	-537	-937	-1,237	-1,437	-1,637	-1,837	-1,837	-1,837	2006
Loveland	17,792	3,392	1,892	-8	-2,208	-4,708	-6,908	-9,008	-9,508	-10,008	-10,508	2015
MPWCD <sup>1</sup>	0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Platte River	0	-5,150	-5,150	-5,150	-5,150	-5,150	-5,150	-5,150	-5,150	-5,150	-5,150	2005
Superior	1,544	-956	-1,456	-1,756	-1,756	-1,756	-1,756	-1,756	-1,756	-1,756	-1,756	2005
<b>Total</b>	140,762	20,912	3,012	-14,488	-32,188	-49,888	-64,188	-78,238	-88,788	-99,238	-110,688	

<sup>1</sup> Grand and Summit Counties 2000 total water demand based on the UPCO Study is about 11,000 AF (see Appendix L for more information on the UPCO study.) Sources other than Windy Gap are currently used to meet water demands. The MPWCD has an immediate need for Windy Gap water for use in augmentation of other withdrawals and diversions.

**Table 10. Windy Gap Firing Project Contribution to Meeting Firm Yield Need.**

Participant	Windy Gap Firing Project Estimated Firm Yield	2030 Firm Yield Deficit	2030 Firm Yield Deficit with the WGFP	Percent of 2030 Firm Yield Deficit Met by WGFP	2050 Firm Yield Deficit	2050 Firm Yield Deficit with the WGFP	Percent of 2050 Firm Yield Deficit Met by WGFP
	AF		%		AF		%
Broomfield	5,600	-9,361	-3,761	60%	-10,661	-5,061	53%
CWCWD	100	-1,914	-1,814	5%	-3,114	-3,014	3%
Erie	2,000	-6,755	-4,755	30%	-6,755	-4,755	30%
Evans	500	-1,802	-1,302	28%	-4,002	-3,502	12%
Fort Lupton	300	-1,662	-1,362	18%	-3,262	-2,962	9%
Greeley	4,400	-9,650	-5,250	46%	-34,650	-30,250	13%
Lafayette	800	-4,066	-3,266	20%	-4,066	-3,266	20%
LTWD	1,200	-6,590	-5,390	18%	-13,590	-12,390	9%
Longmont	5,125	-7,137	-2,012	72%	-11,337	-6,212	45%
Louisville	900	-1,437	-537	63%	-1,837	937	49%
Loveland	4,000	-6,908	-2,908	58%	-10,508	-6,508	38%
MPWCD <sup>1</sup>	[3,000] <sup>2</sup>	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Platte River <sup>3</sup>	5,150	-5,150	0	100%	-5,150	0	100%
Superior	1,500	-1,756	-256	85%	-1,756	-256	85%
<b>Total</b>	<b>31,575</b>	<b>-64,188</b>	<b>-32,613</b>	<b>49%</b>	<b>-110,688</b>	<b>-79,113</b>	<b>29%</b>

<sup>1</sup>The proposed WGFP would firm 3,000 AF of storage for the benefit of the MPWCD and their various contractees in Grand and Summit Counties. MPWCD storage in the WGFP does not have carry-over capacity from year to year, but they receive the first water available each year, so a firm yield of 3,000 AF per year is estimated. This yield would contribute to meeting both existing needs and the estimated increase in demand of 17,000 AF by 2030. Detailed information is not available to calculate specific water supply deficits.

<sup>2</sup>MPWCD firm yield is not included in the firm yield total with Windy Gap Project unit holders.

<sup>3</sup>Platte River Power Authority needs 5,150 AF of reusable water to meet existing needs. Future water needs are expected to increase with the demand for additional power generation, but these amounts have not been determined.