Final Report

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Water Supplies and Demands for Participants in the Northern Integrated Supply Project

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Prepared for

Mr. Carl Brouwer
Northern Colorado Water Conservancy District
220 Water Avenue
Berthoud, CO, 80513

and

The Northern Integrated Supply Project Participants

Prepared by

Harvey Economics
600 South Cherry Street, Suite 220
Denver, Colorado 80246
720.889.2755 fax 720.889.2752
www.harveyeconomics.com
he@harveyeconomics.com

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SECTION ONE
Introduction

This introduction describes a research effort and report prepared by Harvey Economics (HE) for the Northern Colorado Water Conservancy District (Northern District), acting on behalf of the Northern Integrated Supply Project Water Activity Enterprise (NISP). The report's purpose, approach, organization and caveats are described below.

Research Objective, Purpose and Background

HE was originally commissioned by the Northern District in June 2004 to evaluate and prepare water demand forecasts for each of the NISP Participants (Participants), along with a discussion of conservation practices employed by these Participants. Separately, the Northern District staff prepared an evaluation of water supplies for each Participant. These two work elements were then combined to assess potential future water shortages relevant to a determination of purpose and need for NISP. This study was provided to the U.S. Army Corps of Engineers for its use in considering NISP purpose and need and in preparing Chapter One of the NISP Environmental Impact Statement (EIS).

The Northern District had sponsored two other previous water demand studies in the past 15 years. In the year 2000, the Northern District completed a land use based projection of water needs. Unlike the present HE study, that previous effort was focused on demands at buildout capacity. In 1991, the Northern District published the *Regional Water Supply Study,* which examined water requirements for a number of providers, including some of the current Participants. Economic and demographic conditions and prospects have changed considerably for Northern Colorado since that time.

In 2010, HE was again commissioned by the Northern District to update the original study. During the six years since the original study, numerous events have prompted the need for an updated of the 2004 effort. First, numerous comments were received on the draft EIS from the EPA and others, suggesting that with such a severe economic downturn, housing development reversals and declining water use patterns, that water demand projections be reconsidered. Indeed, growth patterns and housing development experienced a major dislocation beginning in 2008 that has not yet concluded as of this writing in late 2010. Water use patterns also declined since the original assumptions were developed in the 2004 report because of drought response conservation measures, the economic downturn and more than normal summer rainfall.

Research Approach

The HE study team (study team) consisted of Ed Harvey, Susan Walker, Ben Norman, Melinda Ogle and Ginny Brookhouser, who together conducted the research and analyses related to water demands and conservation. The study team also included Carl Brouwer and Katie Melander, from the Northern District, who provided water supply data and other historical information collected from the Participants. The research approach entailed

extensive data collection, evaluation and analysis of the information provided, plus conclusions about future water demands and need for NISP. The study team gathered and reviewed supply and demand related information collected by the Northern District and others. The study team established data collection goals for each Participant and then compared those goals with the information collected in the 2004 effort. Personal interviews were conducted with each of the Participants to gather any remaining necessary information, and several follow-up contacts with most Participants were necessary to gather all final information available from each Participant.

The data collection effort, growth projections and water demand projections for each Participant were accomplished as an iterative effort. Initially, the study team provided each of the Participants with a list of information and subject categories that would become part of the purpose and need study. Each of the Participants provided published reports prepared by themselves or by consultants, along with internal operating data related to past and future growth, water use, conservation and water supply. The study team reviewed this information and developed interview questions for each of the Participants to complete the data collection effort. During the personal interviews, Participants were informed of the scope of the purpose and need inquiry, additional information was collected, and data sources were reconciled. In addition to information collected from Participants, the study team gathered published studies and other data from local, state and Federal government sources related to growth, water use and conservation relevant to Northern Colorado.

With the data collection phase completed, the study team evaluated projections of growth, water demand and supply as provided by the Participants for acceptance, rejection or modification. The bulk of Participant growth projections were based on recent growth trends and percentage growth rate assumptions, informed by developer projections. The study team evaluation was based upon historical evidence, capacity for growth, developer plans, land use plans, local government policies and an overall understanding of growth in the region. Judgment and reasonableness based upon past experience were applied in determining whether to accept or reject Participant projections. In the 2004 study, HE typically adjusted downward what it considered to be exuberant projections based on unsustainable growth trends. For the 2010 update, the Participants adjusted downward their own growth projections, in some instances excessively. In consultation with those few participants, growth projections were adjusted upward to represent a more reasonable long-term outlook.

Besides growth projections, the study team scrutinized historical water use patterns, beginning with sales to end users, separately examining individual agricultural or industrial, water intensive customers. The water demand projections were mostly based on water use per capita or per tap assumptions. Assumed future water use patterns reflected recently reduced usage and current conservation effects. Potable and non-potable demands were considered separately. Water use projections included losses within the distribution system, at the treatment plant or through conveyance or storage. On the basis of all these evaluations, the study team either accepted the Participant's growth and water demand forecasts or independently developed demographic and water demand projections for that Participant.

The study team then prepared draft updates to the original working papers describing historical information, current status, water demand projections and conservation initiatives,

shown as appendices to this report. These were reviewed by each of the Participants for accuracy. Participants had the opportunity to disagree with assumptions, and further discussions with the study team ensued, leading to a mutual agreement among each of the Participants and the study team that the information and projections in the appendices in this report were as accurate as possible, given available data and the inherent uncertainty of forecasts, generally. Final versions of the Participant water demand evaluations are set forth in Appendices A through O. Specific water sources and firm yield estimates for each Participant are compiled in Appendix P.

Table I-1 lists Participants that were included in this study and the NISP firm yield request of each.

Table I-1.
New Permitted Firm Yield from NISP Sought by Participants

Participant	Permitted Yield Requested (AF)
Central Weld County Water District (CWCWD),	3,500
City of Dacono	1,000
Town of Eaton	1,300
Town of Erie	6,500
City of Evans	1,600
Town of Firestone	1,300
Fort Collins -- Loveland Water District (FCLWD)	3,000
City of Fort Lupton	3,000
City of Fort Morgan	3,600
Town of Frederick	2,600
City of Lafayette	1,800
Left Hand Water District (LHWD)	4,900
Morgan County Quality Water District (MCQWD)	1,300
Town of Severance	1,300
Town of Windsor	3,300
Total	**40,000**

Source: Northern Colorado Water Conservancy District, 2006 Phase III Participation and Budget.

Report Organization

Following this introduction, this report proceeds with an overview of Participants' water demands. This overview describes historical demographic and water use changes and projections of future demographic conditions and water demands. Section Three provides an identification and evaluation of conservation practices and water use patterns expressed as gallons per capita per day. Participants' water conservation programs are identified in individual Participant water demand evaluations in Appendices A through O.

Section Four focuses on net future water needs by comparing firm annual yields in 2010 with projected water demands. Finally, the report concludes with an identification of each Participant's need for NISP.

Caveats

Standard data sets across all Participants were unavailable. The recordkeeping and data retrieval system for each of the Participants is unique to that Participant. Because of the location and nature of each customer base, water providers, even in close proximity to one another, record, report and utilize different measures as they conduct water resource planning. For example, rural water districts do not normally 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, Participants may or may not keep track of water use by type of customer. Hence, historical recordkeeping practices are not the same from Participant to Participant, although individual practices may well serve each Participant's water planning purposes. To address this issue, the study team worked with the water use and supply records available for each water provider. From those data, the study team developed historical trends and water use patterns that maximized the completeness of foundational information for each Participant.

Just as the historical demand data were not standardized among Participants, existing projections of water demand also were not standardized. Methodologies for projecting future water demand differ substantially from Participant to Participant, and these methodologies are often determined by the historical foundation of information, by different consultants employed by each Participant, the size and technical capabilities available to a Participant, and the nature of the Participant's service area. Further, Participants adopt projections of demographic change from different sources and focus on different measures, such as population, housing units, number of taps or land uses. The study team adopted the view that no single forecasting methodology was necessarily more acceptable than others, and, similarly, data sources and information driving those projections might come from different sources but still be the most reliable data sources as they pertain to that Participant. For instance, one Participant might rely on its own population or housing unit projections that are up-to-date with specific developer information, as compared with the Colorado state demographer's projections that naturally lack this kind of local data. Under conditions of rapid change, local information is preferred.

An important caveat for this study and for all studies of this kind lies with the inherent uncertainty of forecasting in general, and of demographic forecasting in particular. Long-term projections always rely upon underlying assumptions, some of which are assumed to continue on into the future, and some of which are assumed to change. For example, this report assumes that migration will continue, as it has in the past, to be the predominant influence on population and housing unit growth in Northern Colorado, whereas natural population changes driven by birth rates and mortality rates will not be a major influence on these projections. Technology related to water use patterns is not assumed to change fundamentally over the long-term. Over the short-term, assumptions such as these are relatively safe, but over the long-term the error risk associated with such assumptions increases.

Other explicit forecasting assumptions such as growth rates, land-use policies and even service area boundaries for individual Participants will vary over the long-term as compared with the more static assumptions embodied in the study team projections provided in this report. For these reasons, long-term projections such as the demographic and related water demand projections provided in this report can be counted upon to be inaccurate on either the low side or the high side as the year 2050 approaches.

One important source of uncertainty in these water demand forecasts is the future growth rates. Rapidly escalating growth rates which have occurred among the Participants since 1990, dramatically reversed in 2008. Although there are strong indications that moderate growth will continue into the foreseeable future, the volatile nature of growth itself significantly adds to the uncertainty of these forecasts.

Further, estimates of firm annual yield for Participant water supplies represent only those supplies that existed in 2010. Water supplies can be reduced by water quality concerns, species or habitat preservation issues, or water right conflicts with competing users. Over the long-term, uncertainty of supply, mostly its diminution, as well as demand creates an uncertainty in the evaluation of the need for NISP presented in this report. If NISP Participants can trade NISP supplies among themselves, this uncertainty is reduced.

This report recognizes these many dimensions of uncertainty. Key assumptions are carefully scrutinized, and assumptions based upon the best available information are adopted where possible. The study team assiduously attempted to bring no bias into the assumptions underlying the projections offered in this report, but the study team recognizes that there is an equal chance that the assumptions could be wrong in either direction. Since no probabilities could be assigned to a different set of assumptions, the study team relied upon only a single set of projections with the presumption of uncertainty described here.

In summary, the study team evaluated demographic and water demand projections provided by each Participant on the basis of that Participant's individual circumstances. Comparisons with independently derived county or other projections were performed when relevant. The study team drew a conclusion about the water demand forecasting methodology and data sources for each Participant. If clearly better data or a superior demand forecasting methodology was available, the study team identified and then carried out those independent water demand projections. For example, if new lands were annexed to a water provider and not included in the water demand projections, the study team made the necessary adjustments. If assumptions behind the demand projections could not be substantiated with historical information, the study team developed new forecasting assumptions so that the results would be more reliable. The study team attempted to use the most appropriate information available for each provider and to present, in this report, the most defensible water demand projections for the NISP EIS.

SECTION TWO
Overview of NISP Participant Demands

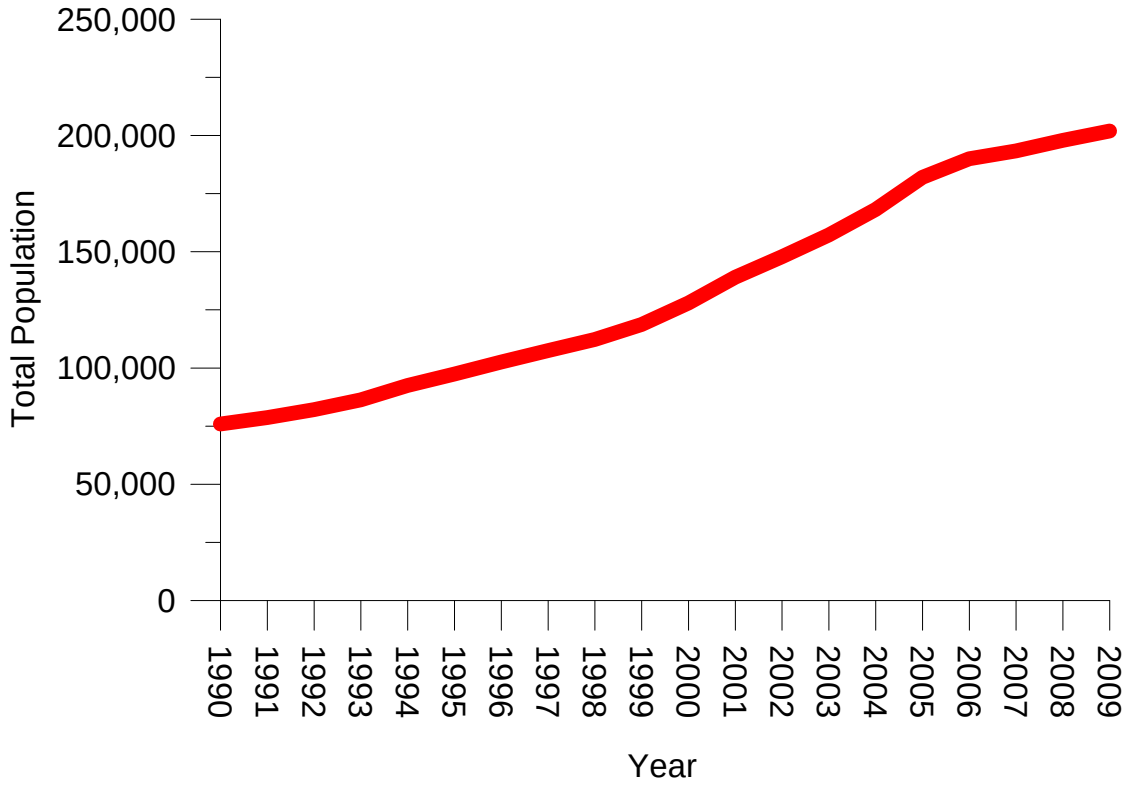
This report section provides the historical foundation for the demographic and water use changes experienced by Participants. Water demand projections combined for all Participants are also identified. Individual historical information and projections for each Participant can be found in Appendices A through O.

Historical Demographic Change

The study team attempted to gather historical population figures, numbers of water taps and housing units for the Participants. Whereas each Participant was able to provide the study team with one or more of these data sets, only population data were available from all 15 Participants.

Figure II-1 depicts historical population trends for all the Participants combined from 1990 through 2009.

Figure II-1.
Population Growth for NISP Participants in Total, 1990 through 2009

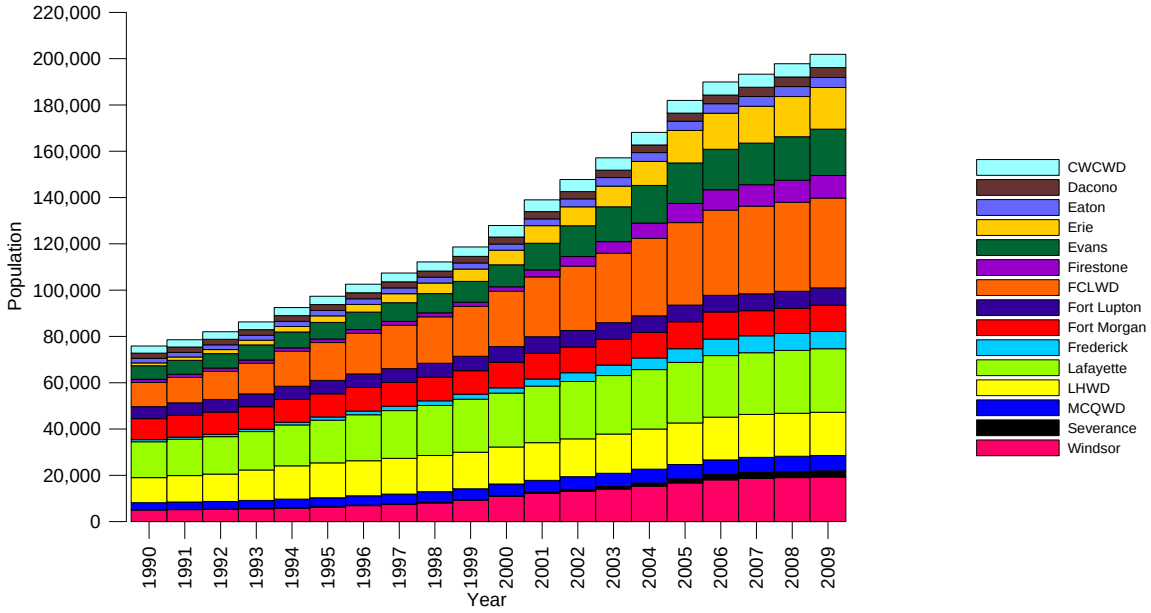


Note: The study team sought the total number of residents in the service area of each Participant from 1990 to 2009. Estimates for missing years were made on the basis of housing units or water taps for a small number of Participants.

Together, the 15 Participants served water to 76,000 persons in 1990, increasing to 202,000 persons by 2009. This expansion represents an average annual growth rate of 5.3 percent. This unusually rapid growth indicates the considerable in-migration that occurred in northern Colorado between 1990 and 2009, likely attributable to a substantial increase in job opportunities in the northern Front Range during this time. From 2004 to 2009, the average annual growth rate for Participants was 3.7 percent, reflecting the recent economic slowdown.

Figure II-2 illustrates population growth by each Participant from 1990 through 2009.

Figure II-2.
Population Growth for Each NISP Participant, 1990 through 2009



Population growth is widespread among all the Participants. The Town of Erie and the Town of Severance grew faster than the other Participants; Severance grew from a population of 89 in 1990 to 2,600 people by the year 2009. The Town of Erie grew almost 1500 percent from 1990 through 2009. The most heavily populated water suppliers in 2009 were the Fort Collins-Loveland Water District with 38,800 residents followed by the City of Lafayette with about 27,500 residents. Together, these two water providers accounted for about one third of the total population of all the Participants in 2009.

Historical Water Use

The 15 Participants serve residential, commercial, industrial, public and other water uses in their service areas. These service areas include communities and the surrounding vicinity in some instances and primarily rural areas with small population centers in others. The study team gathered data for total water use by customer type delivered at the tap, where possible. In many instances, a full breakdown of water use by type of user was not available; however, the study team did distinguish each water provider's large industrial or other single large

water users. Historical water uses by customer type, where available, are described for each Participant in Appendices A through O.

Potable water deliveries to end users are segregated from non-potable water deliveries since seven out of the 15 water providers deliver non-potable supplies for irrigation of golf courses, parks, schools and large residential or commercial developments. Whereas these seven water providers are responsible for the non-potable supplies, the Town of Windsor has a dual water system for some land development for which it has no supply obligation.

Table II-1 shows potable and non-potable water deliveries by Participant for 2009.

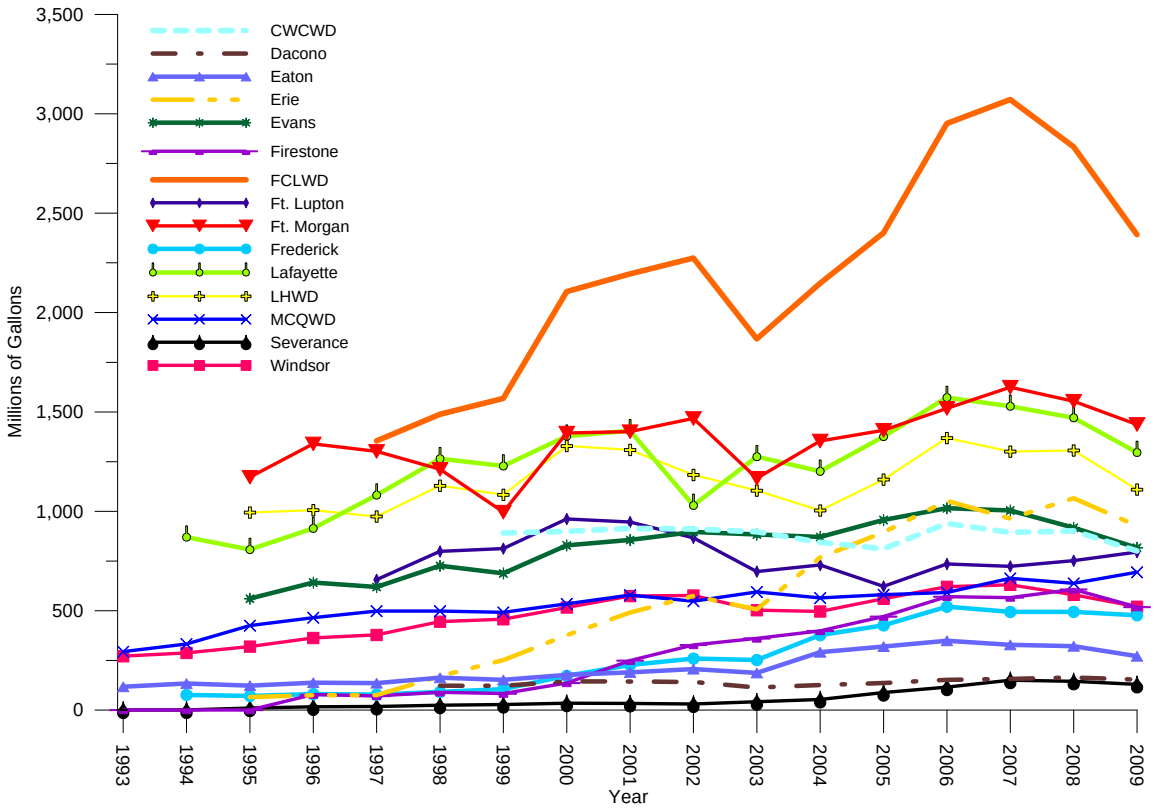
Table II-1.
Potable and Non-Potable Water Deliveries by NISP Participants, Millions of Gallons, 2009

Participant	Potable Deliveries	Non-Potable Deliveries	Total Deliveries
CWCWD	800	0	800
City of Dacono	152	0	152
Town of Eaton	183	88	271
Town of Erie	865	62	927
City of Evans	735	82	817
Town of Firestone	518	0	518
FCLWD	2,392	0	2,392
City of Fort Lupton	400	395	795
City of Fort Morgan	1,278	159	1,437
Town of Frederick	477	0	477
City of Lafayette	1,189	107	1,296
LHWD	1,109	0	1,109
MCQWD	693	0	693
Town of Severance	111	18	129
Town of Windsor	524	0	524
Total	**11,427**	**910**	**12,336**

Together, potable and non-potable water deliveries amount to total water deliveries to NISP end users; these total deliveries were a combined 12,300 million gallons (MG) in the year 2009. This amount was down from a peak of 14,100 MG in 2006 and 2007

Figure II-3 indicates total water deliveries to end users for each Participant between 1993 and 2009.

Figure II-3.
Total Water Deliveries to NISP Participants' End Users, 1993 through 2009, Millions of Gallons



Certain water suppliers do not have a complete data set for this time period, as indicated in the chart. Nevertheless, the trends, by and large, show increases in end user deliveries that accelerated through the year 2000 before flattening and then declining, as a result of drought and related restrictions in 2003. Water customers among the Participants were very responsive to drought related restrictions in recent years. For most Participants, water use rose modestly when drought restrictions ended, peaking in 2007 and falling off to lower levels in 2008 and 2009, due to a number of factors, including timely precipitation, the economic downturn and conservation.

Demographic Projections

The 15 Participants utilize a host of different demographic projections to develop their water demand projections. Nine Participants prepared population projections, whereas 5 Participants utilize water tap projections and one Participant prepared housing unit projections. The study team evaluated these projections and their application techniques and

modified, updated or replaced them where necessary. Details of demographic and other variable projections are provided for each Participant in Appendices A through O.

Water Demand Projections

Many Participants provided the study team with their own existing water demand projections. The study team either utilized the Participant's water demand forecasts or independently projected potable water deliveries and non-potable water deliveries and summed both to arrive at total water delivery estimates for each Participant. Most existing water delivery projections were derived from demographic projections applied to a water use factor such as gallons per capita per day (gpcd) or gallons per tap per day (gptd). The study team scrutinized each potable water demand forecasting technique and either accepted it, if appropriate, or applied a different technique relevant to that water supplier and used existing projections as a check on those new water demand projections.

Total water deliveries, the sum of potable and non-potable deliveries, are projected to increase by almost threefold from the peak year of 2007, when total deliveries reached 14,100 MG. By 2060, total water deliveries for all Participants are projected to reach 40,400 MG. Increases are expected from all Participants. Potable water deliveries for all Participants are projected to increase from 11,500 MG in 2009 to 35, 800 MG in 2060. Non-potable deliveries were projected for eight Participants who intend to rely on non-potable resources in the future. Non-potable deliveries are expected to increase from a peak of 1,250 MG in 2004 to 4,600 MG in 2060. Table II-2 provides the potable, non-potable and total delivery projections for the Participants through 2060.

Table II-2.
Projected 2030 and 2060 NISP Participant Deliveries of Potable and Non-Potable Water, Millions of Gallons

	2030 Deliveries			2060 Deliveries		
Participant	**Potable**	**Non-Potable**	**Total**	**Potable**	**Non-Potable**	**Total**
CWCWD	1,600	0	1,600	2,300	0	2,300
Dacono	360	0	360	1,000	0	1,000
Eaton	270	170	440	620	260	880
Erie	2,400	2,300	4,700	4,400	2,300	6,700
Evans	2,110	250	2,360	2,270	270	2,540
Firestone	1,300	0	1,300	2,400	0	2,400
FCLWD	4,700	0	4,700	5,700	0	5,700
Fort Lupton	570	520	1,090	970	580	1,550
Fort Morgan	1,900	220	2,120	2,600	220	2,820
Frederick	1,000	180	1,180	2,900	650	3,550
Lafayette	2,400	220	2,620	2,400	220	2,620
LHWD	2,800	0	2,800	3,300	0	3,300
MCQWD	940	0	940	1,500	0	1,500
Severance	910	140	1,050	910	140	1,050
Windsor	960	0	960	2,500	0	2,500
Total	**24,220**	**4,000**	**28,220**	**35,770**	**4,640**	**40,410**

Total water requirements are equal to total water deliveries plus an accounting for losses. Whereas total deliveries are expressed in millions of gallons consistent with Participants' end use sales records, total requirements are expressed in acre-feet, reflective of raw water resource planning units.

Losses are calculated for each Participant from the end user, or point of delivery, to the treatment plant or master meter, and then back to the point of diversion. The study team obtained these distribution, treatment plant and conveyance loss figures during interviews with each Participant, based upon their own estimates or calculations. Assumptions about future losses are based on existing estimated losses and indications from Participants about future losses. Total water requirements projections assume the following combined distribution, treatment plant and conveyance losses set forth in Table II-3.

Table II-3.
Estimated Future Water Losses for NISP Participants

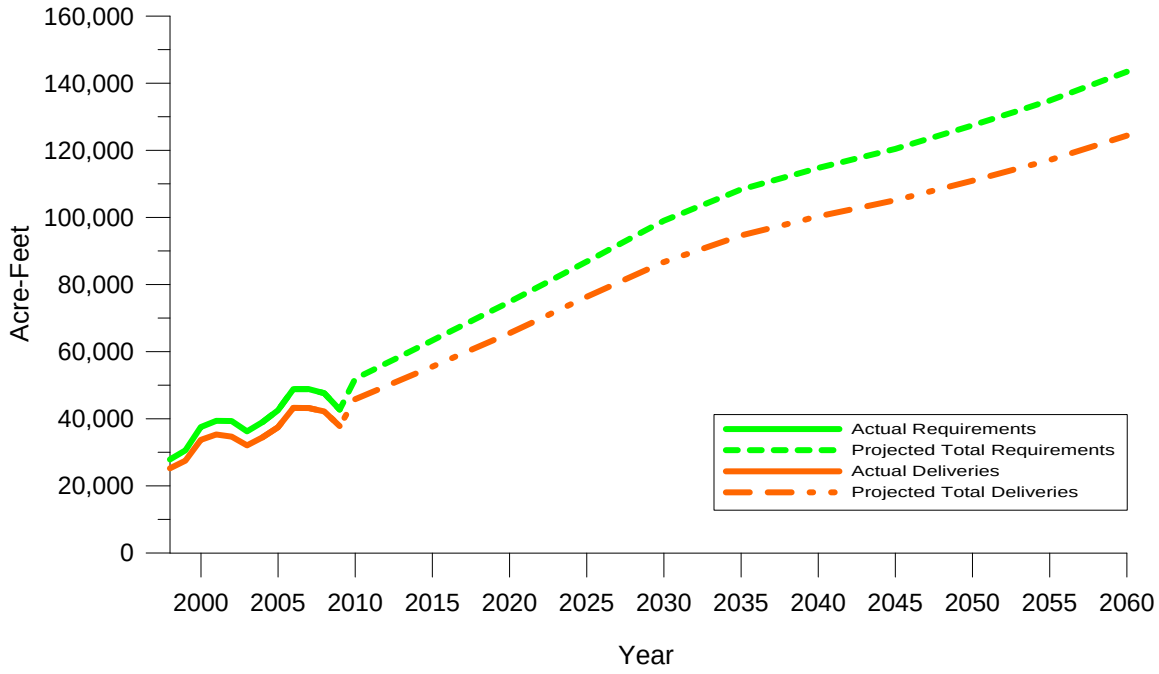
Participant	Losses as a Percent of Total Water Requirements
CWCWD	7%
Dacono	5%
Eaton	8% (1)
Erie	13%
Evans	8% (2)
Firestone	0% (3)
FCLWD	3%
Fort Lupton	10%
Fort Morgan	17%
Frederick	1% (4)
Lafayette	8%
LHWD	14%
MCQWD	3%
Severance	5% (5)
Windsor	9% (6)
Average	**7%**

(1) Does not include 10 percent water resource charge by NWCWD compounded with 8 percent local distribution losses.
(2) Does not include 13.5 percent shrinkage charge from Greeley.
(3) Does not include CWCWD treatment surcharge of 10 percent.
(4) Does not include CWCWD treatment surcharge of 20 percent.
(5) Does not include 10 percent water resource charge by NWCWD.
(6) Does not include 17 percent charge, which is the weighted average water resource charge from Windsor's three treated water suppliers.

A number of Participants acquire their water in a treated form from other water providers who charge 10 to 20 percent water surcharges as a water resource fee.

Figure II-4 provides historical and projected total water requirements and total water deliveries for all Participants from 1998 through 2060. Complete data sets were not available for all Participants prior to 1998.

Figure II-4.
Historical and Projected Water Deliveries and Total Water Requirements for NISP Participants, 1998 through 2060, Acre-Feet

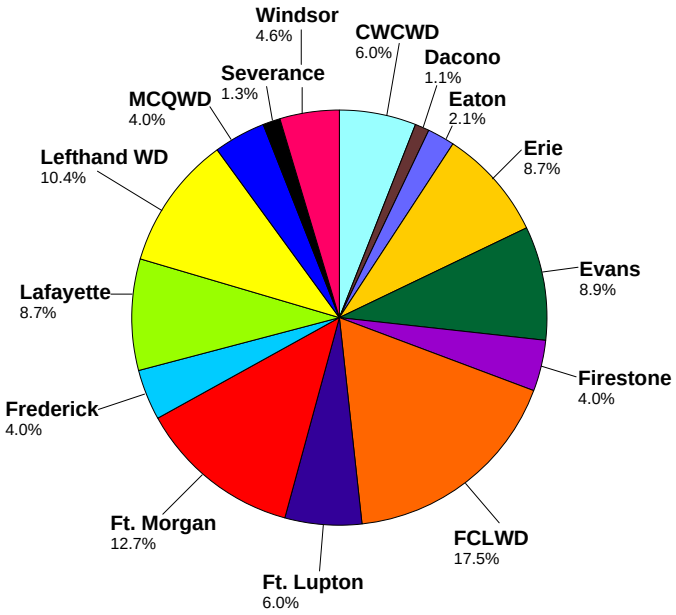


Total water requirements, which include all forms of losses and wholesale water resource fees, are projected to increase from 48,800 acre-feet (AF) in 2007, the peak historical year, to 143,400 AF by the year 2060. This nearly threefold increase would indicate that the Participants together will experience an increase in total water requirements of almost 95,000 AF by 2060.

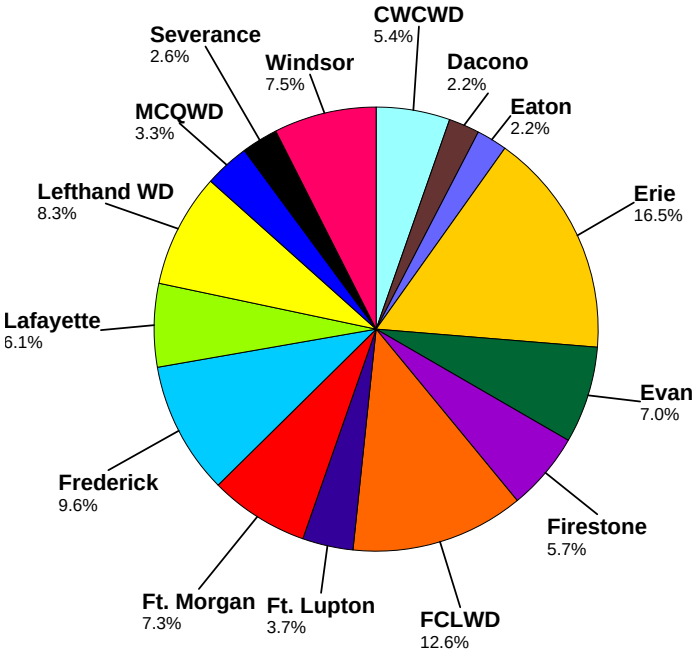
Figure II-5 presents two pie charts, one of total water requirements by Participant in the year 2010, and the other of total water requirements by Participant in 2060.

Figure II-5.
Total Water Requirements among NISP Participants, 2010 and 2060

Year 2010



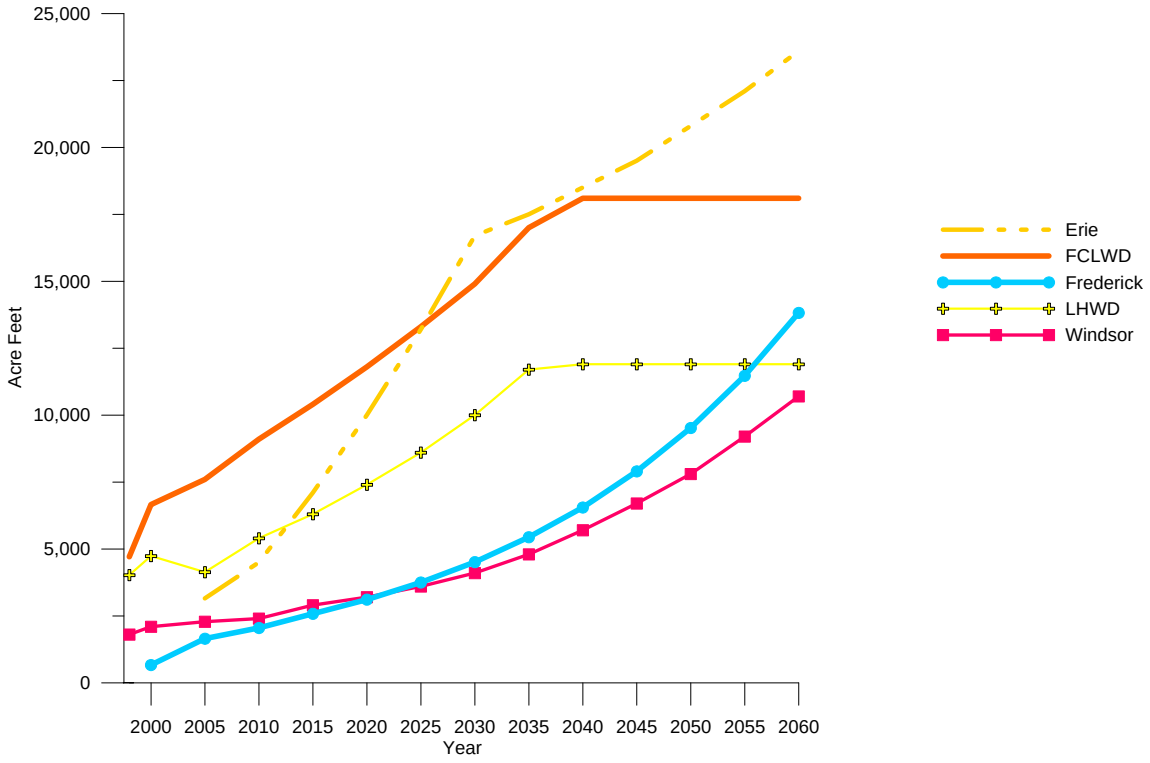
Year 2060

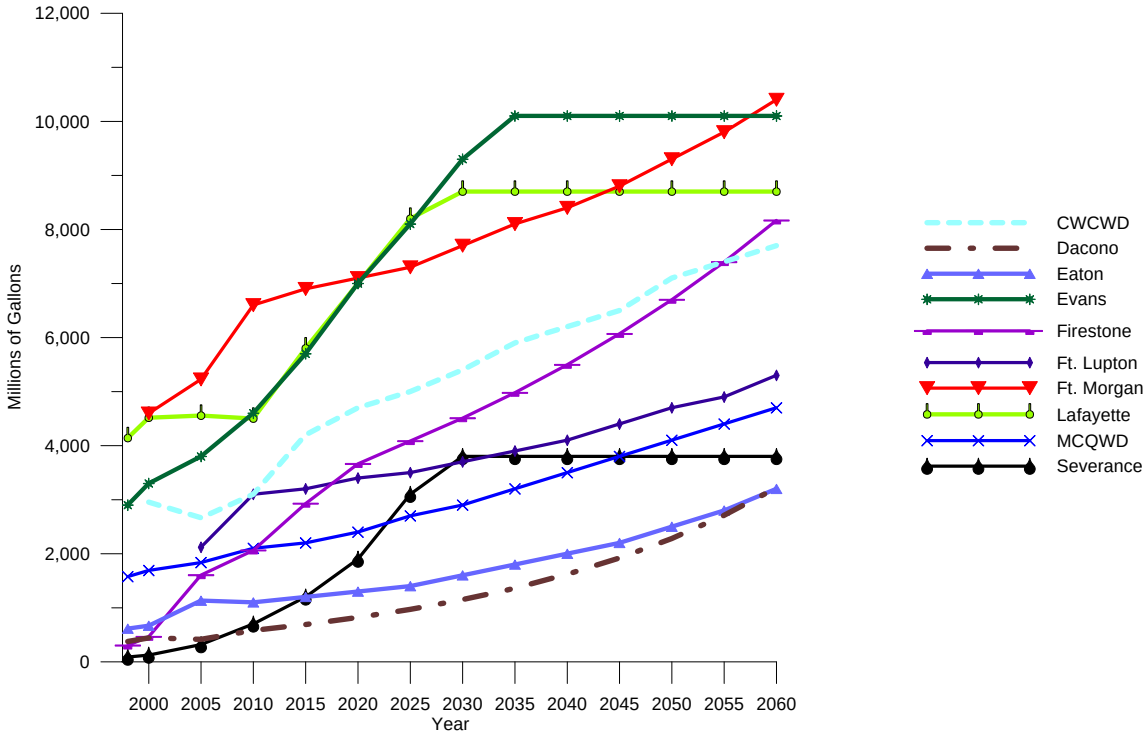


FCLWD, LHWD, Ft. Morgan, Evans and Lafayette, are projected to have the largest water demands in 2010. Erie, FCLWD, Frederick, LHWD, and Windsor will be the largest water providers in 2060.

Figure II-6 graphs projected total water requirements by Participant through the year 2060. To assist the reader, the first graph includes Erie, FCLWD, Frederick, LHWD and Windsor. The remaining water users are shown in the second graph.

Figure II-6.
Total Water Requirements by NISP Participant, 1998 to 2060, Acre-Feet





This figure illustrates that a number of water providers will reach buildout during the forecasting horizon, beginning in 2035. The most rapidly increasing water demands will occur in Severance, Erie, Dacono, Windsor and Firestone.

In sum, these water demand projections point to very substantial increases within the next 50 years for the Participants. The study team water demand projections imply an average annual growth rate of 2.4 percent from 2009 through 2060, which compares with an average annual growth rate of 3.4 percent from 1999 through 2010, measured on the same basis.[1] These projections do indicate that future total water requirements will continue to increase but at a decreasing rate over time. The study team believes that these water demand projections represent the most reliable, justifiable projections available for these Participants.

[1] Data for CWCWD were not available for 1998.

SECTION THREE
Summary of NISP Participant Conservation Efforts

This section provides an evaluation of ongoing water conservation efforts among the Participants and their customers. The extent of current conservation helps determine the potential for additional water conservation savings that might be available to Participants in considering their need to participate in NISP.

It is important to distinguish ongoing water conservation programs from drought related measures. Water conservation measures are those programs that are consistently applied every year to reduce water demands or to increase supplies. These measures are distinguished from drought restrictions that are special, more severe measures that are implemented temporarily to avoid a true water shortage. Drought restrictions are normally reserved by water resource managers for unusually adverse hydrologic conditions or for unexpected circumstances that threaten the ability of the water provider to meet its customers' requirements.

This section provides a brief summary description of the conservation programs currently in place among the NISP Participants, followed by an evaluation of water use patterns. These water use patterns, measured in potable gallons per capita per day, provide an indication of the effectiveness of the conservation efforts currently being practiced among the customers of the Participants.

Conservation Program Overview

The study team gathered information about the different conservation programs practiced by each Participant during personal interviews and in reviews of past studies for each Participant. The water conservation programs for each Participant are described in detail in Appendices A through O.

It is important to recognize that each Participant applies a unique mix of conservation measures suitable to the particular conditions in its community and to the operation of their water system. A brief overview of Participant conservation measures is provided below.

- *Central Weld County Water District (CWCWD)* – CWCWD implemented its water conservation plan in 2003, emphasizing among other elements a diverse public education effort. CWCWD encourages its dairies and other agricultural businesses to use non-treated water when possible. CWCWD utilizes an especially aggressive and advanced computer leak detection system, which monitors inflows and outflows every 2.5 minutes, facilitating rapid system repair. Its conservation plans call for a future review of its rate structure, including an incentive/reward mechanism and potential surcharges for excessive use.

- *City of Dacono* – Dacono encourages water conservation through a variety of measures. They use an increasing block structure for billing, provide their customers with information / education on conserving water, and enact watering restrictions every summer. In addition, they use a demand based formula for calculating the amount of water to be dedicated to each new development. Any conservation measures that are incorporated will reduce the dedication for the developer, providing an incentive to conserve. In 2010, Dacono received funding from CWCB to prepare its conservation plan.

- *Town of Eaton* – Eaton also has an increasing block rate structure and a public information program, including website information for its customers. Eaton requires new developments to construct a dual use irrigation system which will cut down substantially on summer water use, as reflected in the demand projections in this report. In March of 2010, Eaton applied for a grant to develop a Water Conservation Plan.

- *Town of Erie* – Erie updated its Water Conservation Master Plan in 2008; the goals include a 15 percent reduction in water use for all city property and an average annual gpcd of 190. They have 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, which Erie believes may eventually save as much as 1,100 acre-feet per year. 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 and landscape irrigation.

- *City of Evans* – The City of Evans 2009 Water Conservation Plan set a goal of reducing water use by 13 percent by 2018. The plan emphasizes an increasing block rate structure, non-potable water use for residential irrigation, and an active leak detection program. In addition Evans has introduced a rebate program for water efficient devices.

- *Town of Firestone* – In their 2007 Water Conservation Plan, Firestone outlines four conservation goals: reduce residential gpcd and commercial water use by 5 percent; reduce park water use by 8 percent; and reduce open space water use by 10 percent. These goals will be realized through a series of utility maintenance programs, regulatory measures, educational programs, and rebates and incentives

- *Town of Frederick* – Frederick estimates that its current conservation measures provide a 10 percent water savings. They have been notified that their application for funding a water conservation plan has been approved. The current measures include rewarding developers for conservation planning, an increasing block structure, and watering restrictions.

- *Fort Collins – Loveland Water District (FCLWD)* – FCLWD's water conservation goal is 13 percent per year. To meet this goal, they have an

increasing block rate structure and a surcharge, which it applies to users who exceed the established monthly allocation. The district's public information program includes a website with conservation measures and offers to support customers in their various conservation efforts. FCLWD also has a leak detection program.

- *City of Fort Lupton* – As part of its 2007 Water Conservation Plan, the City of Fort Lupton set some long-term conservation goals: reduce residential water by 5 percent over the next decade and by 7 percent after that; meter the water sold to Thermo; and reduce city irrigation water use by 5 percent. To achieve this goal, Fort Lupton is committed to a diverse public education program, which 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, by user.

- *City of Fort Morgan* – Fort Morgan has saved over 500 AF since implementing their 2006 Water Conservation Plan. Programs under this plan include: leak detection and repair; public education; and working with the largest industrial water users to help them conserve. In the 2008 Water Conservation Plan, Fort Morgan added new measures including: expansion of the landscape efficiency program and water recycling systems. *City of Lafayette* – The 2009/2010 Lafayette Water Conservation Plan has a goal to reduce annual water consumption by 507 AF and reduce system-wide losses to 5 percent. From the previous 1997 plan, Lafayette offered a diverse public education program and a tiered rate structure. New initiatives include irrigation system upgrades, water-efficient commercial processes, and improved water accounting and system-wide leak *detection.*

- *Lefthand Water District (LHWD)* – LHWD has an aggressive leak detection and repair program that has resulted in a 50 percent reduction of water distribution losses. The District emphasizes modification to low water use landscaping through demonstrations, classes and requirements for new development through Boulder County. LHWD has an increasing block rate structure. The District reviews high and low water consumption patterns among its customers and replaces meters regularly. The goal of the 2008 Water Conservation Plan is to reduce overall water use by 714 AF per year, by either expanding existing programs or implementing new ones.

- *Morgan County Quality Water District (MCQWD)* – MCQWD has an increasing block rate structure that it considers effective with its agriculturally oriented customers facing low financial margins. As of 2010, the District is in the process of developing a water conservation plan.

- *Town of Severance* – Severance has an increasing block rate structure and a public education program to promote conservation. The Town maintains permanent watering restrictions regarding days of the week and times of the day that customers can irrigate.

- *Town of Windsor* – Windsor has an increasing block rate structure and a surcharge for excessive water use. The Town has plumbing codes requiring low-flow water appliances, and new developments are required to develop dual water systems, where possible, using ditch water. New developments face landscaping restrictions, and all customers face lawn watering restrictions between 10 am and 6 pm during the summer. The Town also has a leak detection system, car washing guidelines and a diversified public information system promoting conservation. The overall goal of the 2008 Water Conservation Plan is a 12 percent reduction. This will be accomplished by either expanding existing programs or implementing new ones.

Ten out of fifteen Participants have active conservation programs in place. Almost all of the Participants have an educational component to their water conservation programs, which ranges from stuffing bills with water conservation reminders to websites, newspaper and television ads, and school programs. All of the Participants also practice universal metering to keep track of water use patterns and to charge customers for the water they consume. The water price signal to customers is accentuated by the increasing block rate structure that is in place for almost all of the Participants. The Participants exhibit considerable emphasis on a strong price signal to customers to conserve water. Leak detection and the repair or replacement of inefficient water mains, pipes and meters are also commonly used by many Participants.

In terms of outdoor water use, a number of Participants have landscape ordinances and permanent outdoor watering restrictions in place. Water audits and the promotion of water efficient appliances are also practiced by a number of Participants. Certain Participants have non-potable irrigation systems or a water re-use system in which wastewater is used for irrigation. In sum, the Participants' ongoing water conservation programs are typical among water providers, with, perhaps, a stronger emphasis on price signals to promote efficient use.

Historical Water Use Patterns

For this study, water use patterns refer to the magnitude of gallons per capita per day (gpcd) of potable water use among end users. In the 2004 NISP Report, the study team assessed the overall Participants' water use patterns and the water use patterns of each Participant individually based on a comparison of individual gpcd figures. Recent research by the American Water Works Association published in the *Water Conservation Measurement Metrics Guidance Report*[2] presents a number of findings that argue against measuring "relative water use efficiency across different utilities." The report emphasizes the difference between a metric, a unit of measure such as gpcd, and a benchmark which is a level of

[2] Dziegielewski, Ben and Jack C. Kiefer, *Water Conservation Measurement Metrics Guidance Report*. The American Water Works Association Water Conservation Division Subcommittee Report. January 2010.

performance of a given metric that is set as a goal. For accurate measurement of progress toward achieving efficiency goals, the report recommends disaggregation of water use into categories, such as indoor residential use. These goals should be particular to the utility and based on the characteristics of its users. For each disaggregated category of water use, the report recommends that a ratio-type benchmark be developed. The development of benchmarks is information intensive, which presents a considerable challenge. While the study team recognizes the validity of this recommendation, such data are not currently available from the Participants. The AWWA report also finds that comparisons of gpcd between water providers can be misleading. As a benchmark, gpcd is highly influenced by weather patterns and changes in customer characteristics. In addition, factors for determining gpcd often vary from utility to utility. That is, some utilities do not include losses in this calculation or may include transient populations, such as commuting workers. This finding is problematic as gpcd is the most commonly used measure by water utilities, both in Colorado and across the county. In addition, for the purposes of this study, it is the only metric available from all Participants. In fact, gpcd continues to be used for most planning efforts. While better methods might eventually be developed as recommended, at this time the study team finds no other means of determining the relative success of conservation efforts by the Participants than gpcd.

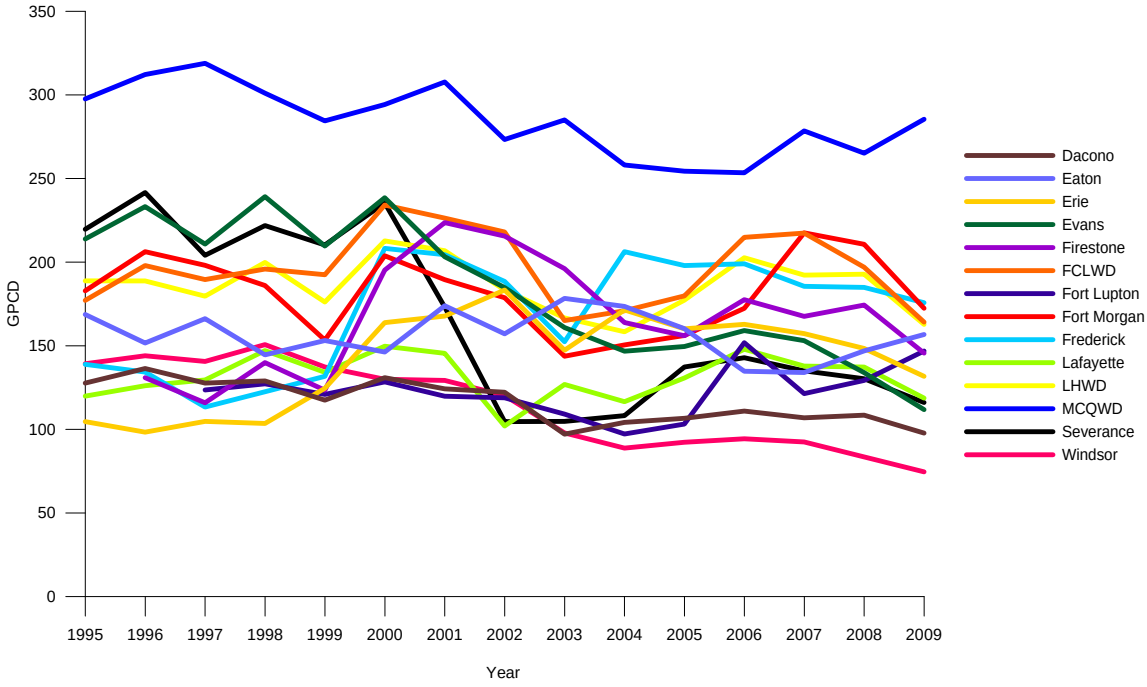
In order to alleviate some of the problems associated with gpcd metrics, the study team obtained the most consistent and accurate population and service area population data available. Gpcd data for the participants is provided below to demonstrate trends among the Participants as a group and for individual Participants.

Table III-1.
Gallons per Capita per Day of Combined NISP Participants

	Simple Average	Annual Change	Weighted Average	Annual Change
1999	190	NA	170	NA
2000	209	10%	192	13%
2001	205	-2%	182	-5%
2002	187	-8%	164	-10%
2003	172	-8%	147	-11%
2004	168	-2%	141	-4%
2005	170	1%	145	3%
2006	184	8%	160	10%
2007	180	-2%	157	-1%
2008	177	-2%	150	-4%
2009	162	-9%	132	-12%
Total Change		**-15%**		**-22%**

This table shows a simple average of gpcd for all 15 Participants from 1999 through 2009, and then an average gpcd weighted by the population of each Participant. Such a weighting reduces the influence of very small water providers, such as the Town of Severance or the Town of Eaton, in the calculations. Regardless of methodology used, the annual combined figures for the Participants indicate a gpcd that fluctuates up and down largely with weather and water use restrictions as well as economic conditions, but also demonstrates a trend of overall reduction in gpcd during the 1999 to 2009 timeframe. Figure III-1 illustrates the water use patterns for individual Participants from 1995 through 2009. CWCWD is not included in this figure but is discussed following Table III-2.

Figure III-1.
Water Use Patterns for NISP Participants, Gallons per Capita per Day, 1995 through 2009



From 1995 to 2009, most of the Participants experienced potable gpcd that fluctuated between a fairly narrow range, depending upon weather, and almost all experienced a substantial decline in 2003 due to drought restrictions. It is also evident from the figure that each Participant's water use patterns are unique from the others, even in the same region. The mix of customer types distinguishes the water use patterns of the Participants: the presence of large water users such as dairies or industry; new large lot homes versus older in-town lots; and the presence of commercial activity can all help determine the water use patterns of a single Participant and why they are different from another Participant.

Table III-2 provides annual total potable gpcd for each Participant from 1999 through 2009, along with averages during this period.

Table III-2.
Total Potable Gallons per Capita per Day Use for Each NISP Participant, 1999 through 2009

Participant	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average	Change 1999-2009
CWCWD	599	495	496	480	463	426	402	456	432	432	382	460	-36%
Dacono	117	131	124	122	97	104	107	111	107	108	98	111	-17%
Eaton	153	146	174	157	178	173	160	135	134	147	157	156	2%
Erie	125	164	168	183	147	171	160	163	157	148	132	156	6%
Evans	189	215	181	164	141	127	130	132	128	122	101	148	-47%
Firestone	123	195	224	216	196	164	156	178	168	174	146	176	18%
FCLWD	192	234	226	218	165	171	180	215	217	197	164	198	-15%
Fort Lupton	121	128	120	119	109	97	103	152	121	129	147	122	21%
Fort Morgan	153	204	189	179	144	150	156	172	217	211	172	177	12%
Frederick	132	208	204	188	152	206	198	199	185	185	176	185	33%
Lafayette	134	150	145	102	127	116	131	148	138	137	119	132	-12%
LHWD	176	213	207	183	167	158	177	203	192	193	163	185	-8%
MCQWD	284	294	308	273	285	258	254	253	278	265	285	276	0%
Severance	210	235	173	105	105	108	137	143	135	130	116	145	-45%
Windsor	137	130	129	120	98	89	92	94	92	83	75	104	-46%
Total NISP Average	**190**	**209**	**205**	**187**	**172**	**168**	**170**	**184**	**180**	**177**	**162**	**182**	**-15%**

The water providers with lower gpcd, including Windsor, Dacono, Evans and Severance are largely bedroom communities with a higher number of persons per tap than other water providers, which tends to lower potable gpcd. The water provider with the highest gpcd was CWCWD. CWCWD provides water to various agricultural and dairy users, such as Aurora Dairy. Since the CWCWD historical data could not distinguish dairies and other large agricultural water users within their commercial consumption data records, CWCWD was excluded from Figure III-1 above. Average residential use per capita per day for CWCWD, on the other hand, was 168 gpcd from 1999 through 2009. Morgan County Quality Water District also has substantial demand from dairies and agribusiness.

Evaluation of Water Use Patterns

The evaluation of Participant water use patterns 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 need for NISP? The 2004 version of this study included a historical examination of water use patterns in Northern Colorado and also included a comparison NISP Participant gpcd to other western cities to answer this question. These data, while imperfect, provide the best source of information as to the ongoing conservation efforts of the Participants.

As shown in the water conservation overview above, most Participants have specific water conservation savings goals. These goals were established with each Participant's understanding of the characteristics of their customer base and have been taken into account in the demand projections for this study. Further, it is in the best interest of each utility to achieve their maximum conservation savings. For 13 of the participants, the firm annual yield from the NISP Project will fail to meet their projected needs over the study period. These providers will need to secure additional supplies or achieve additional savings through conservation. From an economic perspective, it is reasonable to assume that the Participants have sought or will seek maximum cost effective conservation savings before incurring the large costs associated with the NISP Project.

This evaluation begins with an historical look at water use patterns in Northern Colorado to identify what progress has been made in the area of water conservation. Next, this evaluation focuses on establishing a benchmark for reasonable conservation water usage for comparison with the Participants current water use patterns. A comparison to other western cities is also included to test the reasonableness of Participant water use.

Historical water use patterns in Northern Colorado. Two sources of information offer a comparison of historical water use with current water use patterns 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 focused on water use patterns of the original participants of that project: Boulder, Estes Park, Greeley, Longmont, Loveland and the Platte River Power Authority. Although none of these water providers are Participants in NISP, geographically they are representative of the Participants and experienced similar weather patterns. In Table 1-1 of that EIS, the average water use of the Windy Gap participants, excluding Platter River Power Authority, amounted to 250 gpcd, which compares with an average gpcd for the Participants in NISP from 1999 through 2009 of 182.

The Northern District's 1991 *Regional Water Supply Study* included estimates of water use patterns 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 patterns of the Participants expressed in gpcd, according to the 1991 Regional Study, are presented in Table III-3:

Table III-3.
Water Use Patterns for Selected NISP Participants

Participant	1988	Average 1999-2009	Change 1988-2009
CWCWD	395	460	17%
Eaton	183	156	-15%
Erie	389	156	-60%
Evans	216	148	-31%
FCLWD	199	198	0%
Fort Lupton	326	122	-62%
Fort Morgan	280	177	-37%
LHWD	177	185	4%
MCQWD	245	276	13%
Windsor	140	104	-26%
Total NISP Average	**255**	**198**	**-22%**

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

As a whole, the Participants for whom 1988 data are available show a greater than 20 percent reduction in gpcd. However, the variations from provider to provider are quite large. For example, MCQWD experienced a 13 percent increase in gpcd during this period. However, this increase is not due to a failure in conservation efforts, but rather to a growing number of dairies within the service area that as of 2009 represent more than 30 percent of total potable demand for the District. Conversely, Erie shows a remarkable reduction in gpcd of 60 percent. While conservation is likely responsible for a portion of this reduction, changes from an agricultural to suburban economy are also likely responsible for a good deal of this change.

A recent Bureau of Reclamation analysis of Douglas County water needs stated that a "typical minimum planning use is an average of 165 gallons per day per capita in an area without heavy industry."[3] The report goes on to say that Denver Water has a goal of 130 gpcd and makes projections for Douglas County utilizing both the 165 gpcd and 130 gpcd. In 2009, the average gpcd for participants, excluding CWCWD and MCQWD, which both have large dairies, was 136. On average, NISP Participants are in close range to this goal, suggesting adequate conservation efforts by the Participants.

[3] U.S. Department of the Interior, Department of Reclamation. *Douglas County Rural Water Project Appraisal Report*. July 2010.

Normally, water providers and their customers are motivated to take the first steps in a conservation program which achieve the largest savings at the least incremental cost. The Participants have reduced use by implementing relatively inexpensive water saving measures such as public education, watering restrictions and low-flow fixture requirements and landscaping regulation for new construction. In the case of an individual family, this might mean turning off the water while brushing one's teeth, using a hose nozzle when washing the car and limiting outdoor watering. For that same family to achieve greater savings, it might be necessary for them to purchase more efficient appliances or re-landscape using native plants. These reductions would come at a significant cost to the family or to a utility offering rebates. Thus, once waste is reduced, other savings are likely to involve structural changes that are more costly.

Water use benchmark for NISP Participants. A water use benchmark applicable to the Participants may be useful in a comparison to those Participants' existing water use patterns to determine if additional water conservation is a reasonable expectation; however the establishment of such a benchmark is a challenge for a number of reasons.

(1) Numerous jurisdictions, including the States of Texas, California and Utah, have attempted to establish water conservation benchmarks, but each developed that benchmark in a unique manner suitable to its own purpose. No single, commonly accepted means for establishing such a benchmark is known to exist as of 2010.

(2) 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. public water supplies versus all water supplies, or population within the city limits versus service area population, is also not uniform.

(3) Customer characteristics vary from provider to provider and small providers are especially sensitive to changes in customer type.

In sum, establishing a benchmark has inherent limitations. For the purposes of this report, the defined benchmark 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 NISP water use benchmark. 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.[4] The EPA reports an average water use of 242 gpcd for the entire upper Colorado River Basin.[5] 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 in 2001.[6] Yet another benchmark can be extracted from U.S. Geological Survey water use data produced in the year 2000. This Federal agency gathers water supply,

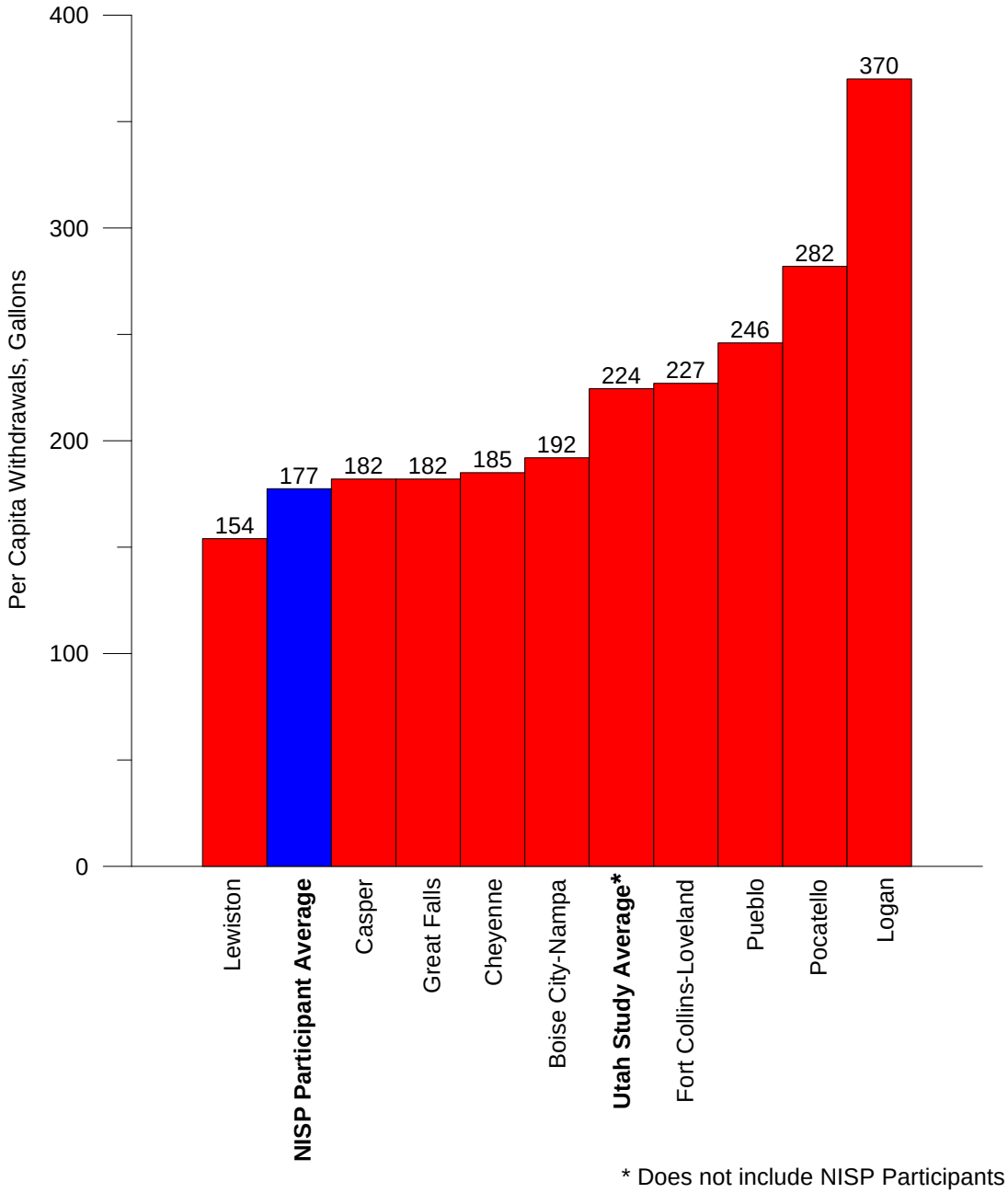
[4] CDM, Statewide Water Supply Initiative, Executive Summary, Page ES-9.
[5] Environmental Protection Agency, accessed at EPA.gov/watrhome/use/cap1.html.
[6] Western Resource Advocate, Smart Water, Page 66, 2003.

demand and population data for counties throughout the U.S. every five years. In the year 2000, admittedly a high water use year, the average gpcd for Colorado's portion of the South Platte Basin was about 200.[7]

An additional source of information for establishing a conservation water use benchmark comes from a study entitled, *Water Use and Residential Rate Structures in the Intermountain West*[8]. 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 III-2 below.

[7] US Geological Survey, Water Supply and Use, year 2000, Colorado.
[8] *Water Use and Residential Rate Structures in the Intermountain West*, Utah Economic and Business Review. Volume 65, March/April 2005.

Figure III-2.
Average GPCD for Selected Cities



As a final data point in considering the NISP benchmark, Denver Water exhibited an average potable gpcd usage of 180 between 1999 and 2009.[9] 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. Denver Water' comparability is somewhat limited in this instance, since it is a much larger metropolitan area with different financial

[9] Comprehensive Annual Financial Report, Denver Water, December 31, 2008 and Comprehensive Annual Financial Report, Denver Water, December 31, 2009.

resources than the Participants. Denver Water data also include parks and other outdoor irrigation requirements, whereas potable water use per day within the Participants includes only potable supplies, excluding a modest portion of non-potable use for irrigation. Based upon the foregoing data points, and using its professional judgment, the study team established the water use benchmark of 215 gpcd for Participants' potable water use.

Comparison of Benchmark to NISP Participant Usage. The study team compared the benchmark of 215 gpcd to the average gpcd from 1999 to 2009 for each Participant. Two Participants were found to be over that average, CWCWD and MCQWD. The study team examined the water use characteristics of these Participants to understand why they exceeded the NISP water use benchmark.

As discussed earlier in this section, CWCWD provides water to various agricultural and dairy users. Nonresidential demands accounted for over 60 percent of total District demand in 2009, with Aurora Dairy and Fort St. Vrain Power Generation representing the largest users. Average residential gpcd between 1999 and 2009 for CWCWD was 168. CWCWD encourages dairy and other agricultural businesses to use non-treated water when possible. As of 2009, more than 30 percent of potable water use in the MCQWD service area was for large dairies. Potable gpcd for residential and commercial averaged 177 between 1999 and 2009.

Residential water use by these Participants is reasonable as compared to the benchmark and as compared to the other Participants. The large water users in these service areas are an integral part of the local economies and are not indicative of a lack of conservation efforts by these Participants.

Summary observations about conservation. All Participants have active conservation programs in place and each include a host of measures. Conservation programs have been expanded and strengthened since 2004. Programs emphasizing price signals appear to be emphasized by Participants. Conservation programs appear to have had an effect in reducing water use among the Participants, although trend data is limited. To the extent there is a NISP water use benchmark, water use patterns of the Participants are not considered excessive. The relatively higher water using Participants are rural water districts that serve large agribusinesses whose effects on water use patterns 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.

SECTION FOUR
Additional Water Needs of the NISP Participants

Additional water needs of the Participants are determined by the difference between their projected future water demands and their firm annual water supplies or yields that were owned or controlled by the Participants in 2010. That is, as future water demands in a normalized weather condition year exceed firm annual yield, this excess amounts to future water resource needs for a Participant. Unmet future needs refer to a Participant's inability to meet normal demands during water supply circumstances similar to a defined drought period. This approach is consistent with industry standards.

In anticipation of future demands exceeding firm yield, it would be prudent for a water provider to seek additional water supplies. In fact, a water provider can operate assuming average year supplies, which temporarily forestalls the need for additional water resources, but water customers would be faced with drought restrictions more frequently, and the uncertainty or risk of insufficient supplies would be elevated to a level that is not consistent with good water resource management. Therefore, this evaluation focuses on the difference between total future water requirements and present firm annual yields to assess the need for NISP. It is important to note that projected water requirements assume that future water supplies are available to meet demands. Tables IV-1 and IV-2 summarize total future water requirements and shortages beyond firm yields, respectively, by Participant from 2010 through 2060.

Table IV-1
Projected Water Requirements for NISP Participants in Acre Feet, 2010 to 2060

Participant	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
CWCWD	3,100	4,200	4,700	5,000	5,400	5,900	6,200	6,500	7,100	7,400	7,700
Dacono	580	690	820	970	1,150	1,360	1,620	1,920	2,280	2,710	3,220
Eaton	1,100	1,200	1,300	1,400	1,600	1,800	2,000	2,200	2,500	2,800	3,200
Erie	4,500	7,100	10,000	13,200	16,700	17,500	18,500	19,500	20,800	22,100	23,600
Evans	4,600	5,700	7,000	8,100	9,300	10,100	10,100	10,100	10,100	10,100	10,100
Firestone	2,061	2,927	3,662	4,083	4,508	4,977	5,495	6,067	6,699	7,396	8,166
FCLWD	9,100	10,400	11,800	13,300	14,900	17,000	18,100	18,100	18,100	18,100	18,100
Fort Lupton	3,100	3,200	3,400	3,500	3,700	3,900	4,100	4,400	4,700	4,900	5,300
Fort Morgan	6,600	6,900	7,100	7,300	7,700	8,100	8,400	8,800	9,300	9,800	10,400
Frederick	2,050	2,580	3,110	3,750	4,510	5,440	6,550	7,900	9,520	11,470	13,820
Lafayette	4,500	5,800	7,000	8,200	8,700	8,700	8,700	8,700	8,700	8,700	8,700
LHWD	5,400	6,300	7,400	8,600	10,000	11,700	11,900	11,900	11,900	11,900	11,900
MCQWD	2,100	2,200	2,400	2,700	2,900	3,200	3,500	3,800	4,100	4,400	4,700
Severance	700	1,200	1,900	3,100	3,800	3,800	3,800	3,800	3,800	3,800	3,800
Windsor	2,400	2,900	3,200	3,600	4,100	4,800	5,700	6,700	7,800	9,200	10,700
Total	**51,900**	**63,300**	**74,800**	**86,800**	**99,000**	**108,300**	**114,700**	**120,400**	**127,400**	**134,800**	**143,400**

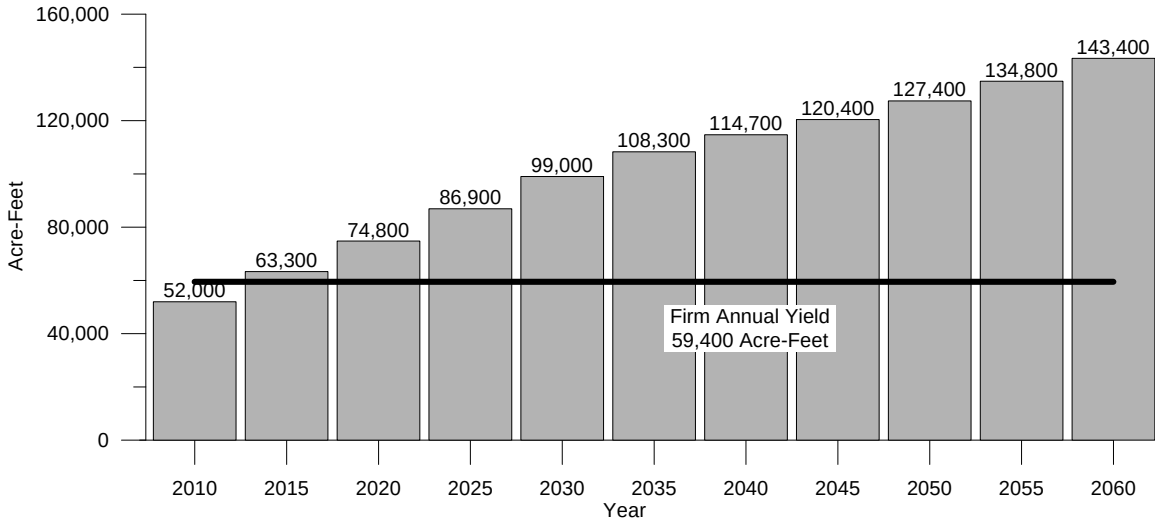
Table IV-2
Projected Water Shortages beyond Firm Annual Yields for NISP Participants in Acre Feet, 2010 to 2060

Participant	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
CWCWD	(40)	1,100	1,600	1,900	2,300	2,800	3,100	3,400	4,000	4,300	4,600
Dacono	(480)	(400)	(200)	(100)	100	300	600	900	1,200	1,600	2,200
Eaton	(550)	(500)	(400)	(300)	(100)	200	400	600	900	1,200	1,600
Erie	(90)	2,500	5,400	8,600	12,100	12,900	13,900	14,900	16,200	17,500	19,000
Evans	(4,000)	(2,900)	(1,600)	(500)	700	1,500	1,500	1,500	1,500	1,500	1,500
Firestone	(900)	(100)	700	1,100	1,500	2,000	2,500	3,100	3,700	4,400	5,200
FCLWD	(2,300)	(1,000)	400	1,900	3,500	5,600	6,700	6,700	6,700	6,700	6,700
Fort Lupton	1,200	1,300	1,500	1,600	1,800	2,000	2,200	2,500	2,800	3,000	3,400
Fort Morgan	2,600	2,900	3,100	3,300	3,700	4,100	4,400	4,800	5,300	5,800	6,400
Frederick	(1,400)	(800)	(300)	300	1,100	2,000	3,100	4,500	6,100	8,000	10,400
Lafayette	(10)	1,300	2,500	3,700	4,200	4,200	4,200	4,200	4,200	4,200	4,200
LHWD	(400)	500	1,600	2,800	4,200	5,900	6,100	6,100	6,100	6,100	6,100
MCQWD	(800)	(700)	(500)	(200)	0	300	600	900	1,200	1,500	1,800
Severance	60	600	1,300	2,500	3,200	3,200	3,200	3,200	3,200	3,200	3,200
Windsor	(520)	(20)	300	700	1,200	1,900	2,800	3,800	4,900	6,300	7,800
Total	**(7,500)**	**3,900**	**15,400**	**27,400**	**39,500**	**48,900**	**55,200**	**61,000**	**68,000**	**75,400**	**84,000**

Combined Water Needs of the NISP Participants

The water needs of the Participants, viewed as a group, are considerable, as illustrated in Figure IV-1.

Figure IV-1.
Comparison of Future Water Requirements with 2010 Firm Annual Yields for 15 NISP Participants, Combined, in Acre-Feet, 2010 through 2060



By 2015, total future demands of all Participants combined will approximate their combined firm annual yield. By the year 2025, the excess of combined demands over current supplies will be more than 25,000 AF. By 2060, the total shortage for Participants will be more than 80,000 AF. Table IV-3 estimates the projected margins of future demands compared with 2010 firm annual yield of a combined 59,400 AF.

Table IV-3.
Cumulative New Water Requirements beyond 2010 Firm Annual Yield, in Acre-Feet, 2010 through 2060

Note: Firm annual yield for 2010 was estimated to be 61,120 acre-feet for the 15 Participants combined.

Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(7,500)
2015	3,900
2020	15,400
2025	27,400
2030	39,500
2035	48,900
2040	55,200
2045	61,000
2050	68,000
2055	75,400
2060	84,000

The Participants are seeking a permitted yield from NISP totaling 40,000 AF in new firm yield.[10] From a combined standpoint, the Participants will need the yield from NISP no later than 2015, and these Participants will need additional supplies from that time forward. Of course, individual Participants are most likely pursuing multiple strategies for water resource acquisition.

It should be noted that the Participants' future investment in NISP and other water supplies will very likely increase their overall costs per acre-foot of water supplies. If these costs were recovered through volumetric water rates, it is possible that water price elasticity effects would result in reduced consumption, thereby reducing water needs. However, municipalities and most water providers in Northern Colorado have policies that growth must pay its own way. It is quite likely that large portions of the incremental costs of NISP and other new water supplies will be collected in the form of tap fee increases, instead of in water rate increases. Since almost all water costs along the Front Range of Colorado are increasing, it is unlikely that growth or water use will be affected significantly by increases in the cost of water for the Participants.

Future Water Needs of Individual NISP Participants

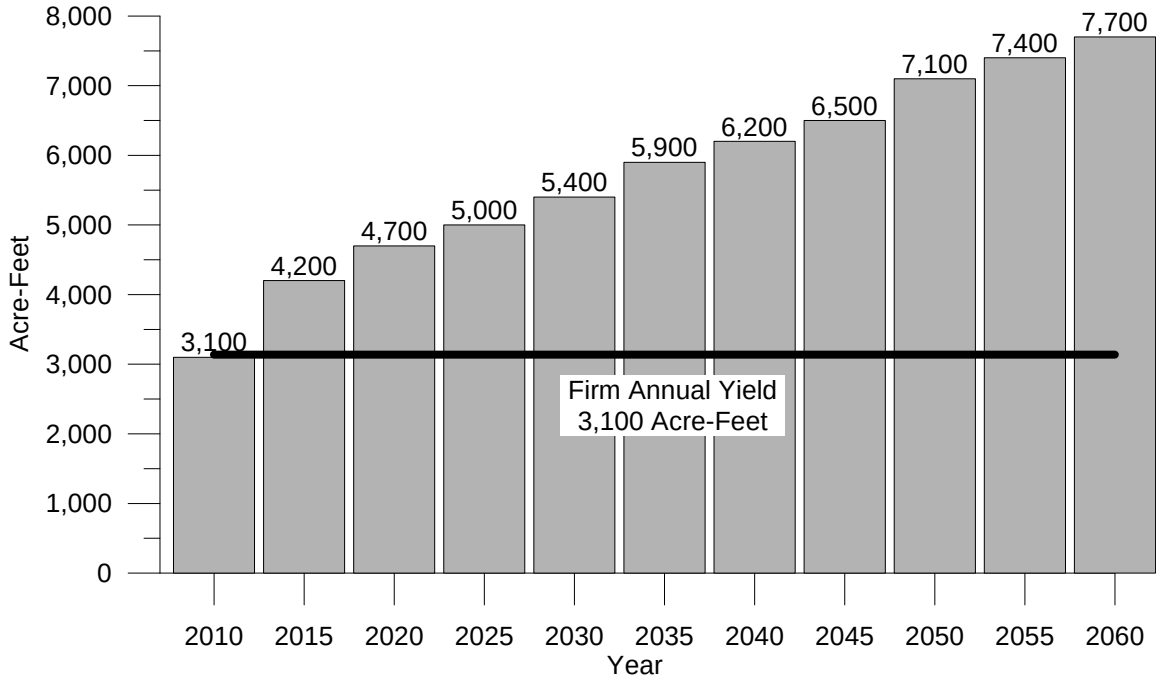
Figures IV-2 through IV-16 present the new water requirements for each Participant beyond their own firm annual yields in 2010. For each Participant, a bar chart comparing future water requirements with 2010 firm annual yield is followed by a table that quantifies the excess supplies or unmet demands for each Participant.

[10] Document obtained from Northern Colorado Water Conservancy District, December 2005.

Central Weld County Water District (CWCWD). With 2010 firm annual yield of almost 3,100 AF, CWCWD is in rough balance with average year demands expected in the year 2010. Projected water demands under normal weather conditions will exceed 2010 firm annual yield in the following year. By 2030, demands will exceed supply by 2,300 AF, by 2060 the shortfall will be about 4,600 AF. CWCWD is seeking 3,500 AF of new permitted firm yield from NISP.

Although CWCWD treats water for the communities of Dacono, Firestone, Frederick, Kersey, Milliken, LaSalle, Gilcrest, Platteville, Left Hand and Aristocrat. CWCWD is currently responsible only for providing treatment and not for supplying the raw water for these communities; therefore, they were not included in the demand evaluation.

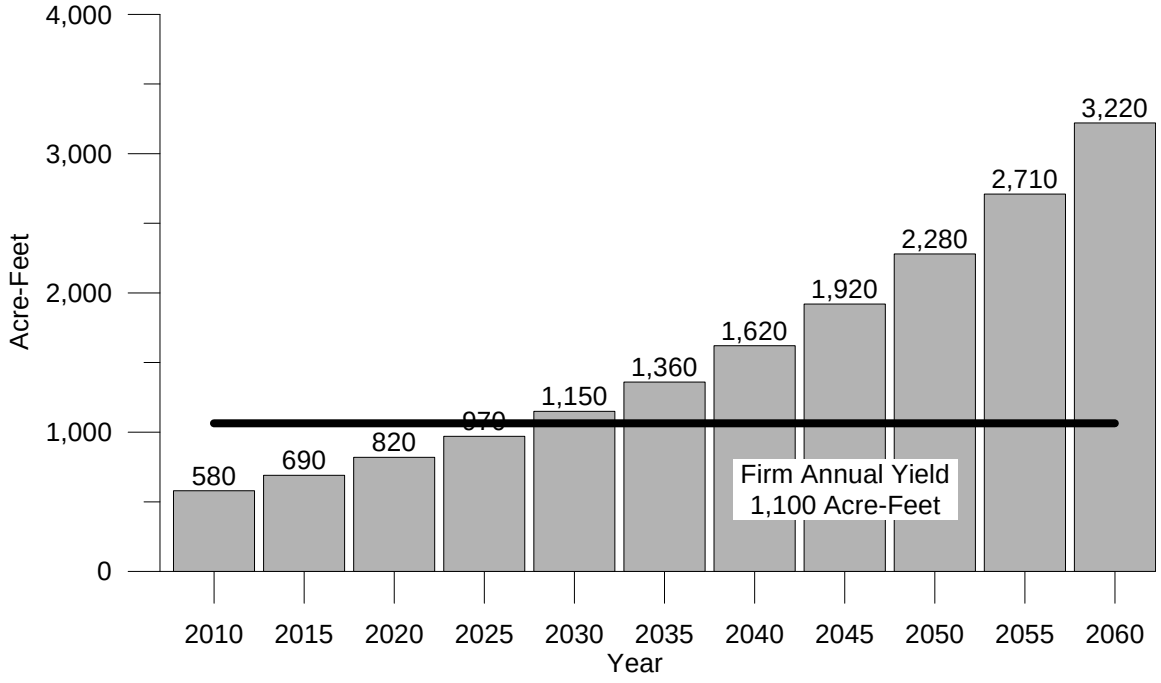
Figure IV-2.
Comparison of Future Water Demands with 2010 Firm Annual Yield, CWCWD, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(40)
2015	1,100
2020	1,600
2025	1,900
2030	2,300
2035	2,800
2040	3,100
2045	3,400
2050	4,000
2055	4,300
2060	4,600

Town of Dacono. The Town of Dacono's future water demands will be adequate with its 2010 firm annual yield of 1,150 AF until about 2030. After that, demands will increase steadily until demand exceeds firm annual yield by more than 2,000 AF in 2060. Dacono is seeking 1,000 AF of new permitted firm yield from NISP.

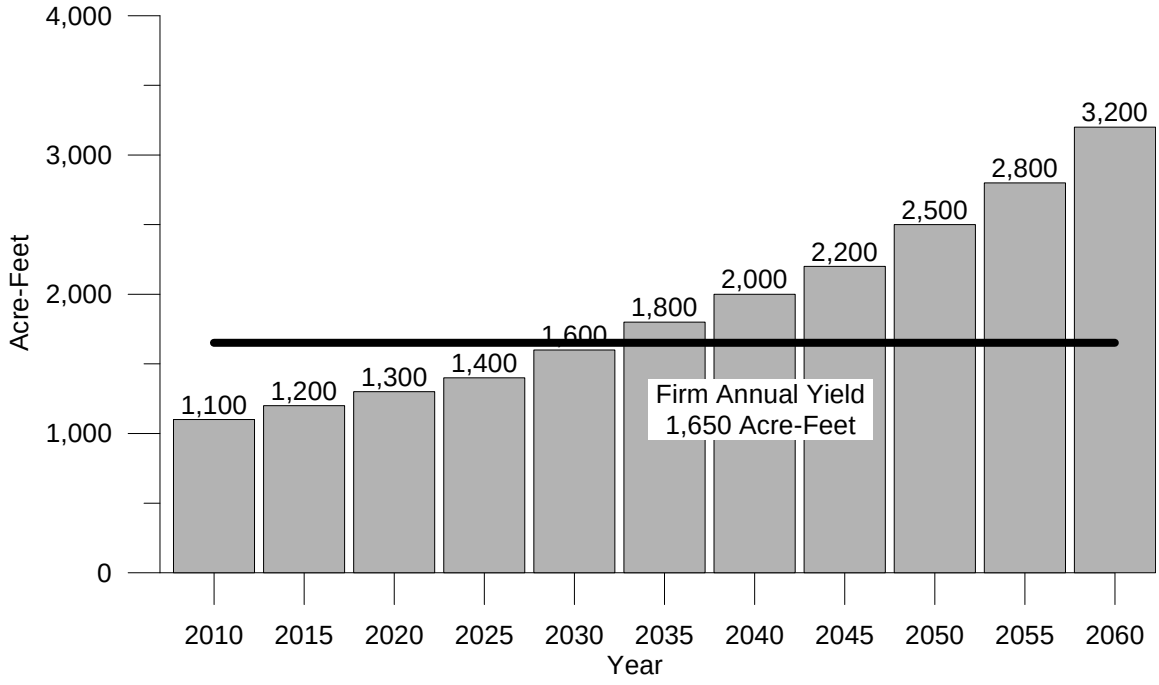
Figure IV-3.
Comparison of Future Water Demands with 2010 Firm Annual Yield, Town of Dacono, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(480)
2015	(370)
2020	(240)
2025	(90)
2030	90
2035	300
2040	560
2045	860
2050	1,220
2055	1,650
2060	2,160

Town of Eaton. The Town of Eaton's future water demands will be adequate with its 2010 firm annual yield of 1,650 AF until about 2030. By the year 2040, the Town of Eaton is projected to need about 350 AF in new, firm annual yield. By 2060, that figures rises to 1,550 AF. Eaton is seeking 1,300 AF of new permitted firm yield from NISP.

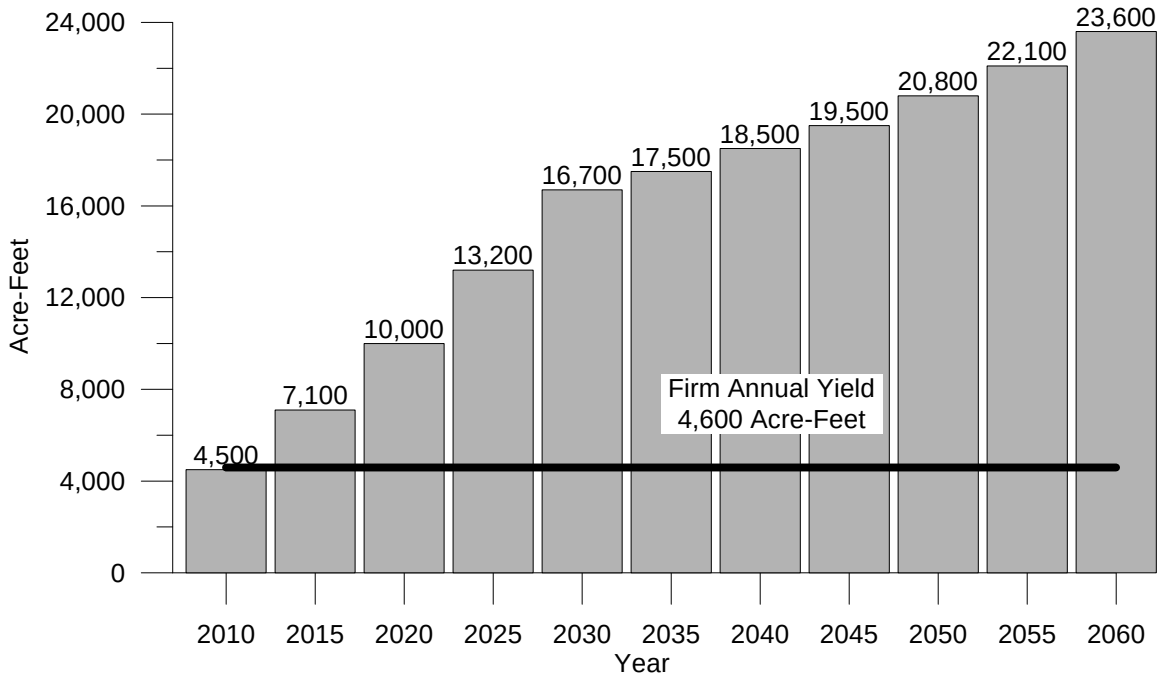
Figure IV-4.
Comparison of Future Water Demands with 2010 Firm Annual Yield, Town of Eaton, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(550)
2015	(450)
2020	(350)
2025	(250)
2030	(50)
2035	150
2040	350
2045	550
2050	850
2055	1,150
2060	1,550

Town of Erie. The Town of Erie has a 2010 firm annual yield of about 4,600 AF and is in rough balance with water demands expected for the year 2010. The Town of Erie will need additional firm annual yield shortly thereafter, and this excess of demands over 2010 water supplies will increase rapidly. By 2030, the demand will exceed firm supplies by more than 12,000 AF and by 2060 that shortfall will increase to 19,000 AF. Erie is seeking 6,500 AF of new permitted firm yield from NISP.

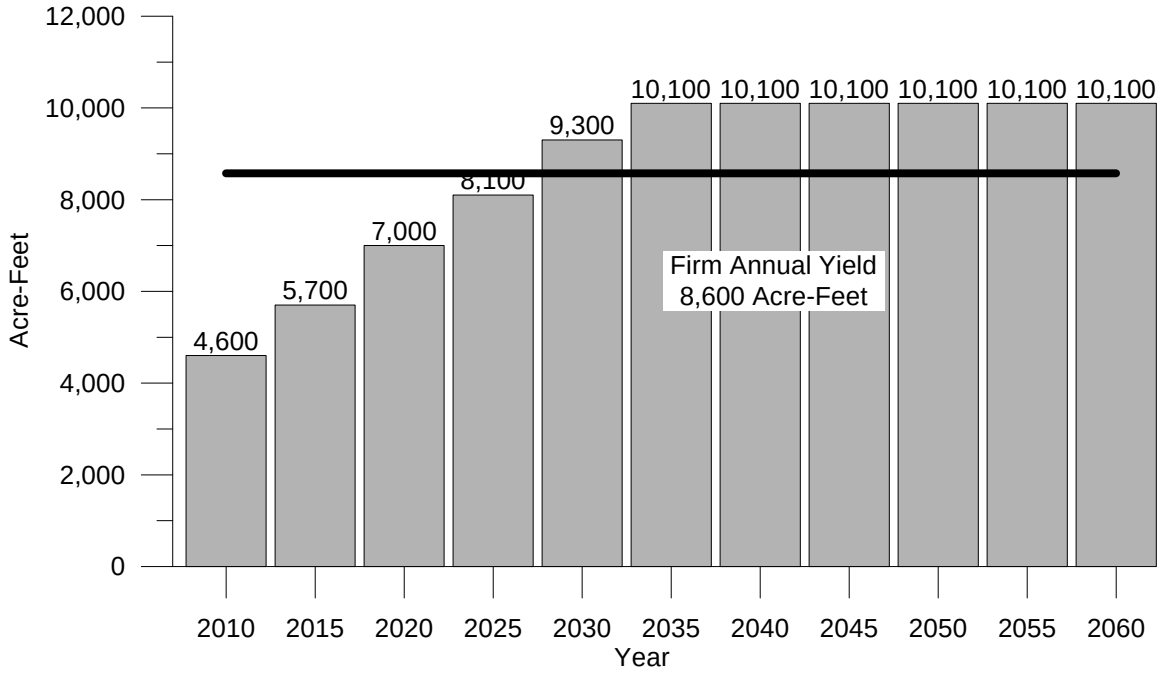
Figure IV-5.
Comparison of Future Water Demands with 2010 Firm Annual Yield, Town of Erie, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(90)
2015	2,500
2020	5,400
2025	8,600
2030	12,100
2035	12,900
2040	13,900
2045	14,900
2050	16,200
2055	17,500
2060	19,000

City of Evans. The City of Evans obtains treated water from the City of Greeley but must provide Greeley with the underlying water resources to meet that need. Evans' firm annual yield in 2010 was estimated at about 8,600 AF, including non-potable supplies that were available only for non-potable deliveries. The City of Evans faces an excess of demands over its supplies in coming years, reaching a deficit of 700 AF by the year 2030 and 1,600 AF in 2035, about which time the city should reach buildout. The City of Evans is seeking 1,600 AF of new permitted firm yield from NISP.

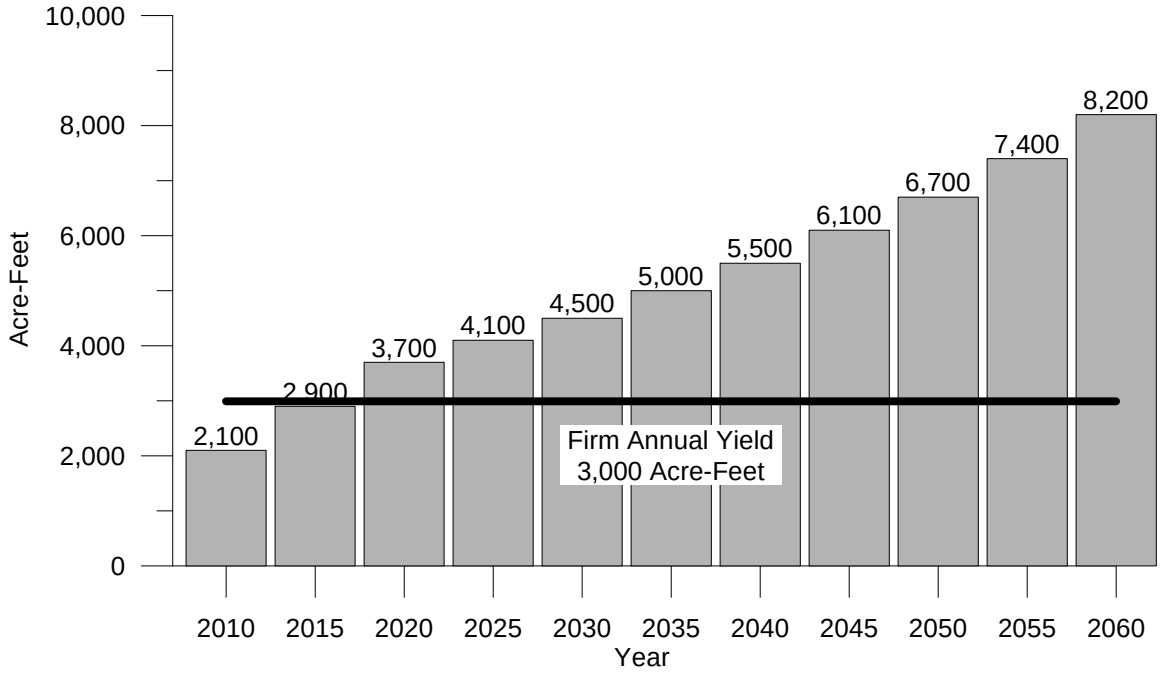
Figure IV-6.
Comparison of Future Water Demands with 2010 Firm Annual Yield, City of Evans, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(4,000)
2015	(2,900)
2020	(1,600)
2025	(500)
2030	700
2035	1,500
2040	1,500
2045	1,500
2050	1,500
2055	1,500
2060	1,500

Town of Firestone. The Town of Firestone will have adequate firm annual yield until about 2015, after which shortages will steadily increase. By 2030, firm annual yield will be about 1,500 AF less than projected demands. Firestone's firm annual yield will be more than 5,000 AF less than demand by 2060. Firestone is seeking 1,300 of new permitted firm yield from NISP.

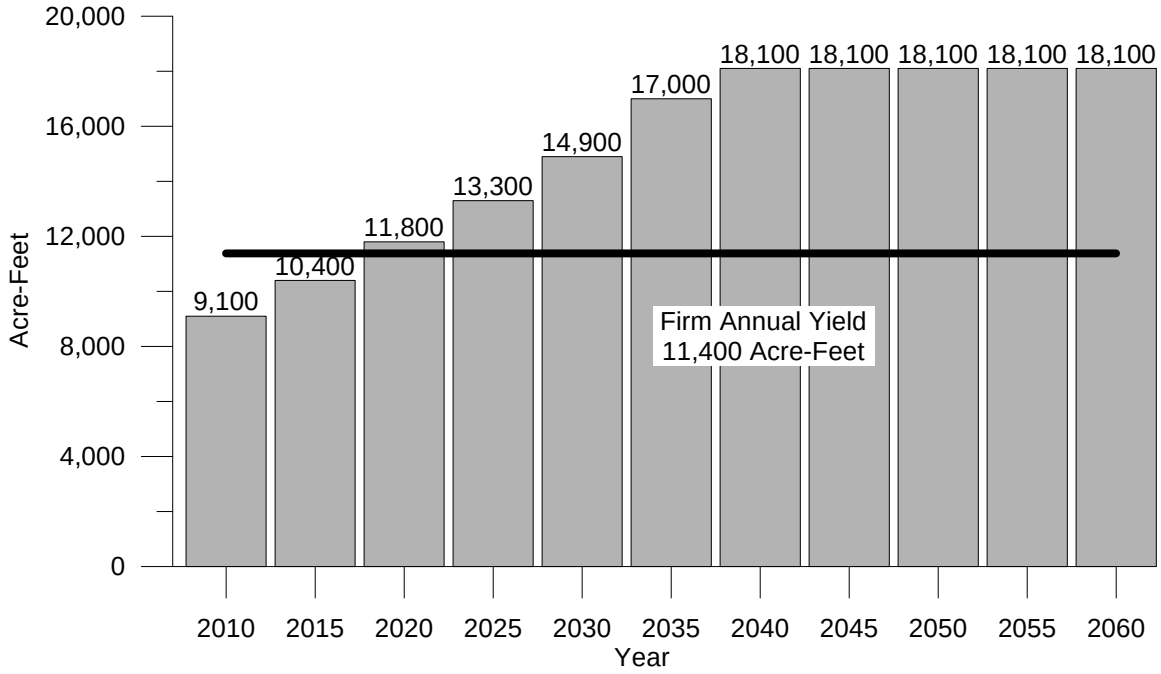
Figure IV-7.
Comparison of Future Water Demands with 2010 Firm Annual Yield, Town of Firestone, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(900)
2015	(60)
2020	700
2025	1,100
2030	1,500
2035	2,000
2040	2,500
2045	3,100
2050	3,700
2055	4,400
2060	5,200

Fort Collins-Loveland Water District (FCLWD). With a 2010 firm annual yield of about 11,400 AF, FCLWD will have adequate supply until 2020. After that, shortages will develop and grow steadily to 6,700 AF at buildout, which is projected to be reached around 2040. FCLWD is seeking 3,000 AF of new permitted firm yield from NISP.

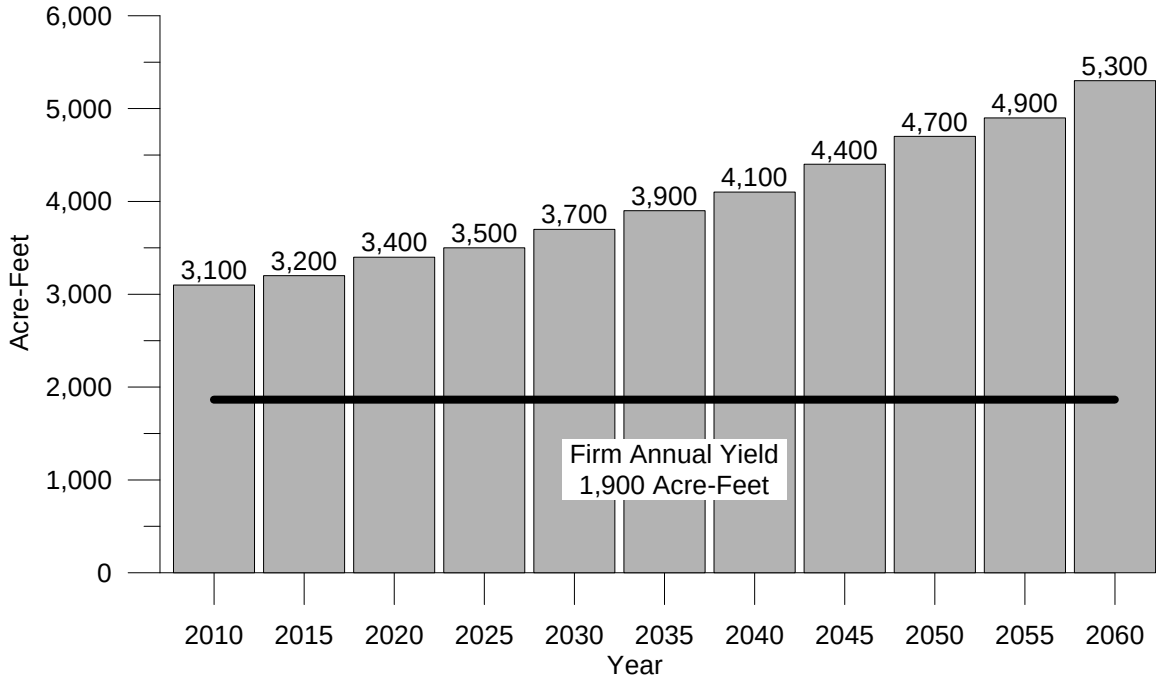
Figure IV-8.
Comparison of Future Water Demands with 2010 Firm Annual Yield, FCLWD, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(2,300)
2015	(1,000)
2020	400
2025	1,900
2030	3,500
2035	5,600
2040	6,700
2045	6,700
2050	6,700
2055	6,700
2060	6,700

The City of Fort Lupton. The City of Fort Lupton had a 2010 firm annual yield of almost 1,900 AF, which suggests that the city faces immediate shortages. The excess of Fort Lupton's future water demands compared with its firm annual yield will rise slowly but steadily to reach 1,600 AF by the year 2025 and more than 3,000 AF by the year 2060. The City of Fort Lupton is seeking 3,000 AF of new permitted firm yield from NISP.

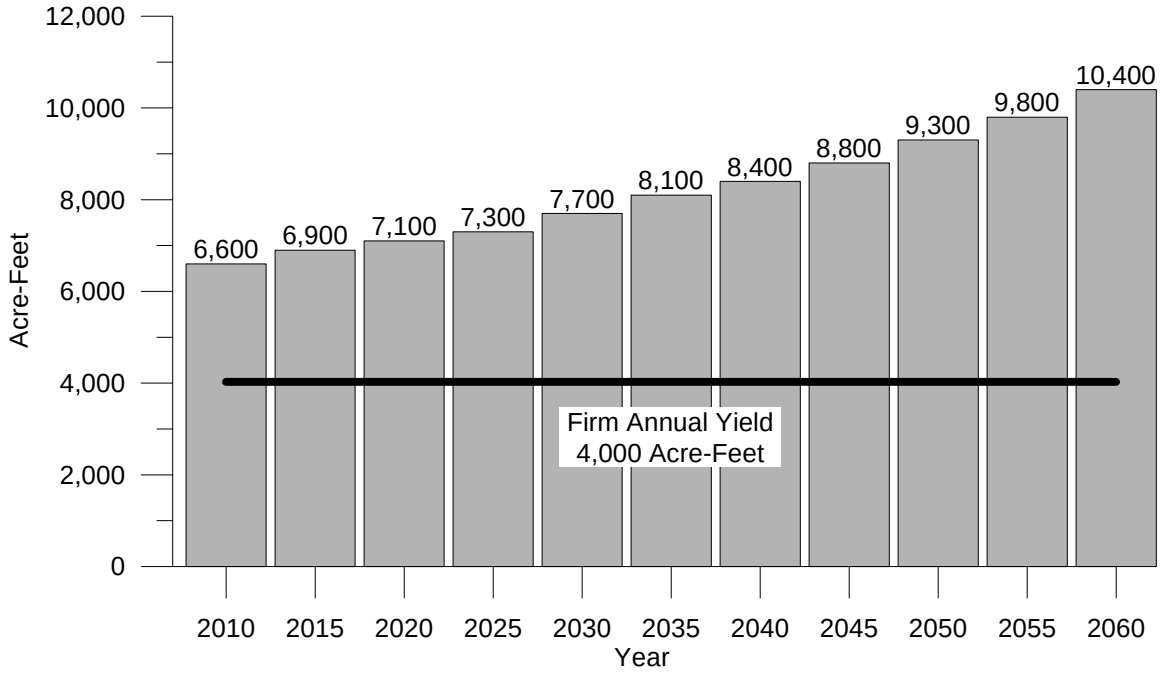
Figure IV-9.
Comparison of Future Water Demands with 2010 Firm Annual Yield, Town of Fort Lupton, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	1,200
2015	1,300
2020	1,500
2025	1,600
2030	1,800
2035	2,000
2040	2,200
2045	2,500
2050	2,800
2055	3,000
2060	3,400

City of Fort Morgan. With just over 4,000 AF of 2010 firm annual yield, the City of Fort Morgan could experience shortages in the immediate future. Fort Morgan's need for new water supplies will grow steadily, reaching 3,300AF in the year 2025 and 6,400 AF in 2060. Fort Morgan is seeking 3,600 AF of new permitted firm yield from NISP.

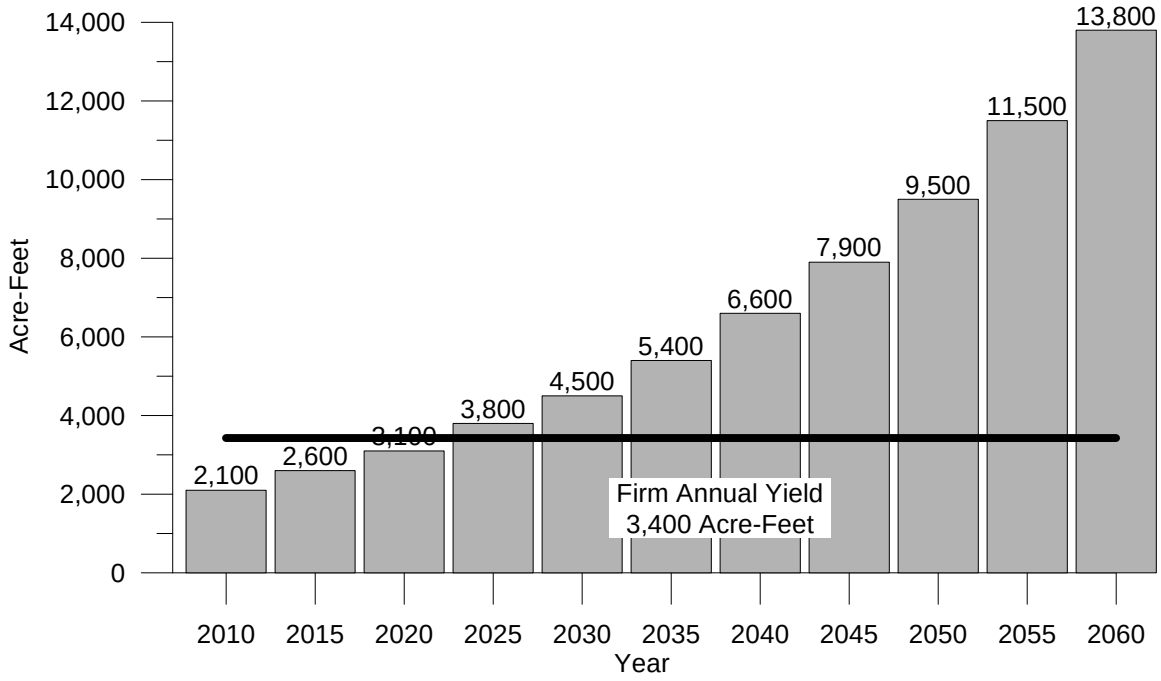
Figure IV-10.
Comparison of Future Water Demands with 2010 Firm Annual Yield, City of Fort Morgan, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	2,600
2015	2,900
2020	3,100
2025	3,300
2030	3,700
2035	4,100
2040	4,400
2045	4,800
2050	5,300
2055	5,800
2060	6,400

Town of Fredrick. The Town of Frederick's projected water demands in 2010 are about 1,400 AF less than its 2010 firm annual yield of about 3,400 AF. Supplies will be adequate until about 2025, after which shortages will growly at a rapid pace, reaching more than 10,000 AF by year 2060. The Town of Frederick is seeking 2,600 AF of new permitted firm yield from NISP.

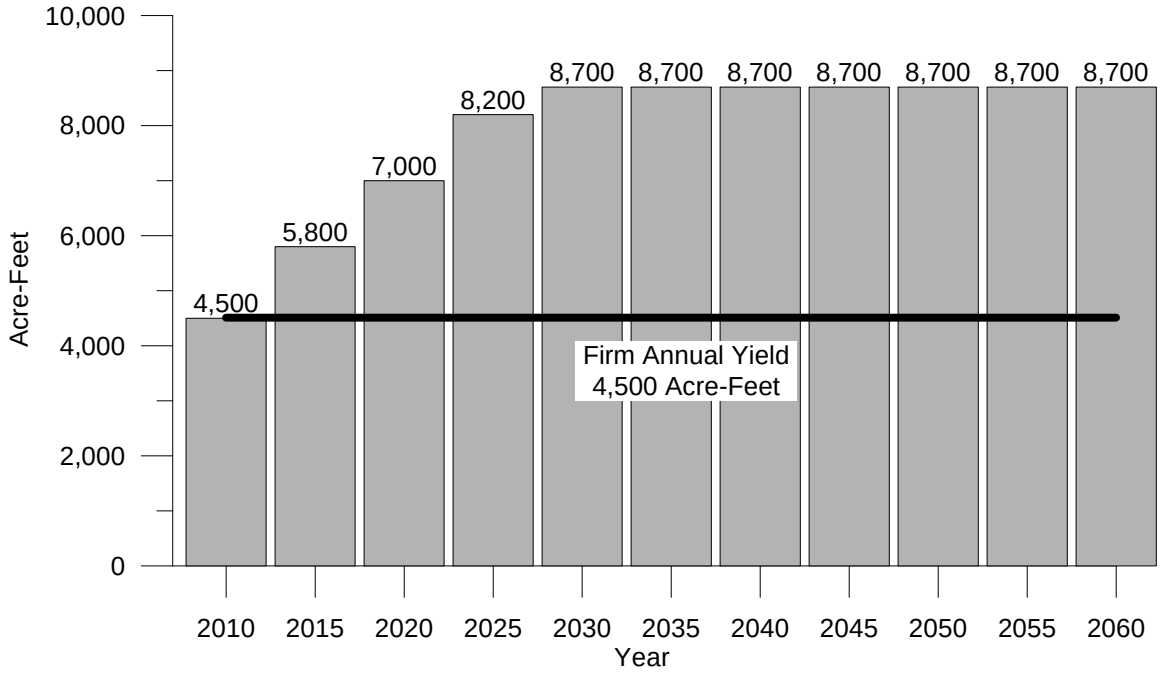
Figure IV-11.
Comparison of Future Water Demands with 2010 Firm Annual Yield, Town of Frederick, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(1,400)
2015	(800)
2020	(300)
2025	300
2030	1,100
2035	2,000
2040	3,100
2045	4,500
2050	6,100
2055	8,000
2060	10,400

City of Lafayette. The City of Lafayette's projected water demands in 2010 are in rough balance with its 2010 firm annual yield of about 4,500 AF. From there, the excess of projected demands over 2004 supplies will increase, reaching more than 4,200 AF by the year 2030, when buildout is achieved. The City of Lafayette is seeking 1,800 AF of new permitted firm yield from NISP.

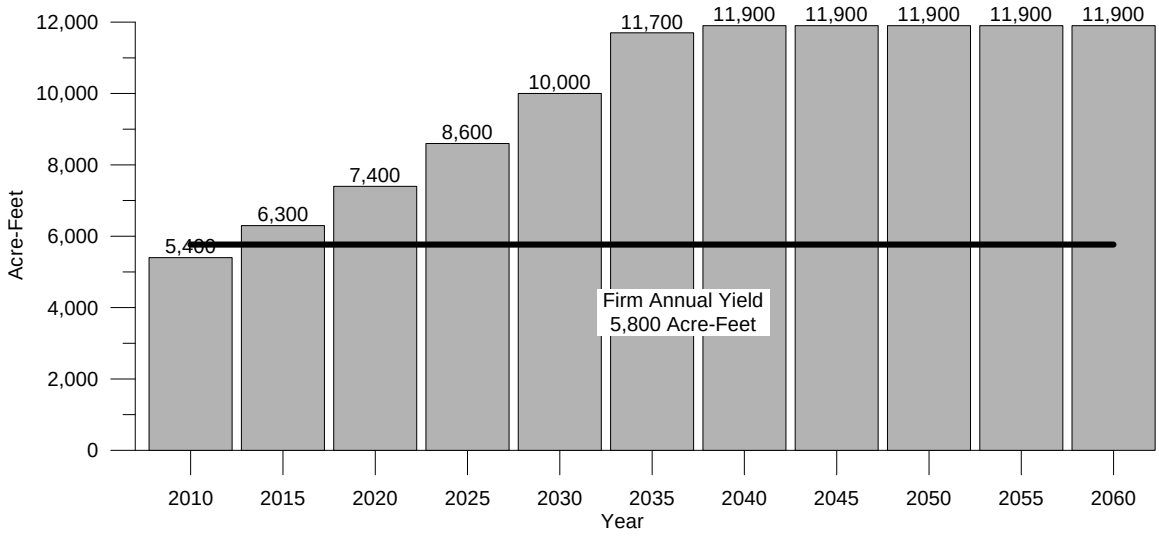
Figure IV-12.
Comparison of Future Water Demands with 2010 Firm Annual Yield, City of Lafayette, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(10)
2015	1,300
2020	2,500
2025	3,700
2030	4,200
2035	4,200
2040	4,200
2045	4,200
2050	4,200
2055	4,200
2060	4,200

Left Hand Water District (LHWD). LHWD's 2010 firm annual yield of about 5,800 AF will meet average year water demands projected through the year 2010, but supply will be less than demand within the next two to three years. The need for new firm annual yield will grow after that, reaching 6,100 AF at buildout, by the year 2040. LHWD is seeking 4,900 AF of new permitted firm yield from NISP.

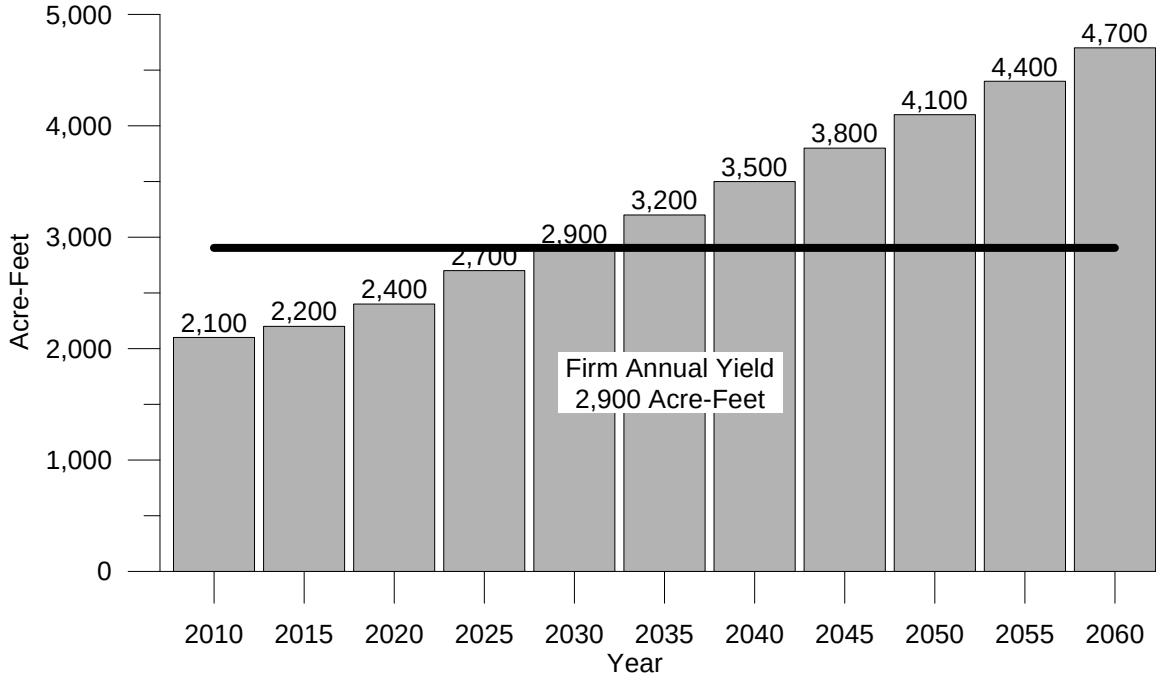
Figure IV-13.
Comparison of Future Water Demands with 2010 Firm Annual Yield, Left Hand Water District, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(400)
2015	500
2020	1,600
2025	2,800
2030	4,200
2035	5,900
2040	6,100
2045	6,100
2050	6,100
2055	6,100
2060	6,100

Morgan County Quality Water District (MCQWD). This water district, with almost 2,900 AF in 2010 firm annual yield, will be able to meet projected demands through the year 2030. After that, the need for new water resources will gradually increase, reaching 1,800 AF by the year 2060. MCQWD is seeking 1,300 AF of new permitted firm yield from NISP.

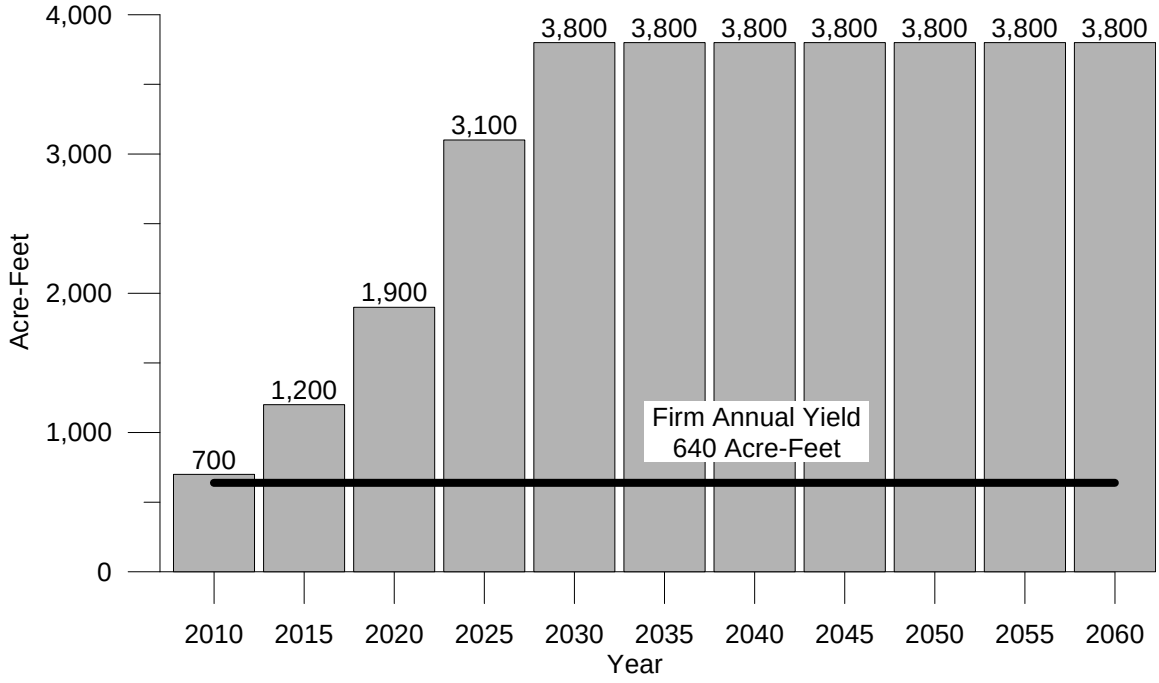
Figure IV-14.
Comparison of Future Water Demands with 2010 Firm Annual Yield, Morgan County Quality Water District, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(800)
2015	(700)
2020	(500)
2025	(200)
2030	0
2035	300
2040	600
2045	900
2050	1,200
2055	1,500
2060	1,800

The Town of Severance. The Town of Severance's 2010 firm annual yield of 640 AF is less than projected demands for 2010. New water resource needs for the Town of Severance will grow relatively rapidly, reaching 2,500 AF by 2025. By 2030, when buildout is projected to occur, the shortage will be 3,200 AF. The Town of Severance is seeking 1,300 AF of new permitted firm yield from NISP.

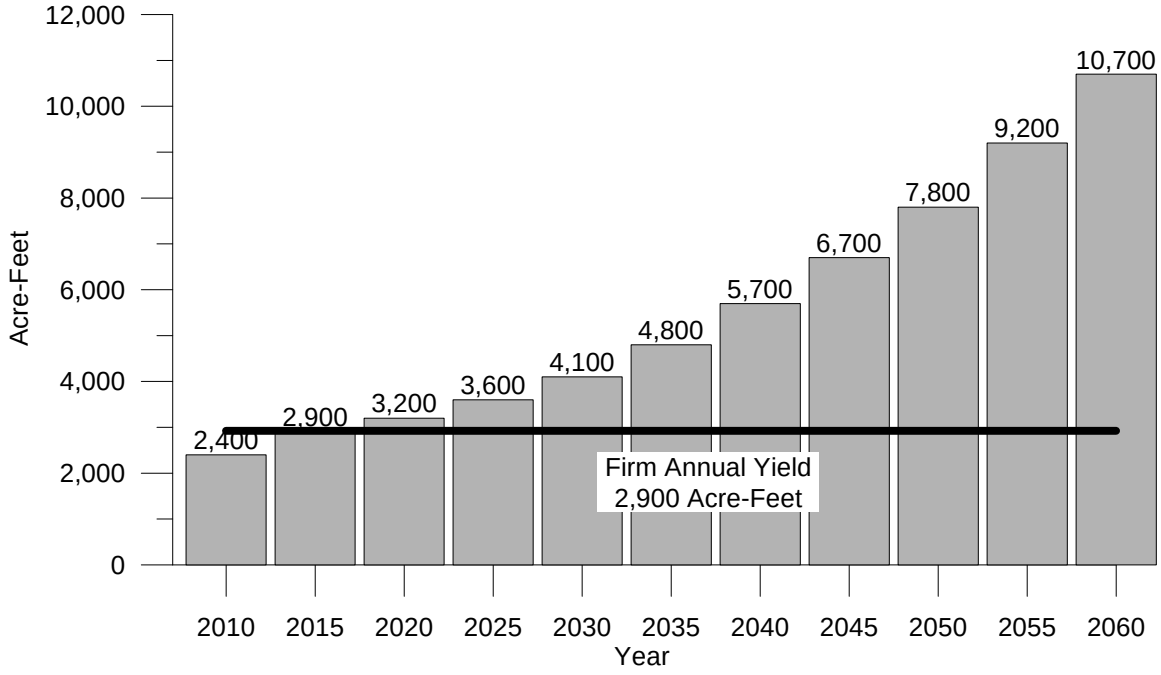
Figure IV-15.
Comparison of Future Water Demands with 2010 Firm Annual Yield, Town of Severance, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	60
2015	600
2020	1,300
2025	2,500
2030	3,200
2035	3,200
2040	3,200
2045	3,200
2050	3,200
2055	3,200
2060	3,200

Town of Windsor. With 2010 firm annual yield of a little more than 2,900 AF, the Town of Windsor's water demands projected for the year 2010 are about 500 AF less than its supply, but new water supplies will be required in the near future. Windsor's need to secure new water resources will grow, reaching 1,200 AF by the year 2030. The Town of Windsor is seeking 3,300 AF of new permitted firm yield from NISP.

Figure IV-16.
Comparison of Future Water Demands with 2010 Firm Annual Yields, Town of Windsor, in Acre-Feet, 2010 through 2060



Year	Cumulative Water Requirements beyond 2010 Firm Annual Yield
2010	(520)
2015	(20)
2020	300
2025	700
2030	1,200
2035	1,900
2040	2,800
2045	3,800
2050	4,900
2055	6,300
2060	7,800

Conclusions about the Need for NISP

The study team performed a careful analysis of existing supplies and projected water demands for each of the 15 Participants in NISP. In each instance, the Participants have projected new water resource needs that justify their participation in this project. For many Participants, additional water resources should also be identified in the near future.

By 2015, the total future demand of all Participants combined will exceed their combined firm annual yield. By the year 2025, the excess of combined demands over current supplies will approximate 27,400 AF. The Participants are seeking from NISP a combined 40,000 AF in new permitted firm yield.[11] Between 2030 and 2035, these Participants will need additional supplies beyond NISP. Of course, individual Participants are most likely pursuing multiple strategies for water resource acquisition.

[11] Northern Colorado Water Conservancy District, 2006 Phase III Participation and Budget, December 2005.