CITY OF LONGMONT

Water Demand Evaluation

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Abbreviations, Definitions, Unit Conversions

Abbreviations

ac-ft	acre-foot
ac-ft/yr	acre-feet per year
AWWA	American Water Works Association
City	City of Longmont
CBD	Central Business District
CIP	Capital Improvement Program
EN	established neighborhood
GIS	Geographic Information System
gpcd	gallons per capita per day
gpdga	gallons per day per gross acre
gpdpa	gallons per day per parcel acre
GA	gross area
HDR	High Density Residential
IED	Industrial/Economic Development
IWA	International Water Association
LACP	Longmont Area Comprehensive Plan
LDR	Low Density Residential
LHWD	Left Hand Water District
LPA	Longmont Planning Area
LPWD	Longs Peak Water District
MDR	Medium Density Residential
MG	million gallons
mgd	million gallon(s) per day
MNC	Multi-Neighborhood Commercial
MSA	Municipal Service Area
MUC	Mixed Use Corridor
NC	Neighborhood Center
PA	parcel area
PGOS	Parks, Greenways, and Open Space

PN	planned neighborhood
PQP	Public/Quasi-Public
psi	per square inch
RC	Regional Commercial
ROS	right-of-way
RWMP	Raw Water Master Plan
SC	Strip Commercial
SVVPA	St. Vrain Valley Planning Area
TWMP	Treated Water Master Plan
ULDR	Ultra Low Density Residential
VLDR	Very Low Density Residential
WCMP	Water Conservation Master Plan
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

Definitions

Adjusted Forecast

Second stage in developing water demand forecasts. Using the reference forecast as a base, the adjusted forecast adds or subtracts water demand due to additional parameters, such as water conservation, changes in development, or climate variations. The City may add, remove, and adjust individual assumptions that impact water demand.

Downstream Demand

Raw water demand that exists at a location on Longmont's water system that is normally met with Downstream Raw Water Supplies, normally below the City's wastewater treatment plant. Examples include Return Flow Obligations, water delivered downstream pursuant to exchange contracts, water pumped to Union Reservoir, and raw water irrigation of City facilities (i.e. parks and open space).

Downstream Supply

Raw water supplies that exist at a location on the St. Vrain Creek that is not currently available to be used at the water treatment plants. Usually this is water that exists below North 75th Street. Examples include the Lower Ditch transfer cases (when not in virgin flow), wastewater treatment plant effluent, Union Reservoir water, and unchanged ditch or reservoir rights.

Gross Area

A land area that includes the parcel area and public right-of-way.

Gross per capita

Volume of water produced at the water treatment plant divided by the population receiving the treated water.

Parcel Area

A land area, smaller than the gross area, defined in a GIS layer and linked to water meter records and long-term planning maps.

Reference Forecast

First stage in developing water demand forecasts. Water demand estimated based on existing use rates and represents existing conditions in the water system.

Upstream Demand

Raw water demand that exists at either the water treatment plants or as a function of operation of the raw water supply system.

Upstream Supply

Raw water supplies that have either original appropriations to the water treatment plants or have been changed in Water Court to allow use at the water treatment plants. Usually this consists of water rights that exist upstream of North 75th Street, transbasin water, or Lower Ditch transfer chares when the St. Vrain Creek is on virgin flow.

Unit Conversions

1 million gallons (MG) = 3.0689 acre-feet (ac-ft)

1 acre-foot (ac-ft) = 0.32585 million gallons (MG)

1 acre-foot (ac-ft) = 325,850 gallons

1 million gallons per day (mgd) = 1,120.147 acre-feet/year (ac-ft/yr)

1.0 Purpose

The purpose of this study is to develop the methodology and tools needed to streamline the consistent, reproducible, and defensible estimation of raw water demand, treated water demand, peak water demands, and wastewater flows through build-out for the City of Longmont (City). The demands and flow rate estimates are based on a diverse range of land use classifications and assumptions which can subsequently be used to support decisions related to level of participation in the Windy Gap firming project as well as to review water treatment, water distribution, wastewater treatment, and wastewater collection and Capital Improvement Program (CIP) project recommendations as they relate to system capacity and hydraulic performance through build-out to the respective service area boundaries.

This document is intended to be a "living document" providing for routine updates as conditions change and new information becomes available. This will provide the City with increased justification to support fiscally responsible decision making for the benefit of its customers and the community.

This evaluation forecasts the City's Total Water Demand at residential and commercial/industrial build-out. The City of Longmont's water consists of upstream raw water supplies, available to be used at the water treatment plants; and downstream raw water supplies, water not currently available to be used at the water treatment plants, but available to use without treatment as raw water. In addition to treated water demands Longmont has demands for raw water on the downstream portions of its system that also have to be met. An example of these demands are water for exchange purposes that results in additional upstream water supplies, return flow obligations resulting from use of changed irrigation water rights, and raw water irrigation of City facilities. The Total Water Demand is the sum of Treated Water Demand (met from upstream supplies) and Raw Water Demand (downstream demand that is not met by downstream supplies).

2.0 Introduction

The City of Longmont (City) continues to grow and is approaching build-out to its Longmont Planning Area (LPA) boundary. As part of the 2004 Raw Water Master Plan Update, the City developed, cooperatively with the Water Board, a set of twelve Guiding Water Principles, which are summarized in Table 1. These include maintaining a raw water supply sufficient to meet water demands, based on a drought with a 1-in-100-year recurrence interval, and developing flexibility in raw water supply to respond to changes in supply and demand conditions. In support of these principals and in order to make informed, fiscally responsible decisions, the estimation of future water supply needs requires careful consideration of the multiple factors that influence water supply and demand.

TABLE 1
Longmont Guiding Water Principles

Goal	Statement of Goal	Policy Statement
Goal 1	The City will acquire and maintain a raw water supply sufficient to meet the water demands of the City at build-out of the Longmont Planning Area during a drought with a 1-in-100-year recurrence interval.	The City will maintain diligence on conditional water supply projects. The City will continue to meet its Raw Water Quality of Life Benchmark. The City will continue to pursue efforts to maintain and improve the yields of its water rights and interests in regional water projects.
Goal 2	The City will maintain and enforce a Raw Water Requirement Policy that is consistent with other polices adopted by the City, and that support the attainment of the other goals stated in this document.	The City will continue to consistently apply the Raw Water Requirement Policy to all new development in the City. The City will continue to revise the Raw Water Policy as necessary to meet the water supply needs of the City.
Goal 3	The City will acquire, develop, and beneficially use a water supply that consists of water rights in the South Platte and Colorado River basins.	The City's water supply will continue to be composed approximately one-third from the Colorado Big Thompson and Windy Gap projects with the balance from St. Vrain and Left Hand basin water rights.
Goal 4	The City will pursue policies that develop and maintain a high quality raw water supply for delivery to treatment facilities either directly or by exchange.	The City will place highest priority on development and maintenance of water originating in high mountain watersheds, and the storage of that water in mountain reservoirs. The City will integrate other sources of supply, giving highest priority to exchanges. The integration of such supplies into the treatment system will take place as demand requires and when technology of treatment evolves to allow for high quality potable water at reasonable treatment costs.
Goal 5	The City will pursue policies that promote the retention and preservation of water supplies that originate in the St Vrain Basin for use within the St. Vrain Valley.	The City will work cooperatively with the St. Vrain and Left Hand Water Conservancy District and local irrigation companies and water districts to develop and implement strategies that result in the preservation, retention, and use of native water supplies.

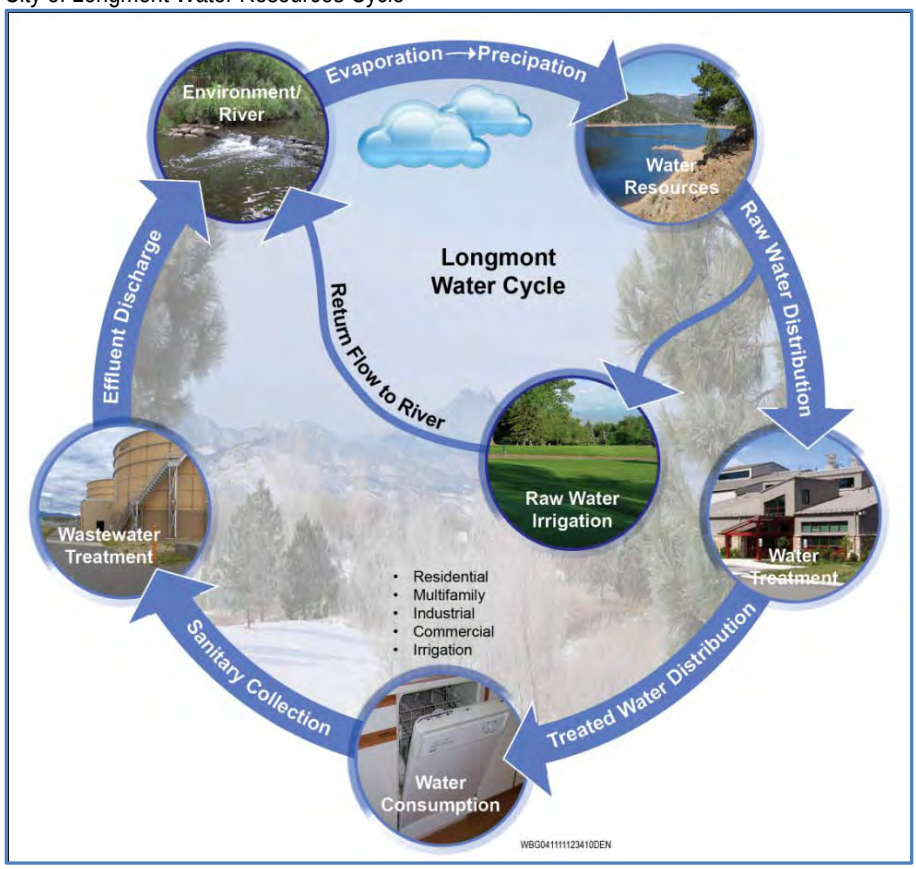
TABLE 1
Longmont Guiding Water Principles

Goal	Statement of Goal	Policy Statement
Goal 6	The City will pursue policies that will protect and improve the quality of the water supplies in the St. Vrain Creek watershed.	The City will continue to develop and implement watershed protection programs, actively participate in implementing projects and programs that improve the water quality of storm water discharges, and discharges from the Wastewater Treatment Plant that are within the Total Maximum Daily Loading of the St. Vrain Creek.
Goal 7	The City will develop and implement a water conservation policy that strives to achieve a sustainable use of its water resources.	The City will strive to achieve water conservation that results in water demands at build out of the Longmont Planning Area that are 10 percent lower than current projections. The City will pursue water development that does not rely on the dry up of agricultural lands.
Goal 8	The City will pursue water policies and operations that minimize adverse environmental impacts.	The City will independently and in partnership with other agencies and organizations evaluate the environmental impacts of water development projects and operate the City's water resource facilities to minimize adverse environmental impacts while not unreasonably diminishing the yield of the City's water supplies.
Goal 9	The City will pursue water policies and operations that promote multiple uses of water.	The City will manage its water resources with the primary goal of meeting the domestic water needs of its customers while also striving to provide for other water uses such as recreational, agricultural, and environmental.
Goal 10	The City will develop a strategy of flexibility in raw water supply that will enable it to respond to changes in supply and demand conditions.	The City will continue to acquire, develop and operate its water supply to provide for the necessary redundancy, flexibility and capacities to address potential changes in climate, system and operational failures, and changes in water demands while maintaining a reliable water supply.
Goal 11	The City will consider regional supply and treatment partnerships and agreements that complement and support other regional goals of the City and clearly benefit the citizens of Longmont.	The Longmont Municipal Charter, Section 11.1, allows the City to provide extraterritorial water service provided the agreements or contracts clearly benefit the inhabitants of the City.
Goal 12	The City will develop strategies to meet the above goals in the most economically beneficially manner for the citizens of Longmont.	The City will continue to evaluate the costs and benefits of all water development strategies and seek to meet the water needs of the community using favorable financing options, encouraging water conservation, efficient project designs, and partnering in regional water projects were appropriate.

One of the most prominent, publicly-visible, factors influencing water demand is the behavior of residential water users (i.e., per capita water use). However, there are many other very complex factors that also influence the amount of water needed. Many municipalities along the Front Range, including Longmont, rely on precipitation and runoff to fill raw water storage reservoirs on an annual basis, in addition to direct raw water supply from surface water.

Climate variability may impact precipitation amounts and patterns, which may change the amount of water available for storage by the City. Increases in average temperature may also impact water demand patterns in the warmer months, even if water conservation practices are encouraged by the City. A simple illustration of the cycle of water resources for the City is provided in Figure 1.

FIGURE 1
City of Longmont Water Resources Cycle



Raw water resources are distributed by the City for many beneficial uses that include raw water for irrigation, treated water for customers, and various water rights obligations. Wastewater from non-consumptive customer use is collected in the sanitary system and conveyed to the wastewater treatment plant. In addition to climate variability and conservation, other factors that may influence the amount of water required throughout the water cycle include efficiency of raw and treated water distribution systems, efficiency of the water treatment process, and new water customers (i.e., industrial or commercial).

Changed conditions since previous master planning efforts, coupled with increased scrutiny in the identification of future raw water demand and CIP requirements, have led to the need to revisit water demand projections. Given the uncertainty of many demand variables, current conditions also required a process to continually update the future water demand projections. The discussion and analysis presented herein utilizes the multiple data sources available to outline a streamlined procedure for the uniform estimation of water demand projections to support raw water supply decisions as well as development of justifiable updates to the existing treated water and wastewater system CIP.

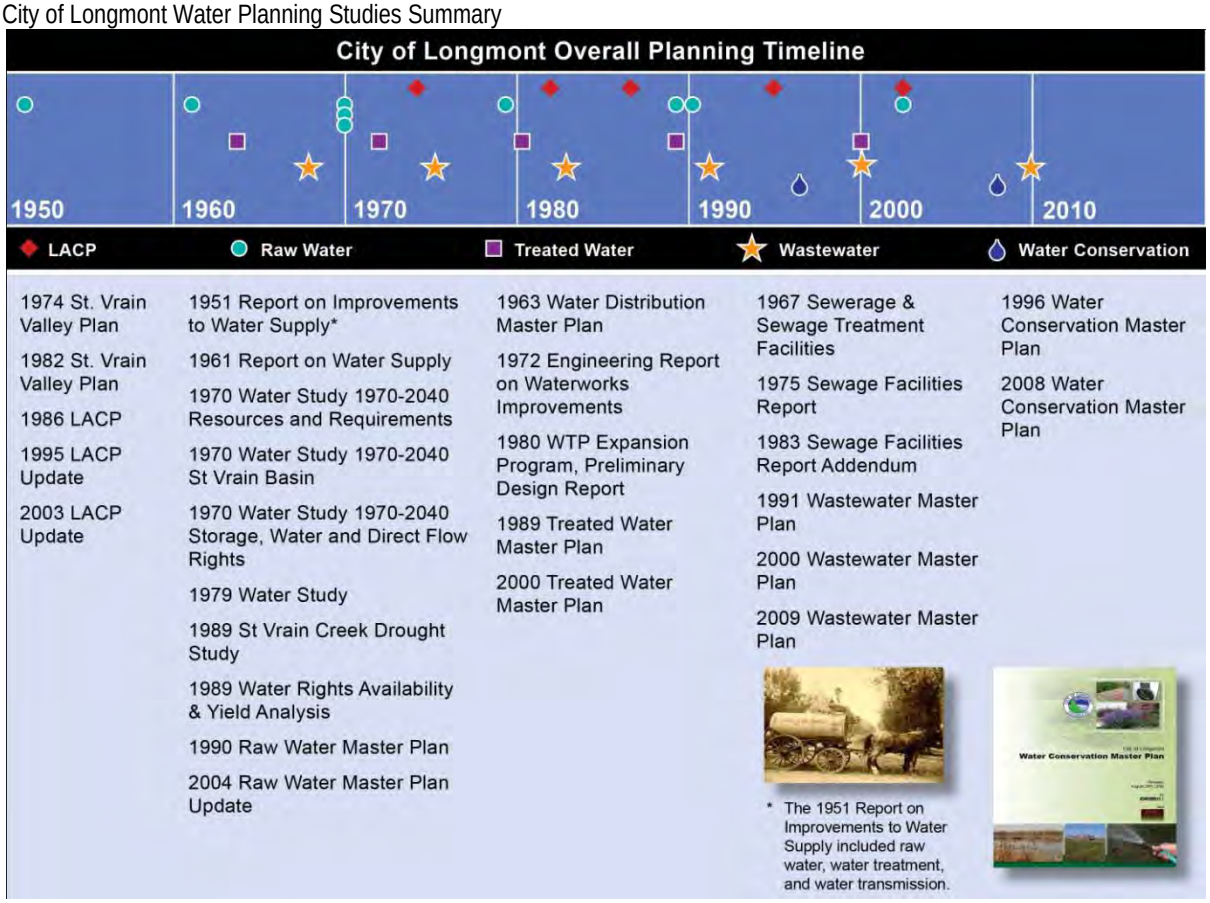
Given that many of the assumptions in the water demand projection are based upon a chosen set of variable parameters and yield from yet to be realized projects, these future water demand projections require an iterative process. As time goes on and assumptions are verified or changed the future demand projections will need to be updated. This study has set up the process that will allow the iterative process to occur.

3.0 Background

3.1 Introduction of the City's Water Planning

The City's Public Works and Natural Resources Department has a strong planning background, which began more than 50 years ago to develop water resources and infrastructure that would sustain the quality of life valued by its residents. The Longmont Area Comprehensive Plan (LACP), historically called the St. Vrain Valley Plan, has served as a guiding document for community development. The plan map establishes planning boundaries, land use areas, and identifies community facilities. One component of the LACP is a summary of existing and forecasted development in terms of population and land use, which influences Public Works infrastructure. Planning effort for raw water supply, water treatment and distribution, wastewater collection and treatment, and water conservation have used information from the LACP to plan for the future. A summary of these planning studies since 1950 is provided in Figure 2.

FIGURE 2
City of Longmont Water Planning Studies Summary



The earliest planning studies were for raw water supply, emphasizing the importance of establishing a robust water supply portfolio. Adequate and early planning for water supply has given the City a strong water supply foundation. As the City approaches more advanced stages of planning, closer to build-out, it is important to continue to align water planning with the community vision provided in the LACP.

3.2 Longmont Area Comprehensive Plan

The City has a long history of community planning. The following excerpt from the LACP (adopted on August 26, 2003, and including Amendments through April 11, 2006) provides a brief synopsis of these historical efforts as they relate to land-use planning in the area.

> *The Longmont Community has a tradition of City planning that dates back to the establishment of the Chicago Colorado Colony in 1871. With the adoption of the St. Vrain Valley Plan in 1974, the City solidified this tradition in response to a period of rapid growth and change. The City revised the St. Vrain Valley Plan in 1982. In 1986, the City of Longmont again revised the St. Vrain Valley Plan, in response to conditions affecting the City at that time, and renamed it the Longmont Area Comprehensive Plan. The City updated the Longmont Area Comprehensive Plan in 1995 and again in 2003.*

Much has changed since those early planning efforts. The planning concepts have evolved from a "Prime Urbanized Area," establishing an area within which the City would provide services, effectively discouraging urban sprawl (City of Longmont St. Vrain Valley Plan, 1974), to development of the Three-Tier System, developed as part of the 1982 City of Longmont St. Vrain Valley Plan Update, that is still in use today with slight modifications. The latter established the following planning tiers:

- **Tier One –** The Municipal Service Area (MSA) is the area that the City considers appropriate for urban development and intends to annex and provide urban services; it represents the greatest level of public investment for installation and maintenance of capital improvements.
- **Tier Two –** The Longmont Planning Area (LPA) is the next tier outside the MSA. The City plans these areas in advance using the neighborhood planning area concept. Neighborhood planning areas are the basis planning unit; they include a mix of land uses that serves residents and workforce. The areas may be defined by streets, creeks, ditches, natural drainage boundaries, or infrastructure features that may increase cost-effectiveness of expansion.
- **Tier Three –** The St. Vrain Valley Planning Area (SVVPA) is the next tier outside the LPA. Changes to land use, transportation, and water rights in this area may impact the City, and are monitored by the City so it can understand all opportunities and constraints.

A map of the Longmont area showing the three tiers is provided in Attachment 1, Longmont Area Comprehensive Plan (LACP) Maps.

The most recent LACP summarizes the community's vision for the future, establishing policy and guidelines for growth and development. Included within the LACP are 14 land

use classifications that have been established by the City and are summarized in Table 2. Detailed definitions of the various land use classifications are included in Attachment 2, LACP Land Use Classifications.

TABLE 2
Land Use Classifications Established by Longmont Area Comprehensive Plan (LACP)

Residential Land Use	Commercial Land Use
Ultra Low Density Residential	Neighborhood Commercial
Very Low Density Residential	Multi-Neighborhood Commercial
Low Density Residential	Regional Commercial
Medium Density Residential	Central Business District
High Density Residential	Strip Commercial
	Mixed Use Corridor
Public Land Use	**Employment Land Use**
Public/Quasi Public	Industrial/Economic Development
Parks, Greenways, Open Space	

The LACP is a dynamic document that represents existing and anticipated land use classifications and development densities at a snapshot in time. The LACP map that was used for this study includes amendments through July 27, 2010 (see Attachment 1).

3.3 Previous Water Utility Master Planning Studies

This section provides a summary of planning studies completed by the City in the areas of raw water supply, water treatment and distribution, wastewater collection and treatment, and water conservation. More explanation on the basis for water demand estimation has been included for certain studies, where appropriate, in order to frame the analysis completed for this evaluation. Previous Raw Water Master Plans have evaluated the Total Water Demand, while previous Treated Water Master Plans have evaluated the raw water need to meet the Treated Water Demand.

The term gross per capita consumption is simply the volume of water produced at the water treatment plant divided by the population receiving the treated water. It does not separate out commercial water use, industrial water use, City water use (such as at school districts, parks, greenways) or losses in the distribution system.

3.3.1 Raw Water

Since 1951, the City has completed ten studies related to raw water planning, listed in Figure 2. The most recent plans were the 1990 Raw Water Master Plan and its update in 2004. The 2004 Raw Water Master Plan Update forecasted water use through 2048, using the Treated Water Master Plan (TWMP) from 2000 as a starting point and applying a similar methodology. Forecasted water use was updated based on new estimates for build-out population and future water use by some industrial customers. Population estimates decreased compared to previous plans due to land use amendments and Boulder County open space purchases within the LPA.

3.3.2 Treated Water

Since 1951, the City has completed six studies related to water treatment, distribution, and treated water demands. Five studies are summarized below, excluding the 1980 Preliminary Design Report for the new water treatment plant. These summaries are meant to focus on historic background information that is relevant to this evaluation. More detailed excerpts from these previous evaluations are included in Attachment 3, Excerpts from Previous TWMPs. The LACP planning map that was updated December 28, 1999, and used as the basis for the 2000 TWMPs is included as Attachment 4, LACP Map as of December 28, 1999.

Report on Improvements to Water Supply System (1951)

The 1951 report studied the "City of Longmont Water System facilities" to project demands through a 20-year planning horizon based on population estimates from the U.S. census. The study acknowledged data reliability concerns regarding filter plant discharge and operational limitations resulting in excessive overflows, making it difficult to determine end use by revenue customers, but stated a belief that forecasted water requirements were substantively correct. The results are summarized in Table 3, with actual numbers (based on a review of historic records) included in italicized text.

TABLE 3
Summary of Projections from 1951 Report on Improvements to Water Supply System

		Water Requirement		
Year	**Population**	**MG/year**	**Acre-feet/year**	**Average daily gross per capita**
1950	8,099	998	3,060	338
1970	12,000	1,400	4,300	319
Actual 1970	*23,800*	*2,396*	*7,353*	*276*

Water Distribution Master Plan (1963)

The Water Distribution Master Plan for Longmont (July 1963) considered U.S. Census Bureau reports in combination with input sought from community leaders and developers related to forecasted area development (location and land use) to estimate population and subsequent water requirements. Analyses were performed to estimate water consumption for various land use classifications (commercial, industrial, etc.) to develop Water Use Analysis Charts to aide in demand projections. The report further considered water losses, including storage and transmission facilities, and rural water use. The combined loss was estimated to represent 20 percent of water treated.

Although the range of investigation in this study extended only to 1980, some projections on the water use analysis table and the water consumption table go to the year 2000. The results are summarized in Table 4, with actual numbers (based on a review of historic records) included in italicized text.

TABLE 4
Summary of Projections from 1963 Water Distribution System Master Plan

		Water Requirement		
Year	**Population**	**MG/year**	**Acre-feet/year**	**Average daily gross per capita**
1960	11,489	1,116	3,428	266
1970	17,500	1,596	4,901	250
1980	27,000	2,513	7,713	255
1990	37,000	3,511	10,777	260
2000	45,000	4,434	13,611	270
Actual 2000	*74,145*	*5,763*	*17,690*	*195*

Engineering Report on Waterworks Improvements (1972)

This evaluation considered census data, billing information, and estimates of outside customer use in combination with the independent consideration of industrial water consumption and unaccounted for water (estimated as 20 percent) to project the population served and future water demands. The rationale for the independent consideration of industrial water use was that it was not expected to be proportionate to population growth. Furthermore, industrial water use was metered at a time when most of the single family residential services within the City lacked metering. Industrial use as a percent of total annual water production was found to trend downward from 25 percent in 1964 to 13 percent at the time of the study, with expectations of only modest increases in future industrial consumption. This resulted in the development of net per capita estimates with gross per capita consumption estimates inclusive of the industrial and unaccounted for water consumption.

Compact expansion of the City was anticipated, with growth favorable to the north, west, and south of the City, outside the St. Vrain floodplain, which was viewed as a partial barrier to expansion. It was further assumed that unit water consumption would be consistent with that experienced in 1971 (a noted hot, dry year), which was estimated to be 190 gallons per capita per day (gpcd). The 190 gpcd excluded an estimated 25 percent "unaccounted for" water and metered major industrial users. It was felt that the compact nature of growth would further limit outdoor water use, and the 190 gpcd value embodied "all types of consumption ordinarily found in municipal water service, namely: single-residential, multi-unit residential, commercial, and minor industrial."

The results are summarized in Table 5, with actual numbers (based on a review of historic records) included in italicized text.

TABLE 5
Summary of Projections from 1972 Engineering Report on Waterworks Improvements

		Water Requirement		
Year	**Population**	**MG/year**	**Acre-feet/year**	**Average daily gross per capita**
1970	24,300	2,396	7,400	270
Actual 1970	*23,800*	*2,396*	*7,350*	*276*
1980	40,800	4,000	12,300	269
1990	57,300	5,500	16,900	263
Actual 1990	*52,385*	*4,191*	*12,861*	*219*
1992	60,600	5,800	17,800	262

Treated Water Master Plan (1989)

The scope of this master plan included projecting future service area demands based on population estimates and land use requirements provided by the City Planning Division. Although at the time the MSA was not the treated water service area it was used to develop water demands for treated water. The treated water service area was different from the MSA due to several small areas within the MSA, enclaves that were not part of the City; the MSA also excluded in fill but included rural water services. In comparison, the areas for the established neighborhoods as well as the combined LDR, MDR, and HDR land use classifications from the MSA used to complete the 1989 study are nearly equal to those estimated from the July 2010 LACP.

Forecasted water use for the existing treated water service area was estimated based on a review of historic water consumption data within the service area. The estimation of system-wide average day per capita usage was based on a statistical evaluation of historic 1974 to 1988 treated water production data. This resulted in the selection of the 90th percentile value of 260 gallons per capita per day (gpcd) for evaluating the water distribution system under high use conditions. This assumed design-year per capita usage rate includes unaccounted for water use (system losses and irrigation water use), which was estimated to be approximately 18 percent. The evaluation further assumed consistent water usage between residential customers within the same neighborhood independent of whether service was metered or un-metered.

Future demands for development in the LPA were based on proposed land uses in the planned neighborhoods in combination with the unit consumption rates. Average day unit demand rates for low density residential (LDR), medium density residential (MDR), high density residential HDR, Commercial, Industrial, Open Space, and “Other” land use classifications were estimated based on a review of historic meter data, proposed zoning densities, and representative values from other Colorado Front Range communities.

As noted by the Longmont Planning Division, land use projections suggest a percentage rise in commercial and industrial development over historic patterns, which may lead to an estimated increase in the per capita consumption rate to 305 gpcd at build-out. Population

projections for the study were also provided by the Longmont Planning Division. Table 6 summarizes demand projections resulting from the study.

TABLE 6
Summary of Projections from 1989 Treated Water Master Plan

		Water Requirement		
Year	**Population**	**MG/year (mgd)**	**Acre-feet/year**	**Average daily gross per capita**
1990	54,500	5,200 (14.2)	16,000	262
1995	61,200	5,900 (16.2)	18,200	266
2000	68,600	6,800 (18.6)	20,800	271
2010	84,900	8,700 (23.8)	26,800	282
Actual 2010	*88,221*	*5,298 (14.5)*	*16,258*	*165*
Build-Out	120,900	13,500 (37.0)	41,300	305

Treated Water Master Plan (2000)

The 2000 Treated Water Master Plan provided water transmission, treatment, distribution, and storage infrastructure improvement recommendations through build-out to the LPA boundary. Water demands for the established neighborhoods were based on the analysis completed for the 1989 TWMP, plus adjustments for in-fill demands and estimated demands for the City's wastewater treatment plant. Future demands for the planned neighborhoods were based on proposed land in combination with the unit consumption rates.

Historic water meter data from 1993 through 1997, was reviewed to estimate water use rates for various land use classifications (single family residential, multifamily residential, commercial, industrial, and parks). Residential rates were further adjusted to account for authorized use (permitted uses, fire hydrant flushing, etc.), unaccounted for use (unpermitted use, leakage, etc.), and a forecasted reduction in average occupancy rates from 2.52 to 2.2 persons per unit by 2016.

Commercial and industrial water use rates were estimated based on assessments of a small sample of metered users. Assessment of commercial and industrial demands was conducted for Longs Peak Industrial Park south of Highway 119, Longs Peak Industrial Park north of Highway 119, and the Saint Vrain Centre. Commercial assessments were conducted for customers between the 200 and 300 blocks along Main Street and the Twin Peaks Mall. Demand projections from the 2000 Treated Water Master Plan are summarized in Table 7.

TABLE 7
Summary of Projections from 2000 Treated Water Master Plan

		Water Requirement			
Year	**Population**	**MGD**	**MG/year**	**Acre-feet/year**	**Average daily gross per capita**
1998	62,785	13.7	5,000	15,300	218
2010	84,000	20.4	7,400	22,900	243
Actual 2010	*88,221*	*14.5*	*5,298*	*16,258*	*165*
2020	94,000	24.6	9,000	27,500	261
2028	108,000	29.2	10,600	32,700	270
2048	108,000	33.0	12,000	37,000	306

3.3.3 Wastewater

Flow to the wastewater treatment plant (WWTP) is generally comprised of base flow from residential, commercial, and industrial customers; groundwater infiltration; and wet weather inflow and infiltration. The most recent wastewater treatment master plan was completed in 2009. Wastewater flow projections were estimated based on per capita flow (excluding industrial), calculated from the average during 2000 to 2007. Industrial flow was accounted for separately, and was not quantified on a per capita basis. The population at build-out for this evaluation was assumed to be 101,679, which was based on the most recent information at the time. The estimated population at build-out has since been updated in the July 2010 LACP revision to 112,953.

Water conservation and collection system improvements to reduce inflow and infiltration have impacted flows to the WWTP. As the population of the service area has increased, the per capita contribution to the WWTP has decreased, resulting in a steady flow at the WWTP with minimal increase. Results from treated water demand projections directly correlate to the base flow at the WWTP and could be used to continue refining WWTP flow projections.

3.3.4 Water Conservation

The most recent Water Conservation Master Plan (WCMP) was completed in 2008. Treated water use projections summarized in the WCMP were estimated through 2017, a short-term planning horizon and are intended to be updated every 3 to 5 years so the City can monitor water conservation progress and adjust implementation of measures and programs. Water demand at build out was not included in this evaluation. The WCMP did not include long-term forecasts to build-out and did not account for water usage by potential future large industrial users that would increase the gross per capita usage. Demand projections did not account for changes in land use classifications and undeveloped areas. Projections in the WCMP were meant for the short term water conservation purposes and should not be directly translated to long-term planning.

For the WCMP, residential and multi-family water usage was estimated on a per capita basis from a review of historic water meter data for the periods 2001 to 2002 and

2004 to 2006; year 2003 was not considered due to drought impacts. Treated water demand projections for small commercial uses were based on an annual growth rate of 1.7 percent, which was derived from Building Department projections of small commercial building square footage growth from 2008 to 2012. Small commercial percent growth was forecasted starting from the average water usage from 2000 to 2006. Forecasted demands for the two large industrial customers were accounted for in the plan. One industrial customer provided water use projections; the projection for the second large user was based on average use for the last 5 years with no increase.

Based on the data analysis for the WCMP, the per capita treated water use has decreased, which could be attributed to several factors, including more accountability from completely metered residential customers, proximity to a severe drought year, conversion of irrigation systems to raw water, and conservation efforts. However, given the short-term purpose of these projections to adjust conservation efforts, this per capita usage is not recommended for long-term planning, as it would need to be modified to account for future industrial customers not yet served by the City and other land use changes.

3.3.5 Summary

Based on the intended use of each plan, various methods have been used to estimate treated water demands. However, none have included a comprehensive evaluation of raw water demands such as irrigation and return flow obligations. Following is a brief description of the basis of estimation for the two most recent master plans and explanations for some of the variances. A summary of results of treated water demand from recent master plans is provided in Table 8. The values in Table 8 do not include additional raw water demands on the supply system.

TABLE 8
Recent Completed Water Master Plans – Treated Water Demand Summary[1]

Master Plan	Estimated Build-Out Population	Estimated Treated Water Demand at Build-Out	Gross Treated Water Per Capita (gpcd)
Treated Water Master Plan (2000)	108,000	2048: 33 MGD average day (36,965 acre-feet annually)	2048: 306 gpcd
Raw Water Master Plan Update (2004)	104,000	2048: 30 MGD average day (33,800 acre-feet annually)	2048: 290 gpcd

[1] Values do not include raw water demands for irrigation and return flow obligations, etc.

Gross treated water per capita represents water use by all customer segments (residential, multi-family, commercial, industrial) quantified per resident. The estimated population at build-out has since been updated in the July 2010 LACP revision to 112,953.

Previous Master Plan Analysis

During review of previous master plans, some methodologies were identified that were not as refined compared to the current method. This difference is important in explaining the divergence between previous total water demand projections and those established from the current analysis.

The 2000 TWMP forecasted water use through build-out of the LPA. Commercial and industrial water use rates were estimated based on assessments of a small sample of metered users. The assessment of commercial demand conducted for the 200 and 300 block of Main Street (with gross area corrected to 11.9 acres) and the Twin Peak Mall based on 1996 water consumption records resulted in average day commercial water use of 2,240 and 1,080 gpdga, respectively. The three areas assessed to represent industrial demands included a mix of both commercial and industrial uses. Parcel area-based usage rates for full and near-full year services and partial-year services were added and used as the rate of consumption for the gross area instead of calculating a weighted average for industrial and commercial usage. This resulted in an inflated water usage per gross acre of 2,750 gpd that was applied to commercial and industrial areas, which may account for the difference between the forecasted 2010 water usage of 20.4 mgd and the actual usage of 14.5 mgd.

To the extent practical and for comparison, attempts were made to recreate the water demand estimates from the 2000 TWMP and the 2004 RWMP using the tools developed for this effort. The results of the comparative analyses for both the 2000 TWMP and the 2004 RWMP correlated well with the values predicted using the tools and processes developed by City staff. The estimated future demand values using the new tools and processes were approximately 6.5 percent higher than those presented in the 2000 TWMP and 0.3 percent lower than in the 2004 RWMP. It was determined that these values were within the margin of error of the analysis and that efforts to further refine assumptions in an attempt to more closely match the estimates identified in the previous reports did not warrant the additional effort required. This comparative analysis provides further validation of the methodology utilized to estimate future water demands.

3.4 Summary

In summary, each master plan has used a different approach to forecasting water demand, and there was not an LACP established for plans prior to the 1989 TWMP. Treated water demand forecast methodologies have included a combination of both per capita water use and water use rates tied to land use. A consistent and reproducible methodology for water demand estimation was needed that could be universally applied across the various master planning efforts to support routine updates of those plans. This need was one of the main drivers for this project.

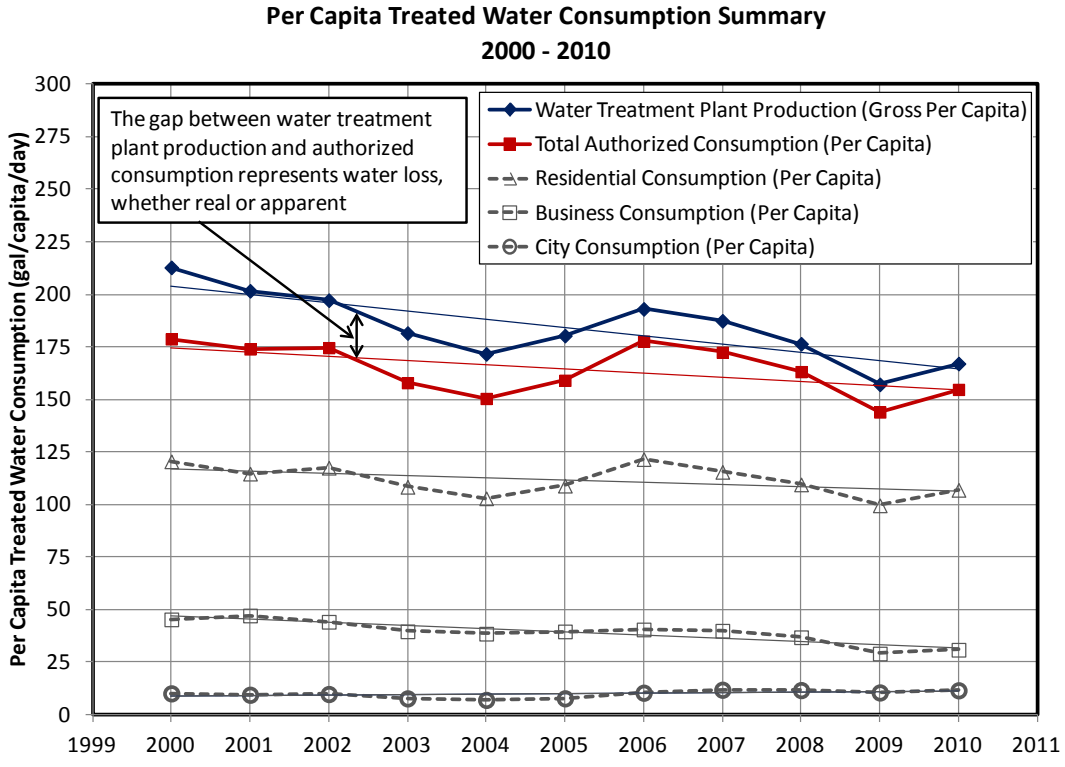
4.0 Project Drivers

Changed conditions since previous master planning efforts, coupled with the need to quantify long-term raw water supply requirements through build-out to the service area boundary, and has led to a need to update water demand projections as well as review CIP recommendations for the City's water and wastewater systems.

A decrease in overall gross per capita treated water use has continued since 2000.

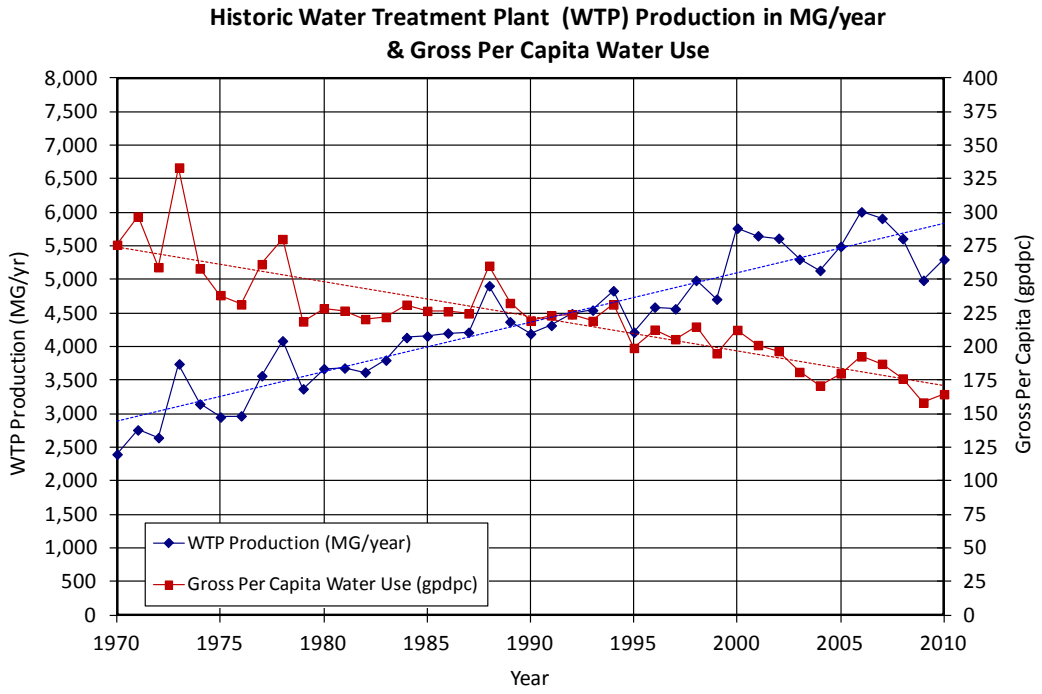
A decrease in overall per capita treated water use has continued since the 2000 TWMP, as illustrated in Figure 3, which shows trends of water consumption since 2000 for three main customer groups, the total of these groups, and water treatment plant production. Treatment plant production is measured at the treatment plants and represents treated water entering the distribution system. Authorized Consumption is the billed and unbilled metered consumption from the City's billing system, and an estimated amount of unmetered authorized consumption. The gap between water treatment plant production and authorized consumption represents water loss, whether real or apparent. Per capita usage is shown separately for residential, business, and City customer segments in Figure 3.

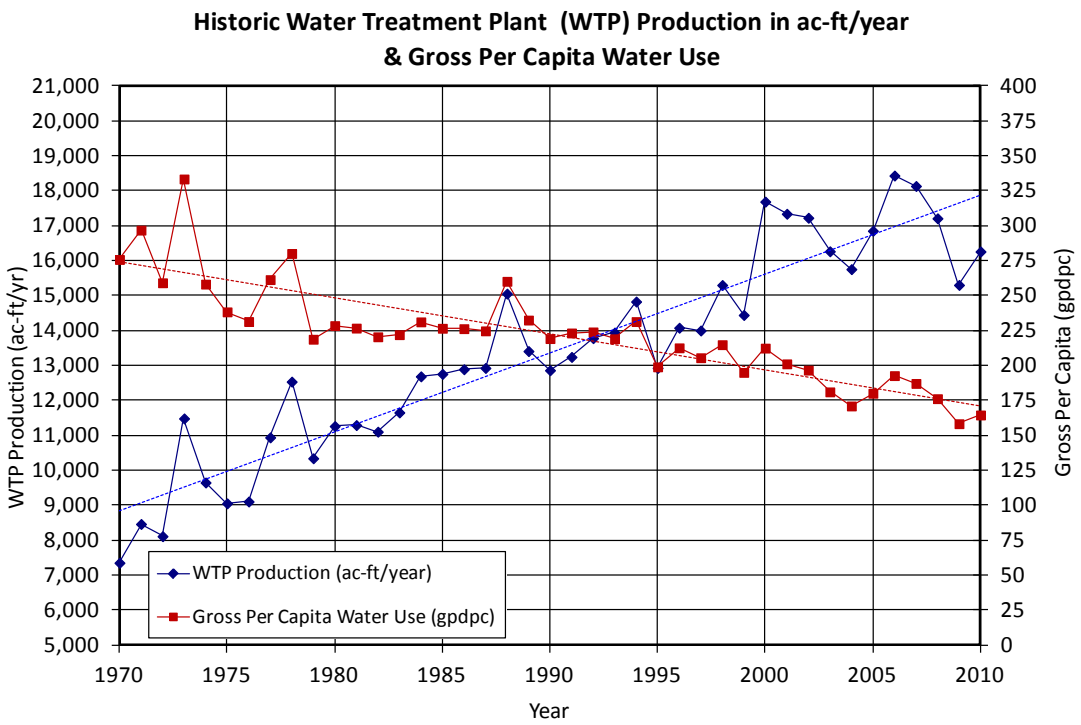
FIGURE 3
Per Capita Treated Water Consumption (2000-2010)



The decreasing trend of per capita treated water use is also apparent in Figure 4, which includes historical per capita and WTP production since 1970. The average-day per capita water production shown on the graph includes all water uses such as business, residential, public, and water losses. Metered consumption by rate code is available from the City's Banner billing system since 2000; however, the City has been fully metered only since 2006, so consumption for flat rate residential customers is an estimate.

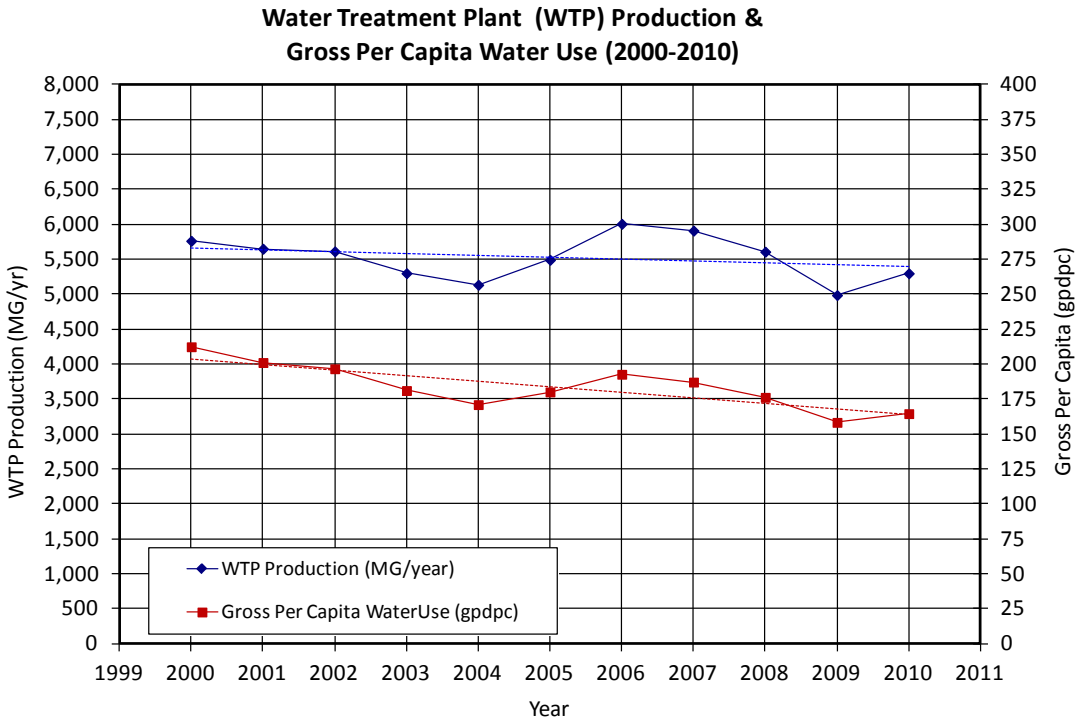
FIGURE 4
Water Treatment Plant Production and Gross Per Capita Treated Water Production (1970-2010) in MG and acre-feet





The same per capita data for more recent years, from 2000 to 2010, is shown in Figure 5.

FIGURE 5
Water Treatment Plant Production and Gross Per Capita Treated Water Production (2000 to 2010)



It is speculated the reduction in per capita usage and production may be attributed to a variety of factors including, but not limited to, better accounting of water use, increased metering of customers, reduction in water loss, media attention on drought conditions, and increased water conservation practices. Residential water accounts were not fully metered until the end of 2006, and since that time this additional data has allowed for refinement of the estimated unit demand rates used for planning purposes and quantification of the volume of water losses.

Usage trends are one of many circumstances driving the need for this evaluation. Other reasons include the following differences from previous master planning efforts:

- Better accounting of water though full metering. This has resulted in a general overall reduction in per capita consumption.
- Changes in land use in the comprehensive plan. For example, large areas north of Highway 66 previously identified as Industrial Economic Development uses are now VLDR, ULDR, Mixed Use and Parks, Greenway, and Open Space.
- Water conservation due to drought and changes in consumer habits.
- Increased use of raw water for irrigation and projections for additional conversion of irrigation to raw water irrigation. This has resulted in a reduction in required treatment capacity and distribution system capacity improvements.
- Need to assess the sensitivity of water demand projections relative to the multiple assumptions required to complete the analysis (i.e., land-use classifications, development density, redevelopment, industrial consumption, climate variability, etc.).
- As the City continues to approach build-out, a larger percentage of undeveloped area remains in commercial and industrial land use,
- Improved geographic information system (GIS) technology and tools for evaluating unit demand rates.

5.0 Existing Total Water Demand Evaluation

The methods to estimate future treated water demand will be based on water use associated with existing and future land use classifications. Estimating appropriate unit demand rates requires detailed analysis of existing data, as well as assumptions related to impacts that redevelopment may have relative to these unit demand rates. The resultant unit demand rates for each of the land use classifications can then be applied to estimate future demands associated with new development and/or redevelopment within the City's service area boundary. The methodology outlined herein allows the City to update projections as land use changes are made within the LPA. Given the dynamic nature of planning for the future, it is prudent to assess the sensitivity of underlying assumptions on the resultant estimated water demand.

Water demand forecasts prepared in this evaluation are sectoral, meaning unit demand rates were developed for each customer class, which were added together with other identified demands to determine the total. Development of demand forecasts was generally performed in two stages, which are consistent with recommendations from the AWWA reference Forecasting Urban Water Demand (Billings). First, future water demands were estimated based on current use rates. Referred to as the reference forecast, this represents existing conditions in the water system. The second stage works towards development of the adjusted forecast. The adjusted forecast works from the reference forecast and adds or subtracts water demand due to additional parameters, such as water conservation, changes in development, or climate variations. These forecasts are more complex, but allow the City to add, remove, and adjust individual assumptions that impact water demand. As the number of variable assumptions increases, so increases the complexity of evaluating future water demands. The following sections discuss the stages toward developing the reference and adjusted forecasts beginning with data collection, the foundation of water demand forecasting.

5.1 Available Information

Data collection is an important component of water demand forecasting and provides the foundation for building the methodology that will be applied to estimating future demands. This section discusses available data for potable and raw water for the City.

5.1.1 Treated Water

Boulder and Weld County Land Parcels

The Boulder and Weld County Assessor offices maintain parcel information in GIS systems. The parcel attributes include parcel number, owner name, parcel address, legal description, assessor classification, and parcel area. The parcel layers serve as the common link for the water meter records and the long-term planning maps.

Water Meter Records (Banner/Hansen databases)

Water consumption data from the Banner database for 2000 to 2010 was reviewed to estimate existing water consumption. The data from this database, along with the Hansen database of detailed meter information, was linked to parcel data in the City's GIS system to assign water meter records to specific parcels. Along with monthly water consumption, these databases contain premise codes, service numbers, rate codes, customer names, premise addresses, meter sizes, serial numbers, service status, and meter location descriptions. The premise code is a unique number assigned to each premise address. Service numbers are assigned for each City service on each premise in increments of 100. For example, the 100 series is used for electrical services and the 200 series is used for water services. An analysis of the data was performed to identify and correct meter readings that had readings that could be in error. In total there were 42 services identified with meter reporting errors that were corrected for this evaluation. The errors appeared to involve data entry error and incorrect activity codes.

Longmont Area Comprehensive Plan (LACP)

The City planning staff maintains the long-term land use planning maps in the LACP in the City's GIS system, including the three-tier planning system, neighborhood planning areas, and land use classifications. The Department of Planning and Development Services (Planning) also provided the redevelopment focus areas in GIS for further evaluation. There are four redevelopment focus areas identified by the City: Midtown, Downtown, Twin Peaks Mall, and Southeast Urban Renewal (including the flour mill, sugar factory, and FasTracks). A map identifying the Redevelopment Focus Areas is provided in Attachment 5, Map of Redevelopment Focus Areas. Each GIS layer was joined to the parcel layers to add the planning attributes to the parcels. LACP maps used for this evaluation from the LACP are provided in Attachment 1.

Water Treatment Plant Efficiency

As a result of minor process inefficiencies the amount of water conveyed to the WTP is more than the amount of treated water produced from the WTP. Sedimentation basin underflow, spent backwash water, and filtered water that is not conveyed to disinfection (filter to waste), is sent to lagoons. Even though recycle streams from the lagoons increase plant efficiency there is water loss due to evaporation, seepage, and drying operations. The percent of treated water produced compared to influent water is the plant efficiency. For the past three years (2008-2010) the Nelson-Flanders WTP has operated at efficiencies between 94 to 95 percent.

5.1.2 Raw Water

A significant amount of raw water that is not treated for drinking water is required to operate the Longmont water supply system. Meeting the City's raw and treated water demands is an ongoing, complex process of moving water through reservoirs, streams, and ditches while considering water exchanges, water transfers, flow obligations, and other water rights issues. The St Vrain river basin captures drainage from approximately 214 square miles from the canyon area west of Lyons, Colorado. In an average year the basin produces approximately 114,000 acre-feet of water. Use of this native basin water by the

City of Longmont is approximately 8 percent of the total, and represents only one component of the larger realm of water rights associated with the basin.

The following components contribute to the demand of raw water (not for drinking water) and must be accounted for in the evaluation:

- **Water Leases and Exchanges –** A water exchange allows an upstream diverter to take water that would usually flow to a downstream diverter, if the upstream diverter provides a suitable replacement supply of water to the downstream diverter at the same point and time.
- **Return Flow Obligation and Union Reservoir Replacement Obligation –** Return flow is water that previously returned to streams and rivers after it was applied to beneficial use, both as direct surface flow or from tributary groundwater.
- **Union Reservoir Pumpback Pipeline –** Stored water pumped from Union Reservoir back upstream would allow ditch shares currently being used for raw water irrigation to be made available for use at water treatment plants, and increase reliability of winter raw water supply by exchanging with ditch water that would otherwise be diverted for storage.
- **Raw Water Irrigation –** Raw water is used for irrigation throughout the City and School District Facilities.
- **Raw Water Supply Losses –** These are water losses due to surface evaporation or as a result of conveyance from the reservoir to the water treatment plant, including stream loss and pipeline loss.

The City's raw water supply system is illustrated in Figure 6 and illustrates the watershed areas from which Longmont receives its Raw Water Supply. Approximately 1/2 to 2/3 of Longmont's water supply comes from the Saint Vrain Creek Basin, the "Native Basin Supply". Approximately 1/3 to 1/2 of the City's water supply comes from the Colorado River Basin on the western slope of Colorado, then delivered through the Colorado-Big Thompson project (C-BT) to Longmont's treatment plants. Water from both sides of the continental divide primarily originates in Rocky Mountain National Park and the Indian Peaks Wilderness area. This results in a naturally excellent raw water supply for eventual treatment and distribution to the citizens of Longmont.

Longmont's Native Basin water flows down the North and South Saint Vrain Creeks, where it is diverted in the foothills west of Lyons for treatment, or stored in Ralph Price Reservoir for later delivery to Longmont. The Colorado River water is delivered by the C-BT system to Carter Lake. At that point it is stored for later release to Longmont through either the Saint Vrain Supply Canal or the Carter Lake Connecting Pipeline. These sources, above the water treatment plants, are considered "upstream raw water supplies".

Raw water is then treated at either the City's Nelson-Flanders Water Treatment Plant (WTP) or the Wade Gaddis WTP; both plants are located west of Longmont. After use on the City's system and treatment at the Wastewater Treatment Plant (WWTP), the water returns to the Saint Vrain Creek for later diversion by water users downstream of Longmont. These sources, below the water treatment plants, are considered "downstream raw water supplies" and are discussed in Section 6.2.7.

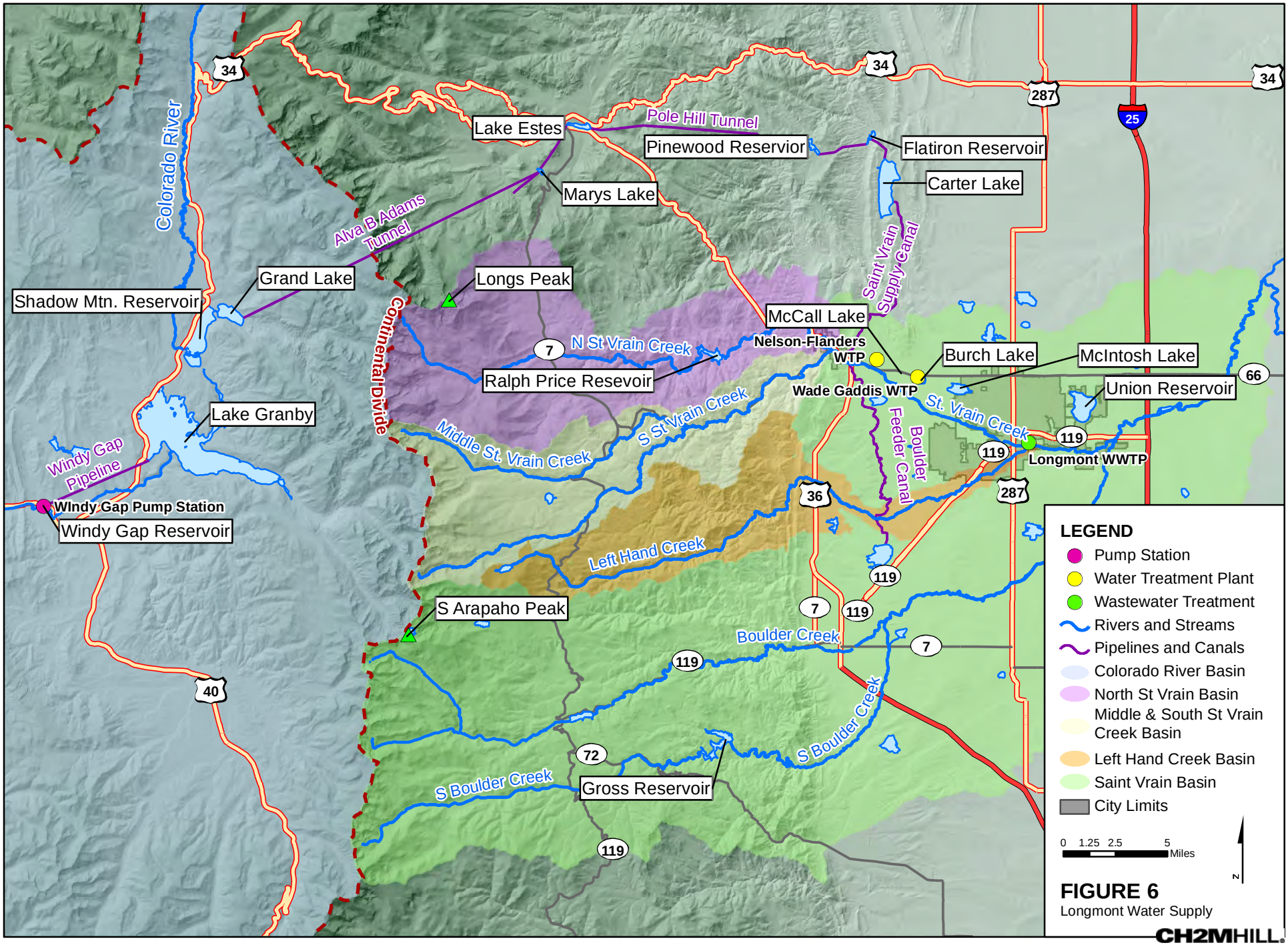


FIGURE 6
Longmont Water Supply

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5.2 Water Demand Assumptions

Even with substantial amounts of data on existing water use for raw and treated water, it is not possible to account for all future changes, whether planned or unforeseen. To define the limits of the following analysis for projecting total water demand for the City, a number of assumptions were required. Many of the assumptions are related to future development throughout the City and the resultant land uses. Discussions were held between Public Works and Natural Resources and Planning to review the list of assumptions. Planning provided input on service area boundaries, land use classifications, and focus areas for redevelopment.

There are two sets of assumptions listed: reference forecast assumptions and variable assumptions for the adjusted forecast. Assumptions for the reference forecast are the absolute minimum requirements to be accounted for during planning. The impact of changes to the assumptions listed in the variable category were further evaluated; it is recommended these impacts are accounted for in the total future water demand and assumptions updated regularly. A more detailed list of assumptions and the potential impacts to future water demands are summarized in Attachment 6, Water Demand Evaluation Assumptions. Supporting notes from the June 22, 2009, meeting with Planning are included in Attachment 7, Meeting Summary with Planning and Development Services. The variability of assumptions is discussed in Section 6.4, Variable Assumptions for Adjusted Forecast. Assumptions for the reference forecast that impact total water demands are listed in Table 9.

TABLE 9
List of Assumptions for Reference Forecast

List of Assumptions for Reference Forecast
1. The LPA as amended in July 27, 2010, is the basis for the water service and land use to build-out.
2. Rate of new development through build-out of the LPA will occur as forecasted in the 2004 RWMP.
3. Undeveloped parcels within existing developments will develop in a similar fashion to the surrounding existing developments (i.e., no significant re-development of existing property).
4. Unit rate of consumption for existing customers will remain consistent with existing demands.
5. Unit rate of consumption for new development will be consistent with that for existing customers within the same land use classification.
6. No significant new high-water-use industrial users will be added to the system.
7. Regulatory climate and laws will not impact future water consumption or uses.
8. Climate variability will not affect future consumption rates.
9. Non-consumptive water use (in-stream flows, recreational uses, bulk system interconnects) will remain consistent with 2009 demand
10. No new taps outside the water service area will be added. Consumptive use from existing outside taps (including the Town of Lyons and Hygiene) will remain at 2008 values.
11. Development within the limits of flood plain will be similar to other similarly zoned properties and have water demand similar to that land use classification.
12. Subdivisions in the LPA currently served by other water providers will continue to be served by other water providers and not the City.

5.3 Unit Demand Rate Analysis

With the available information established and the assumptions defined, the analysis to determine treated water unit demand rates can proceed. The analysis procedure is described below for treated water. Components of the raw water system are also discussed.

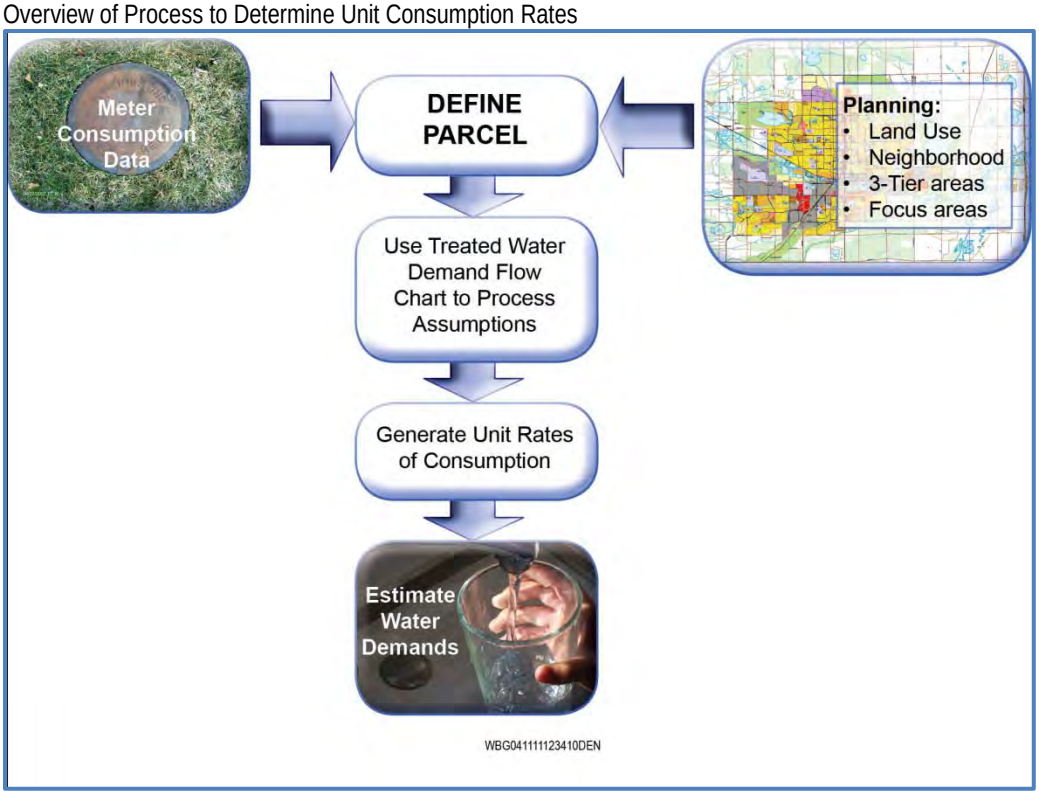
5.3.1 Existing Treated Water Demand

Unit demand rates for each of the land use classifications included within the LACP were developed based on a review of historic water records. The City's GIS, in combination with Microsoft Excel spreadsheets and pivot tables, were used to complete the evaluation. Considerable effort was completed by the City to thoroughly review and modify, as appropriate, the multiple data sets and GIS coverage to increase confidence in analysis results. The following summarizes the methodology utilized.

Analysis Methodology

The components of the analysis methodology include spatial distribution (i.e., meter consumption), geo-processing of land use data (i.e., planning information), and parcel characterization. The process is depicted graphically in Figure 7, followed by a more detailed discussion.

FIGURE 7
Overview of Process to Determine Unit Consumption Rates



Spatial Distribution

The first step in distributing approximately 27,100 Banner/Hansen water meter records to 32,100 parcels in Boulder County and 2,400 parcels in Weld County in the SVVPA is recognizing that joining the meters to the parcels involves three database relationships: one-to-one, many-to-one (both directions), and many-to-many. Although the large majority of the relationships are one meter to one parcel, there are approximately 2,150 meters and 4,070 parcels that belong to the other two relationships. Examples include:

- Townhouses and condominiums with one meter to each building that are composed of separate parcels for each unit
- Irrigation systems that may irrigate all of the residential out lots in a subdivision filing
- Commercial properties with one or more meters to buildings and separate meters for irrigation
- City facilities such as the Civic Center, most larger parks, and the WWTP that are served by multiple meters

There are also approximately 160 meters for arterial irrigation in public right-of-way that are not associated with a parcel and four meters that export water outside the SVVPA.

The premise code in the Banner database was a possible choice as the field to match the two databases; however, the premise code is assigned using the full address including unit number. As a result, different premise codes are assigned for meters that serve different buildings on the same parcel, or for each meter that serves attached units with different addresses on separate parcels. Instead, the parcel number was used for the one-to-one relationships, and a unique identification was manually assigned for the other relationships.

Joining the databases was completed in spreadsheets using the data exported from the GIS system. The two tables were initially joined using parcel addresses. Over 90 percent of the one meter to one parcel relationships can be joined after correcting many thousands of records with spelling differences, such as Sherrimar versus Sherri Mar or Greys Peak versus Grays Peak; different suffix conventions, such as Ave versus Av; the use of abbreviations, such as Mt versus Mount; and typographic errors. The remaining records were individually reviewed and matched with considerable assistance from Mapping, Utility Operations, and Parks staff. As a result, all of the meters were associated with parcels, and the City also has a fully populated water meter GIS layer.

Geo-processing of Land Use Data

Geo-processing is a term that describes GIS tools that allow the user to combine the spatial and database attributes of different GIS layers. Each of the long-term land use planning maps in the LACP, including the three-tier planning areas, neighborhoods and land-use classifications, and the redevelopment focus areas, are available in the City's GIS system. The three-tier planning layer was used to reduce the much larger county parcel GIS layers to the parcels in the SVVPA and further identify the parcels inside and outside the LPA.

The remaining processing associated the neighborhood and land use with each parcel, and provided both the parcel and gross areas by land use and neighborhood for platted area adjustment of large undeveloped parcels.

Parcel Characterization

With multiple assumptions influencing future water demand requirements within the City's water service area, staff developed a flowchart to guide the evaluation process using the LACP three-tier planning process for managing the expansion of the City to build-out of the LPA. This flowchart, and its associated narrative, is included as Attachment 8, Treated Water Demand Evaluation Process Flowchart and Narrative. The flowchart includes a number of decision points to determine how parcels within the SVVPA should be incorporated into the water demand analysis. The flowchart outlines a process of categorizing parcels to determine which parcels are currently receiving treated water service from the City, and which have water consumption that is representative of the associated land use classification. It also categorizes which parcels will receive future treated water service based on the associated land use, and which parcels will never receive treated water service from the City.

The first category is parcels inside the SVVPA but outside the LPA. The assumption is that the City will continue to provide treated water service to the parcels that the City has historically served, but will not provide treated water service to the remaining parcels except for those applications for individual water service outside city limits that are approved by City Council.

The second category is parcels inside the LPA that are currently served by another water provider, either Left Hand Water District (LHWD) or Longs Peak Water District (LPWD). The assumption is that the City will not provide water service to the three subdivisions in the southwest part of the City currently served by LHWD and the two subdivisions north of Highway 66 currently served by LPWD.

The third category is Public/Quasi-Public, Parks, Greenways, and Open Space parcels inside the LPA. Several decisions are required to process these parcels because a significant portion will never receive treated water service from the City, and many that do or will receive treated water service use raw water for irrigation. Unless the City is currently providing treated water service to a parcel or a proposed community facility is designated in the LACP for the parcel, the assumption is that the City will never provide treated water service to the parcel. These are primarily water bodies, including Union Reservoir and Lake McIntosh, open space owned by the City of Longmont and the County of Boulder, and railroad tracks. The remaining public parcels are categorized based on current treated water service with or without raw water irrigation and conversion of irrigation to raw water.

The fourth category is privately-owned parcels inside the LPA that are not in subdivisions served by another water provider. This includes six commercial/industrial land uses, five residential land uses, and one mixed-use corridor land use. For the purpose of adjusting parcel area to account for platting, the assumption is that parcels larger than 10 acres classified by the county assessor as vacant land or agricultural land are not final platted, and the final platted parcel areas will have the same parcel-to-gross-area ratio as the average ratios for the remaining commercial/industrial and residential land uses; see Table 10. The remaining parcels with 10 or more monthly readings are considered representative rates of consumption for the designated land use to calculate the treated water demand. Unit demand rates by land use classification are summarized in Table 11.

Additional detail on the process of parcel characterization is included in Attachment 8.

Observations during Analysis

Outliers: Spreadsheet plots of unit water consumption versus area were developed for each land use classification to assess whether significant outliers existed in the datasets that could artificially inflate or deflate unit demand estimates that will subsequently be utilized to project future demands for undeveloped areas. Significant outliers were individually researched to determine the source and validate the legitimacy of these demands for inclusion within the evaluation. In many cases, the outliers were incorrectly distributed water consumption to parcels involving the many-to-one or many-to-many relationships. In all other cases investigated, the validity of these demands was substantiated and thus included in the development of unit demand rates for the applicable land use classification. This is important because the assumption was made that water demands for future development would be consistent with that of existing customers having the same land-use designation.

Percentile Graphs: As an additional measure of data, distribution plots of water consumption were developed for each land use to identify percentile values. For example, the 90th percentile is the value below which 90 percent of the data may be found. These graphs were developed, in part, because the 1989 TWMP used this method for evaluating water demands and selected the 90th percentile values to set system-wide per capita water use. For purposes of this analysis, percentile values were not used for each land use classification; rather, each land use was evaluated and the average water consumption was used for assigning consumption rates.

Parcel Area versus Gross Area Analysis: An analysis of parcel area (PA) to gross area (GA), and the platted ratio, was conducted by land use classification and the results are summarized in Table 10. For more detailed information supporting Table 10 see Attachment 11, Land Use Areas in LPA.

TABLE 10
Summary of Parcel Area to Gross Area in Combined Municipal Service Area and Longmont Planning Area

Classification	Gross Area (total acres)	Parcel Area (total acres)	Overall (PA/GA) Ratio	Unplatted Parcel Area (total acres)[1]	Platted Ratio
	A	B	C=B/A	D	E=(B-D)/(A-D)
Business	4,742	4,140	0.87	1,305	0.82
Residential	10,210	8,068	0.79	1,211	0.76
Public	5,249	4,859	0.93	468	0.92
Total	**20,201**	**17,067**	**0.84**	**3,370**	**0.81**

[1] For the purpose of adjusting parcel area to account for platting, it was assumed that parcels larger than 10 acres that are classified by the County assessor as vacant land (Class 0100 through 0600) or agricultural land (4117 through 4147) are not final platted.

The parcel area to gross area (PA/GA) ratio is generally higher for the undeveloped areas because right-of-way (ROW) is typically limited to the perimeter of the parcel. Because future water demand for undeveloped areas is estimated based on the rate of consumption of existing areas that have been final platted and have dedicated a portion of the total acreage as ROW, the impact is the potential over-estimation of treated water demands. As

such, when estimating future demands for large undeveloped areas, the gross area was adjusted to compute the future water demand.

Unit Demand Rates

Unit demand rates for each land use classification, in terms of gallons per day per parcel acre (gpdpa) are summarized in Table 11. For more detailed information supporting Table 11 see Attachment 12, Treated Water Demand for MSA & LPA Parcels.

TABLE 11
Summary of Unit Demand Rates by Land Use Classification for Parcel Acreage

Land Use Classifications	Land Use Abbreviation	Unit Rate of Consumption (gpdpa)
Residential Land Uses		
Ultra Low Density Residential	ULDR[1]	800
Very Low Density Residential	VLDR	800
Low Density Residential	LDR	1,610
Medium Density Residential	MDR	1,820
High Density Residential	HDR	2,700
Commercial Land Uses		
Central Business District	CBD	2,050
Mixed Use Corridor	MUC[2]	2,370
Multi-Neighborhood Commercial	MNC	1,390
Neighborhood Center	NC	2,000
Regional Commercial	RC	1,200
Strip Commercial	SC	1,580
Employment Land Uses		
Industrial/Economic Development	IED	1,420
Public/Institutional Land Uses		
Treated Water Irrigation		
Parks, Greenways, and Open Space	PGOS[3]	650
Public/Quasi-Public	PQP[3]	990
Raw Water Irrigation		
Parks, Greenways, and Open Space	PGOS[3]	410
Public/Quasi-Public	PQP[3]	120

[1] The rate of consumption for the ULDR land use is assumed to equal the rate of consumption for the VLDR land use.
[2] The rate of consumption for the MUC land use is assumed to equal the average rate of consumption for all commercial land uses plus 50% of the medium residential land uses.
[3] The rate of consumption for PGOS and PQP was further categorized by community facilities.

Because land use classifications and units change over time, a direct comparison of unit demand rates to previous master plans is difficult. Unit demand rates for this evaluation are defined per parcel acre instead of gross acre. Gross acreage is larger than a parcel acreage for a given platted area because it contains the public right-of-way in addition to the parcel area. The same volume of water expressed as a unit rate will be larger per parcel acre compared to per gross acre. Unit demand rates from the 1989 TWMP and 2000 TWMP are summarized in Table 12.

TABLE 12
Unit Demand Rate Summary from 1989 TWMP and 2000 TWMP

1989/2000 Land Use	1989 TWMP Demand Rate (gpdga)	2000 TWMP Demand Rate (gpdga)[1]
Very Low Density Residential	-	370
Low Density Residential	2,100	1,110
Medium Density Residential	5,200	2,590
High Density Residential	1,140	3,230
Commercial	3,400	2,750
Industrial	3,400	2,750
Open Space	2,700	2,000
Other	1,300	-

[1] The 2000 TWMP assumed 1, 3 and 7 single family residences per gross acre at 370 gpm per residence for VLDR, LDR, and MDR land uses and 17 multi-family units per gross acre at 190 gpm per unit for HDR land use.

To approximate a comparison of unit demand rates from this evaluation to previous master plans the unit demand rate per gross acre in Table 12 must be divided by the platted ratio of PA/GA from Table 10. For the 2000 TWMP, five of the seven unit demand rates were estimated to be lower based on the current evaluation. The two unit demand rates that increased were for VLDR and LDR, which are not a significant portion of the land use area. However, the commercial and industrial unit demand rates from the 2000 TWMP expressed in equivalent units for this evaluation were approximately 3,160 gpdpa; a value higher than the unit demand rates for any commercial and industrial land uses determined for this evaluation.

Data Processing Limitations

As mentioned previously, multiple data sources have been used to evaluate historic and forecasted future water demands. A number of these data sources, such as GIS coverage for land use, parcel, and zoning are maintained by others outside the City Department of Public Works and Natural Resources. This restricts the ability of the end user to have control over how the data is maintained and updated, which in turn limits the ability to further automate the processes presented herein.

5.3.2 Downstream Raw Water Demand

Information on existing raw water demand is provided below, and detailed summaries of these raw water components and associated assumptions are provided in Attachment 9, Raw Water Summary.

Water Leases and Exchanges

Water exchanges and leases represent a demand for raw water. A summary of the City's long-term water leases and exchanges is provided in Attachment 9. Water leases and exchanges for 2011 totaled 7,935 acre-feet per year (ac-ft/yr). Source water for these leases and exchanges is primarily from WWTP effluent, lower ditch transfers, or other downstream water sources that are not available to the water treatment plant.

Return Flow Obligation and Union Reservoir Replacement Obligation

Return flow is water that previously returned to streams and rivers after it has been applied to beneficial use, both as direct surface flow or from tributary groundwater. In order to legally divert previously decreed water at the City's various raw water points of diversion and then subsequently use it in the City's municipal water system, the City must complete a water rights change case in water court to change the point of diversion and/or type of use of the underlying water right. Generally, this involves changing a water right that had historically been used for irrigation to use in the City's municipal system. The return flow obligation is part of the change decree.

As part of that process, the water court requires that other water rights holders not be injured. Historically, as the water was used for irrigation, a portion of that water would return to the stream as either tail water runoff or deep percolation into the underlying aquifer. This return flow must be replicated by the City. Currently, the City's downstream return flow obligation requirement for Longmont is the largest single use of raw water and averages 8,204 ac-ft/yr, which represents the amount from 21 return flow obligations. Also, as part of the Union Reservoir Change case (1987CW222), water that was attributable to historical carriage loss, ditch loss, and return flows is required to be released from Union Reservoir to the Saint Vrain Creek (Union Reservoir Replacement Obligation). Currently, this obligation has averaged 1,390 ac-ft/yr, for a total existing return flow obligation of approximately 9,594 ac-ft/yr.

Raw Water Irrigation

Through an extensive network of raw water supply ditches, the City has the ability to directly irrigate several parks, schools, golf courses, fields, open space, and other properties. Attachment 10, Raw Water Irrigation Summary, catalogs 112 facilities located in the City that irrigate with treated or raw water. The total acreage of these facilities is approximately 3,886 acres, of which 2,172 acres are irrigated. The amount of acres at these facilities irrigated with treated water only is approximately 123 acres, and those irrigated with raw water only is approximately 1,697 acres. The total acreage of facilities capable of being irrigated with both raw and treated water is approximately 352 acres.

Existing Downstream Raw Water Demand Summary

Based on the summaries presented above for each category of raw water demand the approximate existing total annual raw water demand is 19,003 ac-ft, summarized in Table 13.

TABLE 13
Existing Downstream Raw Water Demands

Demand	Total Annual Volume (ac-ft)	Notes
Water Leases and Exchanges	7,935	Estimated for 2011 from Summary of Long-Term Fully Consumable Water Leases and Exchanges (Attachment 9).
Return Flow Obligation and Union Reservoir Replacement Obligation	9,594	From Return Flow Obligations (Attachment 9).
Raw Water Irrigation	1,474	Raw Water Irrigation Summary (Attachment 10).
Estimated Existing Downstream Raw Water Demand	**19,003**	**-**

A majority of the raw water demand is to satisfy return flow obligations and Union Reservoir replacement obligation (50 percent). Raw water used directly for irrigation accounts for approximately 7.8 percent of the total raw water demand.

6.0 Demand Forecasting

To this point, the evaluation has summarized available data and information related to treated water and raw water use, listed the assumptions developed by the City to serve as the basis for the reference forecast, summarized the analysis to determine current treated water unit demand rates by land use classification, and summarized the current raw water demands. With this data compiled, the next step is to apply this information to project future total water demands. Prior to projecting demand, an evaluation of the water service area was performed to summarize land use and the amount of undeveloped area, and the system water balance to account for distributed water loss.

6.1 Future Treated Water Demand

6.1.1 Water Service Area

The City's water service area follows the Longmont Area Comprehensive Plan (LACP) three-tier planning areas for managing the treated water service in the Municipal Service Area (MSA) and Longmont Planning Area (LPA). The combined MSA and LPA acreages in Boulder County and Weld County are shown in Table 14. Neighborhood planning areas are shown in Attachment 1. Additional detail on each land-use classification by gross area and parcel area is included in Attachment 11, Land Use Areas in LPA.

TABLE 14
Combined Municipal Service Area and Longmont Planning Area Gross Acreage in Boulder and Weld County[1]

	Boulder County		Weld County		
Classification	**Established Neighborhoods (total acres)**	**Planned Neighborhoods (total acres)**	**Planned Neighborhoods (total acres)**	**Total**	**% of Total**
Business	2,159	2,178	276	4,613	20
Mixed Use	0	405	0	405	2
Residential	5,436	4,774	122	10,332	46
Public/Quasi-Public	2,014	3,235	1,981	7,230	32
Total	**9,608**	**10,592**	**2,380**	**22,580**	**100**
% of Total	43%	47%	11%	100%	-

[1] Acres are gross areas and not parcel area. Gross area includes parcel area and public right-of-way.

The amount of development in the LPA in Weld County is low compared to Boulder County. More than 80 percent of the LPA in Weld County is public property, which are mostly Union Reservoir and Sandstone Ranch. Planned Neighborhoods (PN) have less residential area and more public area than Established Neighborhoods (EN).

The treated water service by parcel area within the combined MSA and LPA is distributed as shown in Table 15. The areas identified as receiving no treated water service are the

subdivisions served by other water providers and the public/quasi-public parcels that will not receive treated water service as described in the parcel characterization. As of 2008, treated water service is provided to 92 percent of the serviceable acreage in EN, while in PNs only 46 percent of the serviceable acreage is provided treated water service. In five Planned Neighborhoods, less than 20 percent of the potential serviceable acreage was receiving treated water in 2008.

In 2000, the total neighborhood area with treated water service was 7,212 acres out of a potential serviceable area of 13,944 acres (or 52 percent). In 2008, the total neighborhood area with treated water service increased to 9,459 acres, or 68 percent of the potential serviceable area. Approximately 4,485 parcel acres in established and planned neighborhoods remain to be provided with treated water.

TABLE 15
Status of Treated Water Service by Neighborhood and Parcel Acreage[1]

Sum of Parcel Acreage		MSA + LPA in Boulder Co. (acres)			Area with Treated Water Service (acres)		Percent of Serviceable Area
Type	**Neighborhood**	**Total Parcel**	**No Treated Water Service[2]**	**Serviceable Area[3]**	**2000**	**2008**	**2008**
Established Neighborhoods (EN)	Central Business Dist	79	-	79	71	73	93%
	Central Industrial	205	51	154	131	134	87%
	Clark Centennial	648	18	630	510	601	95%
	East Industrial	590	158	432	303	331	77%
	Garden Acres	665	12	653	556	618	95%
	Kensington	538	14	524	426	516	98%
	Lanyon	269	1	268	220	258	96%
	Longmont Estates	929	45	884	724	804	91%
	Loomiller	692	0	692	525	658	95%
	McIntosh	863	451	412	352	403	98%
	North Commercial	201	1	199	172	179	90%
	South Commercial	78	0	78	70	75	96%
	South Industrial	954	79	875	659	721	82%
	Southmoor	388	12	376	288	369	98%
	Sunset	483	7	476	374	465	98%
Established Neighborhoods Total		**7,581**	**849**	**6,732**	**5,382**	**6,205**	**92%**

TABLE 15
Status of Treated Water Service by Neighborhood and Parcel Acreage[1]

Sum of Parcel Acreage		MSA + LPA in Boulder Co. (acres)			Area with Treated Water Service (acres)		Percent of Serviceable Area
Type	**Neighborhood**	**Total Parcel**	**No Treated Water Service[2]**	**Serviceable Area[3]**	**2000**	**2008**	**2008**
Planned	Airport	1,159	85	1,074	518	566	53%
Neighborhoods	East Side	2,241	351	1,890	589	1,314	69%
(PN)	Longmont Tech Ctr.	1,070	660	411	0	26	6%
	Lower Clover Basin	487	176	311	0	37	12%
	Pike	349	18	331	192	277	84%
	Quail	876	246	630	3	99	16%
	Schlagel	638	52	586	384	425	73%
	Terry Lake	919	379	540	0	0	0%
	Upper Clover Basin	785	4	781	101	464	59%
	West St. Vrain	839	176	663	66	70	11%
	Westview	30	0	30	30	30	100%
Planned Neighborhoods Total		**9,393**	**2,146**	**7,247**	**1,883**	**3,309**	**46%**
Grand Total		**16,973**	**2,995**	**13,979**	**7,265**	**9,514**	**68%**
EN – Percentage of Potential Water Service Acreage Served					80%	92%	
PN – Percentage of Potential Water Service Acreage Served					26%	46%	
Total Percentage of Potential Water Service Acreage Served					**52%**	**68%**	

[1]Parcel acreage is different from gross acreage in that it does not include the right-of-way area.

[2]See Attachment 8, Treated Water Demand Evaluation Process Flowchart and Narrative for more information on the category No Treated Water Service. This represents the sum of C and D from the flowchart.

[3]Serviceable area is the Total Parcel Area – No Treated Water Service area.

A similar status table was created for land use and is provided in Table 16.

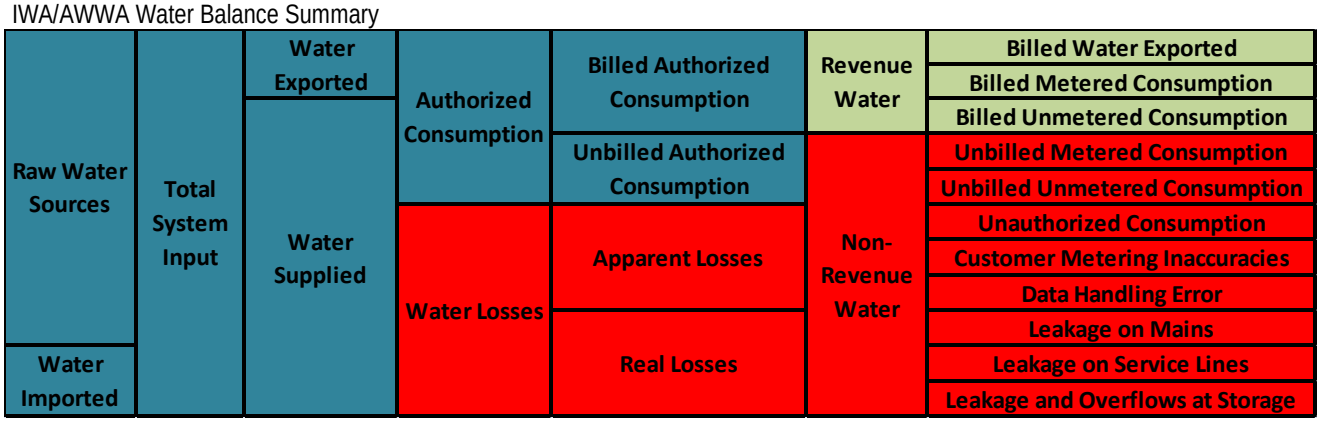
TABLE 16
Status of Treated Water Service by Land Use and Parcel Acreage

Sum of Parcel Acreage		MSA + LPA in Boulder Co. (acres)			Area with Treated Water Service (acres)		% of SA
Type	**Land Use**	**Total Parcel**	**No Treated Water Service**	**Serviceable Area (SA)**	**2000**	**2008**	**2008**
Established Neighborhoods (EN)	CBD	80	0	80	72	74	93%
	HDR	326	1	325	278	300	92%
	IED	1,189	87	1,102	762	847	77%
	LDR	3,079	39	3,040	2,357	2,916	96%
	MDR	536	0	536	434	502	94%
	MNC	163	0	163	136	146	90%
	MUC	-	-	-	-	-	-
	NC	17	0	17	16	17	100%
	PGOS	1,118	718	400	390	393	98%
	PQP	697	3	694	648	694	100%
	RC	89	0	89	81	89	99%
	SC	189	1	188	152	167	89%
	ULDR	-	-	-	-	-	-
	VLDR	98	0	98	55	60	61%
Established Neighborhoods Total		**7,581**	**849**	**6,732**	**5,382**	**6,205**	**92%**
Planned Neighborhoods (PN)	CBD	-	-	-	-	-	-
	HDR	218	0	218	47	112	51%
	IED	1,580	77	1,503	341	483	32%
	LDR	2,208	122	2,086	602	1,214	58%
	MDR	624	1	623	154	410	66%
	MNC	66	0	66	6	25	38%
	MUC	413	0	413	-	-	-
	NC	11	0	11	8	6	60%
	PGOS	1,959	1,306	653	139	265	41%
	PQP	863	138	725	526	641	88%
	RC	369	11	358	59	153	43%
	SC	-	-	-	-	-	-
	ULDR	331	164	166	-	-	-
	VLDR	751	326	426	-	-	-
Planned Neighborhoods Total		**9,393**	**2,146**	**7,247**	**1,883**	**3,309**	**46%**
Grand Total		**16,973**	**2,995**	**13,979**	**7,265**	**9,514**	**68%**
EN – Percentage of Potential Water Service Acreage Served					80%	92%	
PN – Percentage of Potential Water Service Acreage Served					26%	46%	
Total Percentage of Potential Water Service Acreage Served					**52%**	**68%**	

6.1.2 Water Balance

The International Water Association (IWA) and the American Water Works Association (AWWA) developed the IWA/AWWA Water Audit Method for drinking water utilities to apply best management practices in water loss control. This method uses a water balance summarized in Figure 8, to account for water usage in a water distribution system.

FIGURE 8
IWA/AWWA Water Balance Summary



(Source: Adapted from AWWA Publication, Opflow, October 2007)

To account for all of the treated water demand requirements, forecasting must also estimate unmetered water consumption and water losses that are commonly distributed across the selected consumption classifications. For purposes of this water demand evaluation, the water losses are not distributed, but are accounted for separately.

The Total System Input is the water treatment plant production. Authorized Consumption is the metered (billed and unbilled) consumption from the City's billing system and hydrant meter permits, plus an estimated percentage of production for unmetered consumption. Unbilled unmetered consumption includes fire fighting, fire training, grading dust control, pressure testing, parks and forestry watering, sanitary sewer jetting, spring flushing, storm sewer jetting, street sweeping and tank cleaning. Based on input from City staff responsible for unmetered consumption, the total amount is estimated at approximately 1 percent of the water treatment plant production. The difference between the Total System Input and Authorized Consumption is Water Losses.

While process water usage within the City's water treatment facilities was not metered until 2009, the results of the analysis suggest water loss within the distribution system to be approximately 7 to 8 percent. A survey by the AWWA of 662 North American public water systems showed an average water loss of 12.3 percent (Billings). However, water losses typically vary between 10 and 20 percent. The IWA/AWWA Water Balance method has a formula to estimate the theoretical low limit of unavoidable distribution system water leakage if all available best technologies are successfully implemented. The theoretical estimate is based on miles of water mains, number of service connections, average pressure in the system, and the distance of private water lines (to the curb stop). Based on an assumption of 30 feet for the distance of private water lines and an average system pressure of 70 pounds per square inch (psi), the theoretical low limit of water loss for the City would be 180 million gallons per year. Total water treatment plant production for 2008 was

5,607 million gallons. The theoretical low limit of water loss from the system is approximately 3 percent of treated water production. The low limit does not represent a realistic goal, but gives a theoretical reference point for the quantity of water loss due to system characteristics.

The water demand forecasts for this evaluation assume that the City will continue to monitor, maintain, and construct required infrastructure improvements to sustain water loss levels at a minimum of 7 percent. Maintaining the distribution system to achieve this level of water efficiency will require an adequate regular budget for maintenance.

The water demand forecasts presented assume that the City will continue to monitor, maintain, and construct required infrastructure improvements to sustain water loss levels at 7 to 8 percent.

6.1.3 Reference Forecast for Total Treated Water Demand

The forecasted reference total treated water demand for build-out of the City's water service area includes service to parcels and arterial irrigation inside the MSA and LPA, existing water services inside the SVVPA but outside the MSA and LPA, and water service exported outside the SVVPA. Additionally, authorized uses and losses must be added to project the total treated water demands shown in Table 17. Additional detail on the treated water demand analysis performed is included in Attachment 12, Treated Water Demand for MSA & LPA Parcels. Additional detail on the arterial irrigation analysis is included in Attachment 13, Existing and Potential Arterial Irrigation.

TABLE 17
Summary of Reference Forecast for Total Treated Water Demand

	Forecasted Total Treated Water Demand		
Treated Water Demand	**MG/year**	**mgd**	**ac-ft/yr**
Boulder County Parcels	6,887	18.8	21,138
Weld County Parcels	149	0.4	458
Arterial Irrigation	141	0.4	433
Outside Water Services	20	0.1	61
Export to Town of Lyons	209	0.6	641
Total Metered Demand	**7,407**	**20.3**	**22,731**
Authorized Uses – 1.0% (excluding export)	74	0.2	227
Water Losses – 7.2% (excluding export)	533	1.5	1,637
Subtotal Distributed Treated Water Demand	**607**	**1.7**	**1,864**
Reference Forecast for Total Treated Water Demand	**8,014**	**22.0**	**24,595**

To project the treated water demands for build-out within the MSA and LPA, the unit demand rates were applied to the acreages for each land use classification following the parcel characterization.

An analysis was completed of the existing and future arterial irrigation requirements based on linear miles of irrigated right-of-way. The forecasted treated water demands for build out applied the existing demand rate to the future irrigated arterial right-of-way.

Although there are four existing water services that export water outside the SVVPA, the large majority of the projected treated water demand at build-out is treated water service to the Town of Lyons. For the purposes of the projected treated water demands, a maximum daily demand of 572,000 gallons was included. This is as agreed to in the Intergovernmental Agreement (Treated Water Service) dated July 21, 2003, and filed in the office of the Boulder County Clerk and Recorder on August 19, 2003, at reception number 2490437.

Outside water services are outside the LPA, but inside of the SVVPA; over 80 percent are in the Hygiene area. The amount of water exported to the Town of Lyons (641 ac-ft/yr) must be credited back when the total demand is added up since the Town provides the source water for this supply.

6.2 Future Downstream Raw Water Demand

Forecasted demand for raw water is summarized in Attachment 9 and Attachment 10.

6.2.1 Water Leases and Exchanges

Currently, there are six lease and four exchange agreements. The term for all of the lease agreements ends prior to, or in, 2030. One exchange agreement has a term that ends in 2080, two are perpetual, and one has a term that ends in 2020. For this evaluation no additional leases or exchanges are considered. In 2030, the total amount of water leases and exchanges is estimated to be 5,879 ac-ft; this is lower than the 7,935 ac-ft amount estimated for 2011 as a result of the end of lease terms.

6.2.2 Return Flow Obligations

Currently, there are 22 return flow obligations, for a total of approximately 8,204 ac-ft/yr. There are also future decrees for return flow obligations that are estimated to total approximately 3,056 ac-ft; for a total forecasted return flow obligation of 11,260 ac-ft.

6.2.3 Union Reservoir Replacement Obligation

For forecasted water demands, it was assumed this obligation will remain close to the historical average value of 1,390 ac-ft/yr.

6.2.4 Union Reservoir Pumpback Pipeline

The evaluation of total water demand must take into account future raw water demands. A majority of current ditch water is from change cases, from areas annexed into the City. When these cases are finalized and at build-out, 100 percent of change case water will go to the water treatment plant. When this occurs, the water will not be able to be placed in the ditches for use. These water requirements need to be met even if supplied by treated water. The Union Reservoir Pumpback Pipeline is needed to supply the ditch water that is currently in change cases.

The Union Reservoir Pumpback Pipeline project will involve installation of a 24-inch pipeline and pump station to convey water from Union Reservoir to the west for introduction in area ditches and reservoirs. Water will be delivered both directly for irrigation of City and school district facilities under those facilities, as well as exchanged for eventual delivery to the City's water treatment plants. It is anticipated that the first phase of this project will need to provide 2,084 ac-ft of water delivered from Union Reservoir.

6.2.5 Raw Water Irrigation

As discussed above, there are many facilities that already have the capability to irrigate with raw water, including parks, schools, golf courses, fields, open space, and other properties. There are also facilities that are planned to be converted from irrigating with treated water to raw water. This conversion is sought for facilities that have easy access to raw water. Converting to raw water irrigation does not decrease the amount of water supply needed by the City, but decreases operating costs since this water no longer has to be treated at the water treatment plant. The following facilities currently use treated water for irrigation and will eventually be converted to raw water:

- Stephen Day Park (11 irrigated acres)
- Sunset Golf Course (40 irrigated acres)
- Fall River Elementary (5 irrigated acres)

It is important to identify these areas so that the water use is not inadvertently double counted (as treated water and raw water demand), and it will also have some impact on the hydraulic analysis of City's water distribution system.

There are relatively small amounts of irrigated area, but these facilities will be removed from the treated water distribution model for purposes of forecasted treated water demand. They will be accounted for in the raw water irrigation demand.

6.2.6 Forecasted Downstream Raw Water Demand Summary

Estimated downstream raw water demands on the City's system at build-out are presented in Table 18. For more detailed information supporting Table 18 see Attachment 9, Raw Water Summary and Attachment 10, Raw Water Irrigation Summary.

TABLE 18
Forecasted Downstream Raw Water Demand at Build-Out

Demand	Total Annual Volume (ac-ft)	Notes
Water Leases and Exchanges	5,879	From Summary of Long Term Fully Consumable Water Leases and Exchanges (Attachment 9).
Return Flow Obligation	11,260	From Return Flow Obligations (Attachment 9).
Union Reservoir Replacement Obligation	1,390	Based on 2001 to 2011 Union Replacement Obligation actual.
Union Pumpback Pipeline (Phase 1)	2,084	Based on irrigable acreage in Longmont under exchange ditches, not including other exchanges at each ditch.
Raw Water Irrigation	1,699	Raw Water Irrigation Summary Table (Attachment 10).
Forecasted Downstream Raw Water Demand	**22,312**	**-**

6.2.7 Potential Raw Water Sources

The estimated water sources to meet downstream raw water demands on the City's system at build-out are summarized in Table 19.

TABLE 19
Forecasted Downstream Raw Water Deficit

Demand	Total Annual Volume (ac-ft)	Notes
Transfer Decrees	4,608	Existing and future transfer cases.
Union Reservoir	2,779	Using historical yield from 2001 to 2011 (versus 3,259 ac-ft or 213 shares @ 15.3 ac-ft per share).
Reuse Water	9,257	Current reuse amount is 4,615 ac-ft. Build out reuse based on proportionate increase of current water treatment plant demand to forecasted build out water treatment plant demand.
Storage Available	1,384	Capacity of reservoir times assumed 85% ownership over a 7 year drought period for Lake McIntosh, Pleasant Valley in addition to Golden Ponds and Clover Basin.
Additional Windy Gap Reuse (from firming if built)	612	3,700 ac-ft from Council Water Supply and Storage presentation minus 2,500 ac-ft based on prior actual times 51 percent return flow factor.
Union Enlargement (if built)	1,770	13-ft raise per 2004 RWMP update.
Estimated Downstream Raw Water Supply	**20,410**	**-**
Deficit Between Downstream Raw Water Demand Supply	**1,902**	**-**

Raw water demand is generally met by conversion of downstream water rights that cannot be transferred to the water treatment plants, reusable effluent from the wastewater treatment plant and downstream storage such as Union Reservoir. The deficit between raw water demand and downstream raw water supply is forecasted to be met with the City's upstream raw water supply.

The estimated demand for raw water, for uses in addition to the raw water for the potable water system, at build-out is 22,312 ac-ft annually. The estimated raw water supply for this purpose is 20,410 ac-ft, leaving a downstream raw water deficit of 1,902 ac-ft. This is the annual estimated amount that will be necessary, during a drought period, from the City's upstream potable water supply for downstream raw water demand. This amount will be added to the raw water demand for potable water supply in the summary presented in Section 6.3.

6.3 Reference Forecast for Total Water Demand

Based on the methodology for determining treated water and raw water demand, a summary of the reference forecast of total water demand at build-out is presented in Table 20.

TABLE 20
Summary of Reference Forecast for Total Raw Water Demand

Demand	Estimated Annual Volume (ac-ft)	Comments
Total Treated Water Demand	**24,595**	See Table 17, Summary of Reference Forecast for Treated Water Demand.
Raw water provided for export by Town of Lyons	(641)	Subtracted because raw water supply provided by Town of Lyons.
Raw Water Supply & Water Treatment Plant Losses (5%)	1,230	WTP Efficiency for past 3 years is ~95% (5% water loss). City evaluation of raw water supply losses estimated at 2%.
Subtotal Raw Water for Treated Water Demand	**25,184**	-
Deficit Between Downstream Raw Water Demand and Supply	**1,902**	See Table 19, Potential Water Sources to Meet Raw Water Demands at Build Out
Reference Forecast for Total Water Demand	**27,086**	**-**

The base raw water demand of the reference forecast is approximately 27,100 ac-ft/yr. In addition to the treated water demand from Table 17, this total also includes an assumption for water loss from raw water supply.

6.4 Adjusted Total Water Demand Forecast Variable Assumptions

The assumptions support the total reference raw water demand established above. However, the potential for variations in the assumptions must be considered. Previous master plan studies have accounted for variability in water demand with more conservative unit demand rates; the individual assumptions that could vary were never quantified. This evaluation has more acutely identified unit demand rates, and therefore the variability of assumptions must be explicitly addressed. For this and future evaluations, this approach allows the City more flexibility to change individual water demand assumptions.

The impact on water demand as a result of variations in the assumptions is summarized below for several items.

1. **Redevelopment Focus Areas:** There are four redevelopment focus areas identified by the City: Midtown, Downtown, Twin Peaks Mall, and Southeast Urban Renewal

(including the flour mill and sugar factory, and FasTracks). A map identifying the Redevelopment Focus Areas is provided in Attachment 5. The evaluation of this assumption assumes that the unit rate of consumption at build-out in the Redevelopment Focus Areas will be consistent with the existing consumption in the Wallace Addition subdivision, located at the southeast corner of Pike Road and Highway 287 in south Longmont. These areas represent approximately 6 percent of the overall LPA area. Depending on the combination of focus areas that develop over time there is a range of potential impacts on water supply because some redevelopment areas would have a resulting increase in water demand from existing conditions, while others would have a decrease. The impact from each focus area is summarized in Table 21, which result in a range of potential impacts.

TABLE 21
Summary of Treated Water Demand Assumptions for Redevelopment Focus Areas*

	Forecasted Treated Water Demand		
Redevelopment Focus Area	**MG/year**	**mgd**	**acre-feet/year**
Downtown (LDA)	(154)	(0.4)	(473)
Midtown	17	0	52
Southeast Urban Renewal Area	99	0.3	304
Twin Peaks Mall	37	0.1	114
Range of Demands			
Low Range (negative differences only)	(154)	(0.4)	(473)
High Range (positive differences only)	153	0.4	469
Recommended Adjustment	(1)	0	(4)

*values in () are negative

2. **Adjustment for partially developed or partially occupied parcels**: Parcels that are partially developed or partially occupied are assumed to have lower consumption than when fully developed and occupied. To evaluate this assumption, existing commercial/ industrial land use parcels with water service in 2008 were divided into four quartiles based on area. It was assumed that 10 percent of parcels with the lowest rate of water consumption in each quartile represented partially developed or partially occupied parcels. The rate of water consumption for each quartile was recalculated using the average water consumption of the remaining 90 percent in each area applied to the entire area. This process simulates the water demand required as if these areas were fully occupied. This calculation was only performed for existing areas; it was not applied to the remaining industrial/commercial areas that are yet to developed; approximately half of the area designated as industrial/commercial has yet to be developed. Attachment 14, Variable Assumptions Supporting Data contains more information.

3. **New development will have planned neighborhood rate of consumption**: Unit rate of consumption for new development will be consistent with the unit rate of consumption for existing customers within the same land use classification in planned neighborhoods. Planned neighborhoods may include both residential and commercial land uses. It is

important to note that the overall the average unit rate of consumption in planned neighborhoods is less than in established neighborhoods. It was found that while planned neighborhoods typically have a higher unit rate of consumption for residential users the consumption by commercial users is lower, and is enough to result in a lower overall rate of consumption for planned neighborhood areas. Already 92 percent of established neighborhood areas have been developed compared to 45 percent of planned neighborhood areas. Attachment 14, Assumption Supporting Data, contains more information.

4. **Economic development opportunities for high water use industrial users**: Industrial customers are important for maintaining the City's economic vitality. However, water requirements for potential future industrial users is variable. The City has existing industrial customers with higher water requirements, and there is a possibility additional customers will emerge in the future. The City's Code of Ordinances outlines a raw water requirement policy (Section 14.05) that requires transfer of additional water rights if the water demand may exceed 3 ac-ft per acre, or cash in lieu of water rights transfers. Even with the raw water requirement policy for such high water users it is prudent to account for additional customers in the water forecast. Including these demands in the forecast is important for: planning of water treatment plant capacity, sizing physical components within the distribution system as the infrastructure is built (i.e. pipelines and tanks), and having water supply available to attract future industrial customers. The amount of water estimated for future customers is based on the City's experience with past and existing higher water use customers, and is 5 to 10 percent of Total Treated Water Demand.

5. **Industrial Economic Development (IED) conversion to Residential or Mixed Use**: The assumption from the reference forecast is that areas designated as industrial economic development (IED) will be built as planned and will not be converted to another land use in the future, such as residential or mixed use. The City estimated that as of 2008 a disproportionate amount of IED remains to be developed compared to other land uses; only 29 percent of the total IED in planned neighborhoods has been developed as of 2008 (see Table 16). If this land use does change in the future from IED to low, medium, or high-density residential, or mixed use it would increase the water requirement. The unit demand rate estimated for IED is 1,420 gpdpa (see Table 11). The unit demand rates for low-density residential and high-density residential range from 1,610 to 2,700 gpdpa (see Table 11). For purposes of this evaluation it is assumed the land uses for IED will not change, therefore there is no additional water included to account for other land use in these areas.

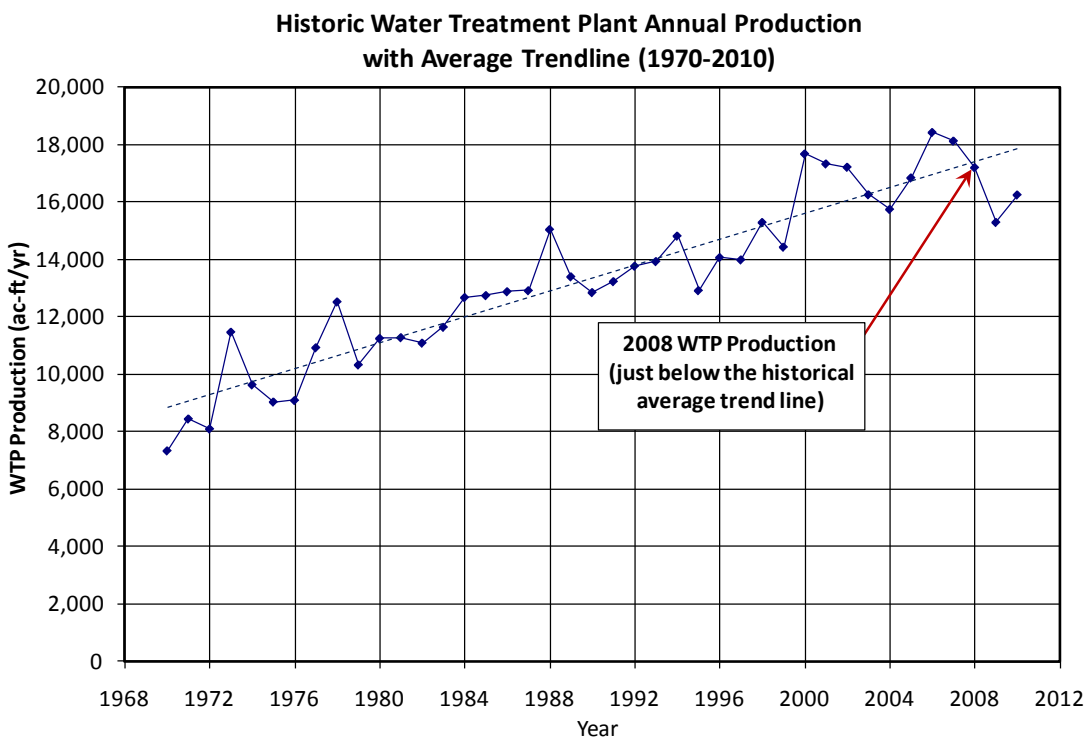
   To estimate the impact on water use of converting IED to another land use, first determine the remaining area of IED to be serviced from Table 16 (1,275 pa). For this remaining parcel area, apply a percentage of area to be converted to another land use. Using the area for each land use then apply the correct unit demand rate. Compare the result to the forecasted water use if the area remains IED only (2,030 ac-ft/yr).

6. **Water Loss Percentage**: Some water loss from the treated water distribution system are unavoidable (see Section 6.1.2 Water Balance). The existing distribution system is efficient and has relatively low water losses. Current water losses within the distribution system are approximately 7.2 percent of water produced from the water treatment plant.

A majority of the system is considered new since approximately 84 percent of the water distributions mains have been installed or replaced since 1970. However, as pipelines age the percentage of water losses may increase if the pipes are not maintained at or near their current condition. An estimate of water losses with an aged system could range from 10 to 15 percent. Maintaining the distribution system to achieve current losses will require regular budget for maintenance and repairs. The variability of distribution system water loss was assumed to be up to 10 percent for the high range of the forecasted raw water requirement.

7. **Adjustment to Average Trend**: Water production data from 2008 was used as the basis for evaluating unit demand rates. Water production from 2008 when compared to the historical trend since 1970 is shown in Figure 9. Production during 2008 is slightly below the historical trend. A percentage of water use was added to each unit demand rate based on bringing the 2008 values up to be consistent with the historical trend line; this is referred to as the adjustment to average trend.

FIGURE 9
Annual Water Treatment Plant Production (1970-2010)



8. **Climate variability impact on treated water irrigation demand**: Climate variability has the potential to impact water supply patterns and water demand (Billings). Concurrent with the preparation of this study, a group of Colorado Front Range water providers initiated a comprehensive study of climate variability impacts on the Colorado Front Range. This study, completed in collaboration with the National Oceanic and Atmospheric Administration (NOAA), University of Colorado, and private sector atmospheric scientists, developed potential runoff scenarios given various ranges of climate variability. This study, titled *Joint Front Range Climate Change Vulnerability Study*,

is scheduled for release by the American Water Works Research Foundation in the near future. This study provided climate data that was used to estimate impacts on water demand from various climate change scenarios. For this evaluation it was estimated that the impact of Climate Change on treated water demand could be 8 percent, with a most probable range of 6 to 10 percent.

Other studies have been complete that evaluate irrigation increase, on a regional scale, not downscaled to Longmont. A Technical Memorandum by the U.S. Bureau of Reclamation, titled *Climate Change Effects on Colorado River Basin Irrigation Demands – A Quick Estimation* (July 2010), also estimated the percent difference in irrigated demand for areas in the Colorado River Basin. In the Upper Colorado River Basin in the state of Colorado, an average temperature increase of 1 degree F resulted in an estimated percent increase in irrigation demand of 6.1 percent. An average temperature increase of 2 degrees F resulted in an estimated percent increase in irrigation demand of 12.4 percent.

9. **Dry Year Adjustment**: The reference demand calculation was determined using the average water use trend line. During a dry period, the 7-year trend line will result in a greater water demand from increased irrigation use coupled with decreased natural precipitation. During the 2004 RWMP update, the dry year trend adjustment was established at approximately 5 percent of total treated water demand; this value remains the same as part of this evaluation. It is important to point out that the raw water supply system and water treatment and distribution system must handle peaks differently. The City's raw water storage system can accommodate peaks above 5 percent by drawing down storage reservoirs and implementing watering restrictions. However, the treated water system is impacted differently by peaks. The water treatment plants and the distribution system must be sized for higher peak demands since the storage time in system is less than one day during peak conditions. In comparison, the City's raw water storage volume is approximately 30,000 ac-ft, which is about 1 year of water demand. For more detailed supporting information see Attachment 15, Water Demand Evaluation – Raw Water Supply Modeling Technical Memorandum.

10. **Future Savings from Water Conservation**: The City began water conservation education and outreach efforts more than 20 years ago. Quantitatively the impact from water conservation is inherent in the unit demand rates calculated as part of this evaluation. However, it is difficult to quantify how much of the water conservation goals have been achieved to this point. A more extensive evaluation would be required to estimate how much water savings has been achieved through conservation. It is evident that per capita use has been decreasing as a result of both changing demographics and water conservation. The assumption for purposes of this evaluation is that approximately half of the total water conservation goal has been achieved, which is equivalent to 1,750 ac-ft.

11. **Factor of Safety**: A factor of safety may be added to the total water demand to account for unforeseen events and demands. A higher safety factor (10-15 percent) may be more appropriate for systems that have not evaluated water demand in detail. This evaluation has included analysis for several aspects that may impact water demand, therefore a lower safety factor may be appropriate (5-10 percent). At this time a safety factor of 5 percent has been assumed. Determining the appropriate safety factor will be evaluated separately.

12. **Distribution system water loss as a result of variable assumptions:** The amount of unavoidable real water loss is a function of the lengths of water mains, the number of service connections, the total length of private pipe (curbstop to customer meter), and the average pressure in the system. The amount of additional distribution system water loss as a result of the variable assumptions was assumed to be zero, based on the following assumptions: there is no new pipe installed and there are no new connections installed beyond what is already accounted for in the recent LACP.
13. **Climate variability impact on raw water supply**: In addition to the impact of climate variability on treated water demand, it can also impact the raw water supply yield. A water yield evaluation completed by Deer & Ault Consultants in 2010 estimated the impact from climate variability on the raw water supply would lower the annual yield by 2 percent.
14. **Climate variability impact on raw water for raw water irrigation demand:** To be consistent with the adjustment applied to treated water for changes in irrigation demand due to climate variability, an increase is also applied to raw water irrigation demand.
15. **Raw water supply and WTP Loss:** Water losses occur in the raw water supply conveyance system (i.e. reservoirs, canals, pipelines) through evaporation and leakage. In addition the amount of water produced from the water treatment plant is slightly less than what enters due to evaporation from ponds and plant water uses (i.e. chemical feed). The amount of losses from raw water supply conveyance and WTP loss was assumed to be 5 percent of the Treated Water Demand. This assumption should be refined based on a more detailed investigation of raw water supply losses.

Table 22 provides a summary of the variable assumptions discussed in this section.

It is important to note that the variability of all assumptions was not evaluated, and the variability in assumptions should be regularly re-evaluated by the City. This evaluation did not consider other conversions of existing land use that could occur as a result of future planning adjustments. Changes to these assumptions could have a significant impact on treatment, treated water distribution system, and the collection system.

Taking into consideration the potential impact from variable assumptions the additional amount of raw water required in the adjusted forecast would be approximately 5,637 ac-ft/year; this does not include the most conservative estimates of the variable range. When added to the estimated reference forecast of 27,086 ac-ft, the total amount of raw water required to meet treated water demands at build-out is 32,730 ac-ft/yr.

The adjusted forecast for total water demand at build-out for the City is estimated at approximately 32,730 ac-ft.

TABLE 22
Summary of Variable Assumptions for Adjusted Total Water Demand Forecast

Variable Assumptions	Assumption Notes
1. Redevelopment Focus Areas	Unit rate of consumption at build-out will be consistent with the existing consumption in the Wallace Addition subdivision
2. Adjustment for partially developed or partially occupied parcels	Partially developed/occupied parcels have lower consumption than when fully developed and occupied
3. New development will have planned neighborhood unit rate of consumption	Unit rate of consumption for new development consistent with existing customers within the same land use in planned neighborhoods
4. Economic development opportunities for high water use industrial users	Estimated range is 5-10% of Total Treated Water Demand
5. Industrial Economic Development (IED) conversion to Residential or Mixed Use	No IED land use areas will be converted to Residential or Mixed Use
6. Treated Water Distribution System Loss Percentage	0 to 2.8% of Total Metered Demand (0 represents maintaining loss of 7.2% and 2.8% represents increase to 10% loss)
7. Adjustment to average trend	Adjustment to bring the 2008 water production value up to be consistent with the historical trend.
8. Climate Variability impact on Irrigation Demand	Treated water demand would increase by approximately 8% (range of 6-10%)
9. Dry Year Adjustment	Approximately 5% of Total Treated Water Demand
10. Future Savings from Water Conservation	Half of the planned savings of 3,500 acre-ft
11. Factor of Safety	5% of Total Treated Water Demand (range 5 to 10%)
Subtotal Treated Metered Water Demand (TMWD) Variability	
12. Distribution System Water Loss as a result of Variable Assumptions	No additional losses from variable assumptions.
Subtotal Treated Water Demand (TWD) Variability	
13. Climate Variability Impact on Raw Water Supply	2% of Reference Raw Water Demand
14. Climate Variability Impact on Raw Water Irrigation Demand by City	Raw water demand increase for raw water irrigation
15. Raw Water Supply & WTP Loss	5% of Subtotal TWD
Subtotal Raw Water Demand Variability	
Total Water Demand Variability to be Applied to Reference Forecast	

TABLE 22
(continued)

	Recommended Adjustments to Forecasted Water Demands			Range (min to max)
	MG/year	**mgd**	**acre-ft/year**	**acre-ft/year**
1.	(1)	(0.004)	(4)	(473) to 469
2.	146	0.4	447	447
3.	(95)	(0.3)	(291)	(291) to 0
4.	400	1.1	1,230	1,230 to 2,460
5.	0	0	0	0 to 1,360
6.	0	0	0	0 to 636
7.	146	0.4	449	449
8.	641	1.8	1,968	1,476 to 2,460
9.	471	1.3	1,445	0 to 1,445
10.	(570)	(1.6)	(1,750)	(1,750) to 0
11.	401	1.1	1,230	1,230 to 2,460
	1,539	**4.2**	**4,724**	**2,317 to 12,185**
12.	0	0	0	0
	1,539	**4.2**	**4,724**	**2,317 to 12,185**
13.	176	0.5	541	541
14.	44	0.1	136	102 to 170
15.	77	0.2	236	116 to 609
	298	**0.8**	**913**	**759 to 1,320**
	1,837	**5.0**	**5,637**	**3,076 to 13,505**

*values in () are negative

6.5 Inclusion of Water Conservation Goals

Detailed information on the City's past and future water conservation efforts are summarized in the Water Conservation Master Plan (2008). The City does not have pressing infrastructure or raw water supply shortages that would require immediate aggressive water conservation activities. The goals and objectives for future water conservation measures and programs set by the City were developed to address future community sustainability and regional water supply reliability. The goal outlined in the 2008 Water Conservation Master Plan is to decrease raw water demand by approximately 10 percent by build-out, for an expected reduction of about 3,500 ac-ft/yr. Water conservation is present in the unit rates that have been applied to land uses for this analysis therefore the water conservation component is inherent in the calculations.

6.6 Undeveloped Areas

Based on an estimated population of 87,461 as of December 30, 2010, and a build-out population of 112,953 (established as of July 2010), the Longmont population has reached 78 percent of build-out in terms of population. This is consistent with approximately 73 percent of residential land use area that is developed. Based on a similar analysis of commercial areas, it was estimated that approximately 56 percent of these areas are developed. Commercial and industrial development lag behind residential and residential water demands will plateau from build-out sooner than other development areas. The overall percent of serviceable areas that have been provided with treated water service as of 2008 is 68 percent and a summary is provided in Table 23.

TABLE 23
Status of Treated Water Service by Customer Classification and Parcel Acreage

	MSA + LPA in Boulder Co. (acres)			Area with Treated Water Service (acres)		% of SA
Classification	**Total Parcel**	**No Treated Water Service**	**Serviceable Area (SA)**	**2000**	**2008**	**2008**
Business	3,753	176	3,577	1,633	2,008	56%
Mixed Use	413	0	413	0	0	0%
Public	4,638	2,167	2,471	1,703	1,993	81%
Residential	8,172	653	7,518	3,928	5,514	73%
Total	**16,975**	**2,997**	**13,979**	**7,265**	**9,514**	**68%**

7.0 Summary and Recommendations

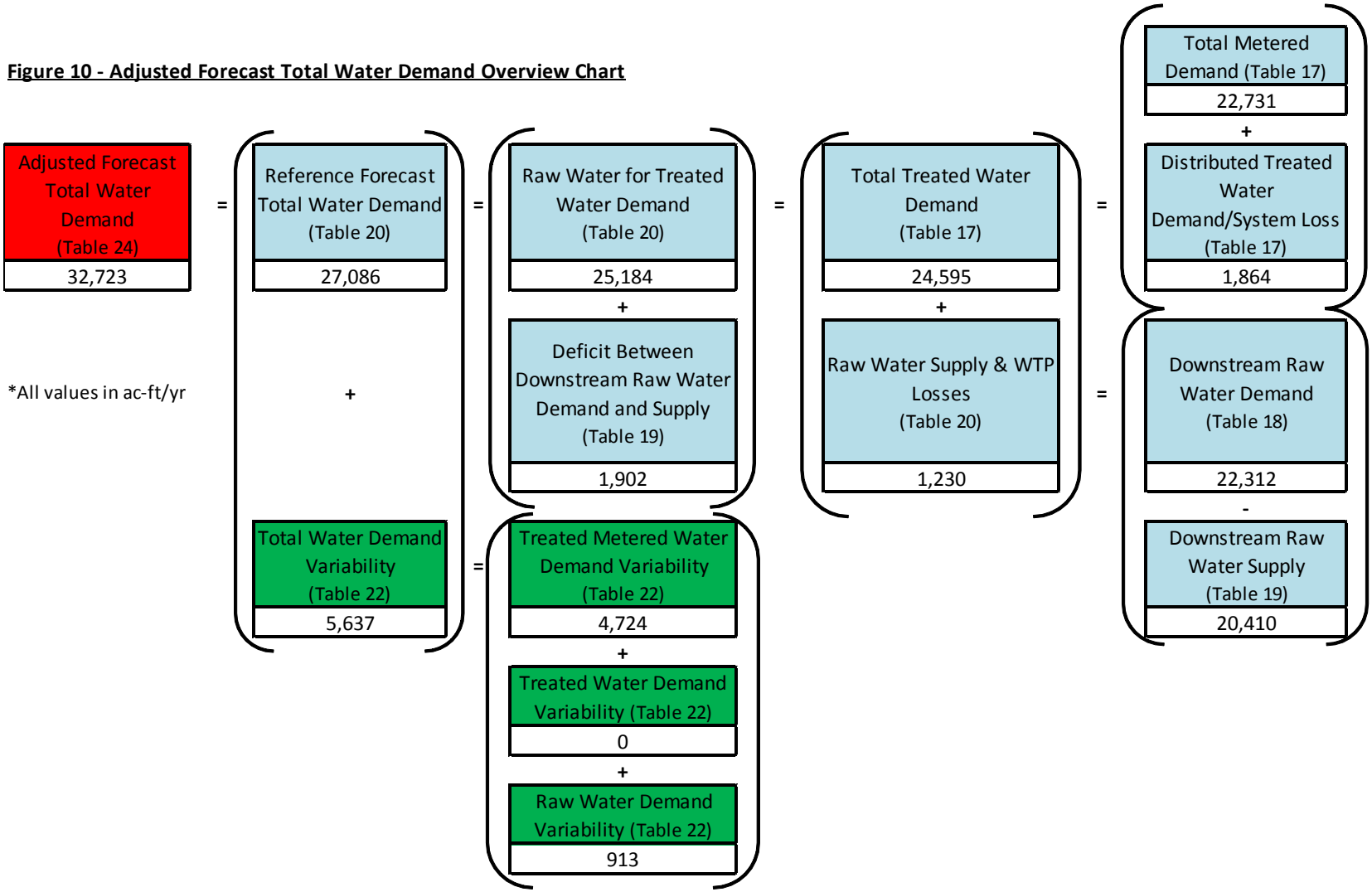
The analyses presented within this report have focused on estimating total raw water supply requirements to meet the estimated demands through build-out to the City's service area boundary. A summary of the adjusted forecast total water demand results is provided in Table 24.

TABLE 24
Summary of Adjusted Forecast Total Water Demand

Demand	MG/year	ac-ft/yr	Comments
Total Metered Demand	7,407	22,731	Includes all metered water use inside and outside the LPA, arterial irrigation, and export to Town of Lyons.
Reference Forecast for Total Treated Water Demand	8,014	24,595	Includes authorized unmetered uses and treated water distribution system losses.
Reference Forecast for Total Water Demand	8,826	**27,086**	Includes raw water supply losses, treatment plant losses, and deficit required during drought year to meet raw water requirements.
Total Water Demand Variability - Adjustment to Reference Forecast			
Low Variability	1,002	3,076	Accounts for the least amount of variability and is the least conservative (higher risk) range.
Mid (Recommended) Variability	1,837	**5,637**	Accounts for some amount of variability.
High Variability	4,401	13,505	Accounts for the most amount of variability and is the most conservative (lowest risk) range.
Adjusted Forecast Total Water Demand	**10,663**	**32,723**	Includes mid-level variability.

The estimated total amount of water required to meet the City of Longmont's needs for the existing LACP, and accounting for a mid-level range in variability of water demand and supply assumptions is 32,730 ac-ft. An overview of the components that feed into the Adjusted Forecast Total Water Demand is provided in Figure 10.

Figure 10 - Adjusted Forecast Total Water Demand Overview Chart



*All values in ac-ft/yr

One of the next steps will build upon these efforts to estimate peak treated water demand flow rates and peak wastewater build-out flow rates to use for evaluating CIP requirements for the respective service area boundaries of the water distribution and wastewater collection systems. In addition to evaluating the CIP needs for the relevant system, additional evaluations related to water supply planning required to refine the water demand assumptions, and recommended for consideration include the following:

- Re-evaluate Raw Water Master Plan with these new demand projections
- Develop a tool for reuse and downstream water demand evaluation to better evaluate this component
- Develop Water Treatment Master Plan Study
- Continue with evaluation of distribution and collection system models
- Complete a Paleo-Hydrology Study Update
- Further refine estimates of raw water conveyance loss in reservoir and raw water distribution system
- Continue to evaluate effects of climate variability on water supply and demand
- Evaluate the effectiveness of water conservation measures to determine how much of the water savings goal has been achieved so far, and how much savings are expected in the future
- Investigate how this Water Demand Study data integrates with ongoing water supply planning efforts such as the Windy Gap Firming Project, Union Reservoir Enlargement, and Union Reservoir Pump Back Pipeline project, etc.

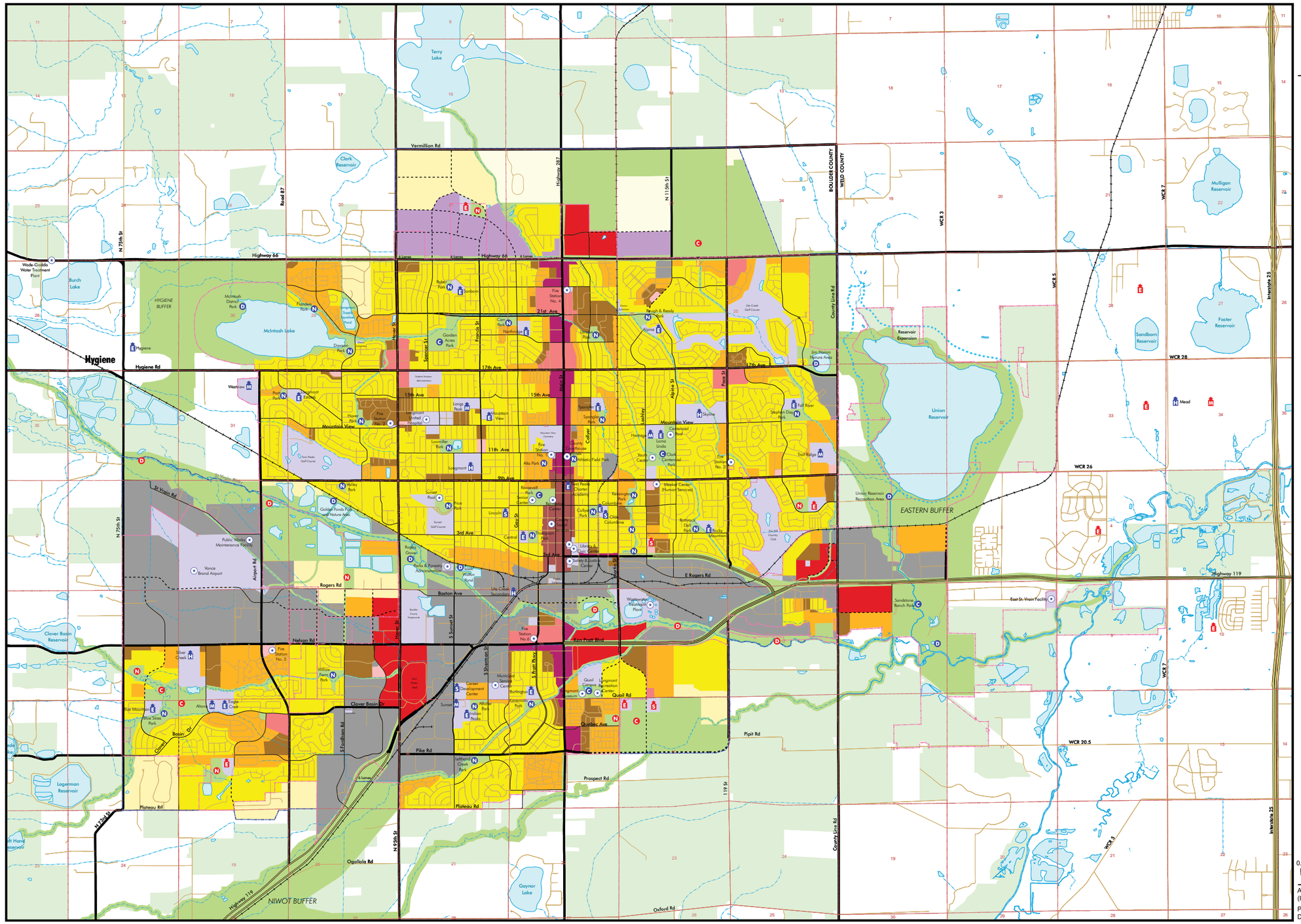
8.0 References

Billings, R. Bruce and Clive V. Jones. Forecasting Urban Water Demand, 2nd Ed. Denver: American Water Works Association, 2008.

ATTACHMENT 1

Longmont Area Comprehensive Plan (LACP) Maps as of July 27, 2010

Comprehensive Plan Map



LONGMONT AREA COMPREHENSIVE PLAN

Legend

Land Use

- Ultra Low Density Residential
- Very Low Density Residential
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Neighborhood Commercial
- Multi-Neighborhood Commercial
- Central Business District
- Regional Commercial
- Strip Commercial
- Mixed Use Corridor
- Industrial/Economic Development
- Public and Quasi-Public
- Parks, Greenway and Open Space
- Open Space Outside LPA
- Union Reservoir Expansion Area

Planning Boundaries

- Municipal Service Area (MSA)
- Longmont Planning Area (LPA)
- Coordinated Planning Area (CPA)

Transportation Network

- Existing Freeway
- Existing Expressway
- Existing Arterial
- Existing Primary Collector
- Existing Neighborhood Collector
- Existing Local Street
- Proposed Arterial
- Proposed Neighborhood Collector
- Railroad

Community Facilities

- Existing Neighborhood Park
- Existing Community Park
- Existing District Park
- Existing Elementary School
- Existing Middle School
- Existing High School
- Existing Special School
- Existing Other Facility
- Proposed Neighborhood Park
- Proposed Community Park
- Proposed District Park
- Proposed Elementary School
- Proposed Middle School
- Proposed High School
- Proposed Special School
- Proposed Other Facility

0.5 0.25 0 0.5 Miles

N W E S

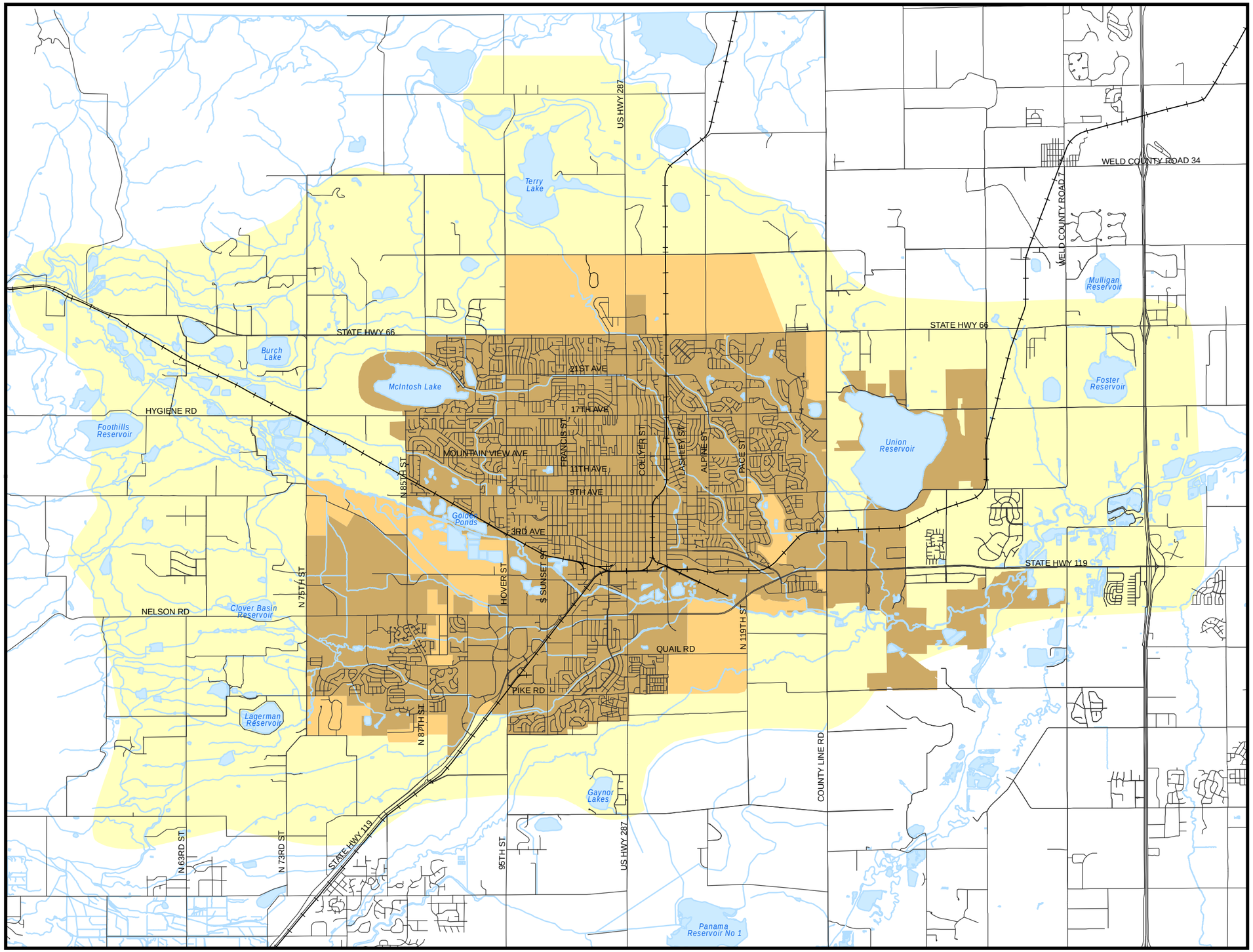
August 26, 2003
(Includes amendments through July 27, 2010)

Planning Division
Department of Economic Development

Map Disclaimer:
This product is for informational purposes only and has not been prepared for legal, engineering, surveying, utility locates or any other particular purpose. The maps and other digital, graphic and tabular information provided by the City of Longmont were compiled from survey, recorded deeds, plats, pole/anchor maps, aerial photography and other sources. The information may not be complete, comprehensive, current, accurate or suitable for any purpose other than reference. Users of this information should review or corroborate the primary data and information sources to ascertain the usability of the information.
The City makes no warranties or representations with respect to such information and further expressly disclaims any warranties and representations regarding the accuracy, completeness, currency, suitability, or fitness for any particular purpose, availability, validity, format, composition, content, timeliness, scope, detail, reliability, merchantability and the medium in which such information is provided.
Data sources: City of Longmont, Boulder County, Weld County.

LONGMONT AREA COMPREHENSIVE PLAN

Three-Tier Planning System



Legend

- Municipal Service Area (MSA)
- Longmont Planning Area (LPA)
- St. Vrain Valley Planning Area (SVVPA)

0 0.5 1 2 Miles

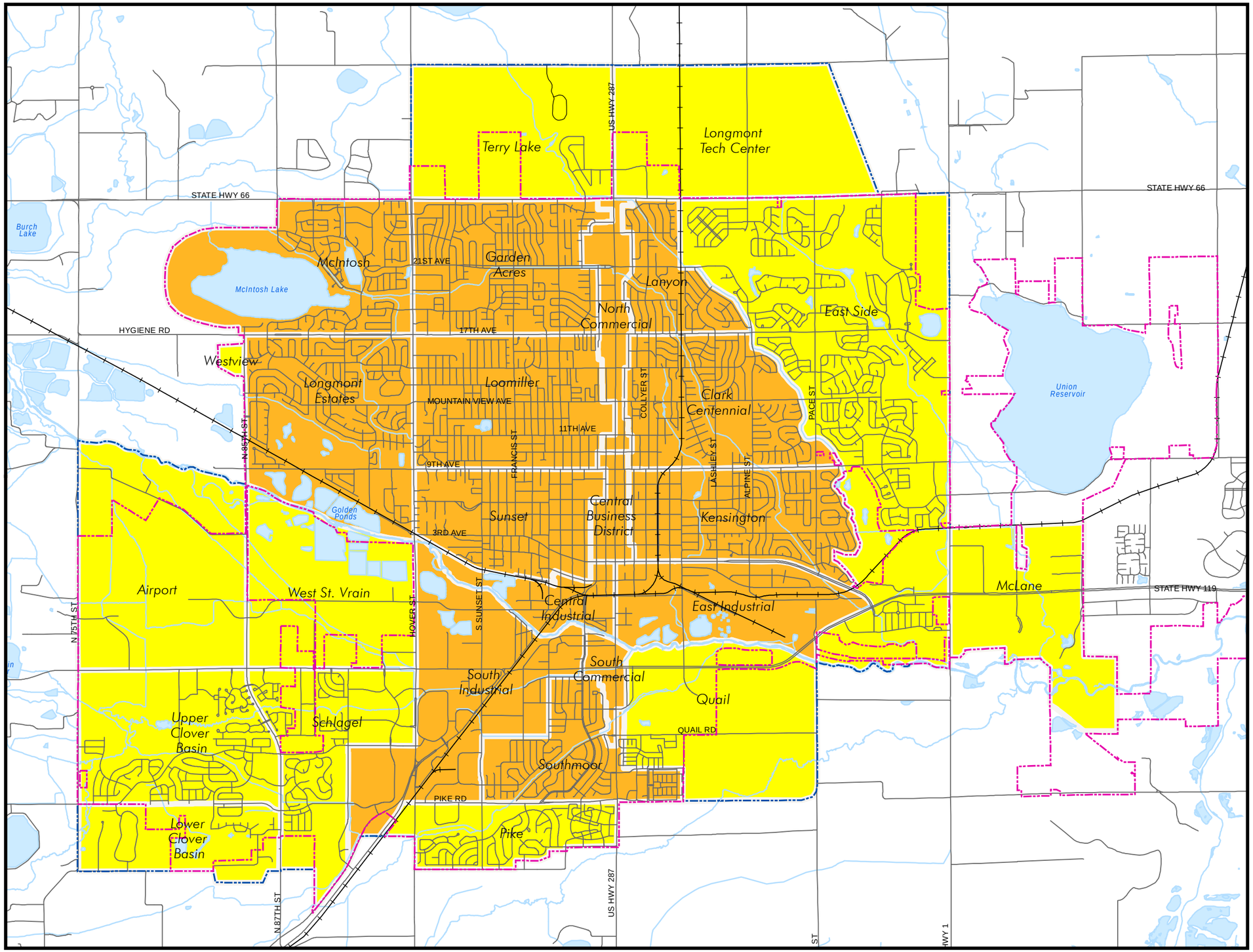
N W E S

August 26, 2003
(Includes amendments through July 27, 2010)

Planning Division
Department of Economic Development

LONGMONT AREA COMPREHENSIVE PLAN

Neighborhood Planning Areas



Legend

- Municipal Service Area (MSA)
- Longmont Planning Area (LPA)

Planning Areas

- Established Neighborhood
- Planned Neighborhood

0 0.25 0.5 1 Miles

August 26, 2003
(Includes amendments through July 27, 2010)

Planning Division
Department of Economic Development

ATTACHMENT 2

Longmont Area Comprehensive Plan (LACP) Land Use Classifications

LONGMONT AREA COMPREHENSIVE PLAN

July 8, 2003

Adopted by City Council on August 26, 2003
Includes amendments through April 11, 2006

Comprehensive Land Use Category Definitions

The following table summarizes each of the land use categories identified on the Comprehensive Plan Map. The table is intended as a quick reference guide to be used in conjunction with the map. Detailed criteria for the location, layout, design, desired character, and size of each land use category are provided in the relevant policy chapters.

Summary of Land Use Categories

Residential Land Uses

Land Use Category	Range of Density	Uses	Locational Criteria
Ultra Low Density Residential	Up to 1 unit per 5 acres. Generally, densities will be lower unless developed as part of a transferred development rights program, in a clustered development pattern.	Ultra low density single-family detached housing.	▪ Areas designated for open space, such as urban shaping buffers. ▪ Areas with severe physiographic constraints. ▪ Clustered to the extent possible. ▪ Areas with limited utility capacity. ▪ Basic urban services (City wastewater required and City water highly desirable). ▪ Areas that may be part of a transferred development rights program.
Very Low Density Residential	Up to 1 unit per acre.	Very low density single-family detached housing.	▪ Areas with physiographic constraints that make higher-density impractical. ▪ Areas away from activity centers. ▪ Areas with limited utility capacity ▪ Full range of urban services required. ▪ Clustered to the extent possible.
Low Density Residential	1-6 units per acre.	Low density housing in neighborhoods. May include a mix of housing types and densities and limited neighborhood services as part of a planned residential development.	▪ Areas that will not be adversely impacted by surrounding land uses. ▪ Areas with no physiographic or environmental constraints. ▪ Areas suitable as quiet residential neighborhoods. ▪ Areas within walking distance of neighborhood or multi-neighborhood shopping, educational, and/or recreational facilities but not requiring proximity to major activity centers.
Medium Density Residential	Greater than 6 units per acre and up to 12 units per acre.	A variety of residential housing types and densities, including duplexes, tri-plexes, four-plexes, and multi-family housing. May include neighborhood services as part of a planned residential development.	▪ Areas serving as transitional land use between low and high density residential uses. ▪ Areas within one-half mile range of shopping, educational, and recreational facilities. ▪ Areas adjacent to arterial or collector streets or accessible to such without passing through less intensive land uses. ▪ Areas where medium density residential is

			compatible with adjacent land uses. ▪ Areas served by public transportation. ▪ Areas where blight exists and medium density residential is the most appropriate method for revitalizing the area.
High Density Residential	Greater than 12 units per acre and up to 30 units per acre.	Multi-family residential housing and group living facilities. May include a mix of housing types and densities and neighborhood services as part of a planned residential development.	▪ Areas adjacent to or within walking distance of schools, parks, and neighborhood and/or multi-neighborhood shopping. ▪ Areas in proximity to employment centers. ▪ Areas adjacent to arterial streets or accessible to such without passing through less intensive land uses. ▪ Areas where high density residential is compatible with the surrounding neighborhood. ▪ Areas served by public transportation.

Commercial Land Uses

Land Use Category	Size and Area Served	Uses	Locational Criteria
Neighborhood Center	2-5 acres, with a trade area of 3/8 to 3/4 of a mile.	Small scale retail, commercial, business and professional offices. *Also allowed:* Mix of higher density housing subject to limits of the *Land Development Code*.	▪ Site having frontage on two collector streets or with frontage on an arterial and a collector street. ▪ Access by walk-in trade from a residential or employment area. ▪ Certain amenities such as a pedestrian plaza and landscaping as well as sign and access control to create a cohesive development. ▪ Impact of new commercial development proposals on existing development. ▪ Ensure that neighborhood commercial development is integrated with and enhances the immediate neighborhood.
Multi-Neighborhood Commercial	Approximately 10-20 acres, with a trade area of 1-2 miles serving a population of 10,000 to 20,000, Typical gross square feet of 85,000 ranging as high as 175,000 square feet.	Retail, commercial, business & professional offices typically anchored by a supermarket or discount drug store. *Also allowed:* Mix of higher density housing subject to limits of the *Land Development Code*.	▪ Site having frontage on two arterial streets at the intersection of three or more neighborhood planning areas. ▪ Certain amenities such as a pedestrian plaza and landscaping as well as sign and access control to create a cohesive development. ▪ Impact of new commercial development proposals on existing development. ▪ Additional multi-neighborhood commercial centers at the intersections of arterial streets where there are existing or future multi-neighborhood commercial centers shown on the *Longmont Area Comprehensive Plan*, provided that any traffic impacts are mitigated. ▪ Ensure that multi-neighborhood commercial

			development is integrated with and enhances the immediate neighborhoods.
Regional Commercial	A minimum size of 40 acres, with a trade area of 5 miles serving a population of 50,000 or more. A minimum of 350,000 square feet of total gross floor area with at least two major anchors	Retail with national retailers that draw from all of Longmont and the rural areas surrounding the City.	▪ A location at the intersection of two arterials or an arterial and a highway where such streets and public transportation provide access for the entire City and market service areas outside the City with a minimum impact on less intensive uses. ▪ A location where it will not overload, create congestion, or be incompatible with existing and planned public facilities, utilities, or services.
Central Business District	N/A	Diverse mix of businesses, including specialty goods retail, bars and restaurants, entertainment, offices, cultural facilities, and civic and government facilities as well as supporting residential uses.	▪ Encompasses the downtown area including several blocks on either side of Main Street between 2nd Avenue on the south to just north of 9th Avenue on the north. ▪ Pedestrian-oriented development. ▪ Potential infill development location.
Strip Commercial	N/A	Developed commercial areas that will gradually redevelop over time.	▪ Generally along Main Street north and south of the central business district in developed areas of the City. ▪ Potential redevelopment location.
Mixed-Use Corridor	Minimum size area of 30 acres, ranging up to 150 acres.	A balanced mix of land uses in the same development, including entertainment, retail, residential, employment, civic, and recreation uses.	▪ A site having frontage on an arterial street or expressway with opportunities for access from an intersecting arterial or collector street. ▪ A location where it will not overload, create congestion, or be incompatible with existing and planned public facilities, utilities, or services.

Employment Land Uses

Land Use Category	Size	Uses	Locational Criteria
Industrial/ Economic Development	N/A	Low intensity industrial uses, including light manufacturing, warehousing and distribution, research and development, and commercial services. Also intended to encourage high quality employment facilities, such as corporate office headquarters and educational facilities in a planned, "campus-like" setting. *Also Allowed:* Limited support services, such as restaurants, supermarkets, specialty stores, professional and medical offices. Residential may be vertically integrated, up to 25% of the total development floor area.	▪ Large sites with no extraordinary constraints to development. ▪ Proximity to major highway and access to arterial streets without the need to travel through less intensive land uses or with direct access to City truck routes for users with high traffic generation. ▪ Existing or planned uncommitted utility services: sewer, water, and electricity. ▪ Location of heavy industrial uses away from residential areas when the use of site design techniques cannot adequately achieve compatibility with nearby or adjacent residential uses.

Public/Institutional Land Uses

Land Use Category	Size	Uses	Characteristics/Notes
Public/Quasi-Public	N/A	Lands for schools, government offices, community centers, libraries, hospitals, and cemeteries. Also includes facilities needed for essential public services such as electrical substations, water and wastewater facilities, and other similar uses. Golf courses and fair grounds are included in this category.	▪ Provided by the City, County, special districts, or by a quasi-public organization.
Parks, Greenways and Open Space	Size depends on type of facility. Neighborhood Park: 10-20 acres. Community Park: 50-100 acres.	Lands for active and passive recreation uses, natural areas, agriculture, preservation of scenic quality, trails and corridors to connect activity centers.	▪ Intended to provide for the active and passive recreational needs of the community. ▪ Conserve cultural and natural areas. ▪ Generally provided by public agencies (city, county, state or federal).

ATTACHMENT 3

Excerpts from Previous Treated Water Master Plans

Attachment 3 – Details from Previous Treated Water Master Plans

Report on Improvements to Water Supply System (1951)

The 1951 report studied the facilities of the City of Longmont Water System pertaining "only to that part of the system that is exclusive of the distribution mains in the City of Longmont." This discussion included water resources, sources of supply, quality of water, population, water requirements, raw water transmission mains, filtered water transmission mains, city storage reservoirs, filter plant (now the decommissioned "South Plant"), long distance recorder, and sterilization.

According to the report, "The population study, based on U.S. census enumerations, indicates that the 1952 population will be about 8500 and that in 1970 it will be about 12,000".

The future water requirements were based on the "records of the water discharged from filter plant in the past." As indicated in the report, "The records kept at the plant have not all been recorded accurately; in fact, for periods the records are sketchy and consist only of the number of filters in operation." The report also stated that "The City-owned swimming pool and the golf course both utilize water from the overflow from the reservoir for filling and irrigation, respectively. Such uncontrolled use, together with the lack of means for the operator to accurately adjust filter plant operations to reservoir water level which results in excessive overflows, makes it difficult to determine the amount of water used by revenue customers." "In spite of the inconsistency of the records, and regardless of the abnormal consumption of water, it is believed that the graph of water requirements as shown" in the report "is substantially correct." The filter plant records and the table developed from the graph resulted in estimated water requirements summarized in Table 2.

TABLE 2
Summary of Projections from 1951 Report on Improvements to Water Supply System

		Water Requirement		
Year	**Population**	**MG/year**	**acre-feet/year**	**Average daily per capita**
1950	8,099	998	3,060	338
1970	12,000	1,400	4,300	319
Actual 1970	*23,800*	*2,396*	*7,353*	*276*

Water Distribution Master Plan (1963)

"The scope of the studies in this report go only into the City of Longmont's water works facility to the extent of studying and recommending on a proper water distribution facility within the City proper. Recommendations and analysis of storage and transmission supply lines were made only as they affect the distribution system." This scope included population and water consumption, existing distribution system, proposed distribution system, potable water storage, estimated costs and recommendations.

"In the forecast of the increase in population for Longmont, an attempt was made to estimate the direction and increase that the population trends will have. Several contacts were made with community leaders and land developers to secure their thinking on the rate and direction that the City might expand. A tremendous variation was received in their opinions. Their conclusions, along with our estimates, are the basis of the water use area analysis map. Also, a population projection was obtained based on information from private reports, U.S. Census Bureau reports, and our own knowledge of the City of Longmont."

"The location and distribution of the population, commercial centers and industrial centers forms the basic foundation for a municipality's water works distribution system." "In the construction of water use analysis map", "a careful study was given to the exact areas and the exact rates at which water was being consumed, and also in the amounts that this water was being consumed." Since "our investigation and analysis is limited strictly to the water distribution system, our consumption figures" in the report "are adjusted to reflect only the amount of water which may flow through the distribution system. Therefore, the figures as shown" in the report "as average daily water consumption… reflect only approximately 80 per cent of the water treated by the water treatment plant. This figure of 80 per cent represents a deletion of approximately 10 per cent for waste at the storage and transmission facilities and a deletion of approximately 10 per cent for rural water users between the City of Longmont and treatment facilities."

"In addition to these statistics on water consumption, a detailed analysis was made in the City Clerk's office of the water consumption figures for various industries and businesses in the Longmont area. With all of these available consumption figures in hand giving the exact amount used by industry, by business and by the residential areas, a breakdown was made of the distribution area as shown" by the Water Use Analysis Charts. This water use analysis included 62 areas with household, business, industry, undeveloped and other uses, areas, number of services, population and water demand statistics

"Although the range of investigation in this study was limited to the date 1980, some projections on the water use analysis table and the water consumption table go to the year 2000. The only purpose served in this extra extension is to show that the date 1980 is only an intermediate goal in the long range development of the City of Longmont's distribution system." The water use analysis resulted in estimated water demands summarized in Table 3.

TABLE 3
Summary of Projections from 1963 Water Distribution System Master Plan

			Water Requirement		
Year	**Population**	**Area (acres)**	**MG/year**	**acre-feet/year**	**Average daily per capita**
1960	11,489	1,911	1,116	3,428	266
1970	17,500	2,864	1,596	4,901	250
1980	27,000	3,792	2,513	7,713	255
1990	37,000	4,698	3,511	10,777	260
2000	45,000	5,550	4,434	13,611	270
Actual 2000	*74,145*	-	*5,763*	*17,690*	*195*

Engineering Report on Waterworks Improvements (1972)

"The intent of this report is to recommend improvements to the Longmont waterworks which will provide satisfactory service for demands of the present and near future. The report presents a plan for ongoing waterworks improvements to treatment, treated water transmission, storage, and distribution facilities. Raw water supply, diversion and transmission are excluded from the scope of our work."

"The report presents a plan for ongoing waterworks improvements to treatment, transmission, storage, and distribution facilities. While the improvements fit into long-range concepts, the report is not comprehensive nor a master plan." "Also, improvements are scheduled for about a decade of time, although for purposes of bond redemption, population growth is projected for two decades."

"In a growing community experience has shown that no study of waterworks becomes final in the sense that future studies are not needed. It is acknowledged that in years to come revision of this report will be necessary to adjust to changing situations."

"For many years the 35 miles separating Longmont from downtown Denver was sufficient to keep the greater impact of metropolitan growth from reaching the community. Largely serving an agricultural area, Longmont experienced a slower rate of growth until 1960. The by 1970 the population doubled under the influence of new industry, governmental installations and commerce locating in the area, and of improved highway access to the cities of Denver and Boulder." "The pressures which produced the population increase experienced in 1960-1970 can reasonably be expected to continue."

"The population forecast… rests on past U.S. Bureau of Census counts, on tentative estimates of the Colorado State Planning Office, and on estimates of the Denver Regional Council of Governments." "For the purposes of this study we have indicated… a shaded area representing the probable growth range. To follow a prudent approach, the upper boundary will be used to schedule waterworks improvements, while the lower boundary will be used to project revenues for bond redemption."

"So far, Longmont has developed in a rather compact manner, and we feel the City will continue to expand in area rather compactly. As to water service area, however, there may well develop some separated tracts along the transmission mains west of the City where scattered service already exists."

"The St. Vrain river flood plain is a partial barrier to expansion, but other than this there are no mountains, reserved lands, nor political boundaries to limit growth. The flat lands to the north, west, and south of the City are believed to be mover favorable to building than the hill to the east; consequently, building is expected to be more rapid in these three directions."

"Water produced for consumption from the Longmont municipal system may be subdivided into these categories: (1) permanent connections, both metered and unmetered, for residential, commercial, and industrial places, (2) temporary connections for fire fighting, water roadway flora, and construction needs, (3) losses from reservoir seepage, pipeline leaks, slow meters, and street-hydrant flushing, and (4) unmetered park and recreation area watering. Because the bulk of water customers is not metered in Longmont, the amount of water not developing revenue remains unknown, and only gross production records exist for planning system improvements."

"The combination of indeterminate uses, as defined by items 2, 3 and 4 above, are often termed "unaccounted-for" water in completely metered systems." "In general, when the "unaccounted-for" water is kept below about 15 percent of the total water produced, then the water not developing revenue may be considered to be under reasonably good control. Most waterworks require a continuous maintenance program to hold the losses below 15 percent." "In consideration of the age, length of lines, and other physical aspects of the waterworks, we have assigned a value of 20 percent of the total annual production as "unaccounted-for" water for projecting water requirements."

"Because industrial water consumption is metered in Longmont, it has long been known that such use is a significant component of the total annual water production, having ranged from 25 percent in 1964 to about 13 percent at present." "As to the future, we expect only a modest increase in major industrial water consumption, not at all proportionate to population growth. The Longmont Chamber of Commerce has emphasized that only low water use industry has been or will be sought for the City."

"The metered major industrial consumption is extended at the rate of 5 MG per year. In actuality the consumption would suddenly move upwards with the advent of another customer, but the uniform increase is used as an approximation believed to be valid over an extended time period."

The report "estimated the population served from the waterworks by use of census data, household factors, billing information, and approximations of outside customers. " "In this report the industrial component of the total production is treated separately since it is not expected to be proportionate to population growth. Also, "unaccounted-for" water is considered separately. Therefore, net per capita figures, rather than gross figures, have been derived in the manner presented in" the report.

"Because we feel the 1971 consumption to be closer to the normal experience, projection of future consumption will be based on a constant 190 gpcpd (excludes an estimated 25% "unaccounted for" water and metered major industrial consumption). Inasmuch as 1971 is a hot dry year, it is possible that 190 gpcpd will not often be exceeded. It has been supposed by some persons that the average annual per capita consumption will gradually increase during the ensuing years; in this supposition we do not concur for a reason centered around living density. Not only are dwelling lots becoming smaller, but are living more closely together in apartments, condominiums, and townhouses. For a residence, the annual outside water use on yards in by volume roughly two to three times greater than inside use, so that a reduction of yard size makes a substantial reduction in per capita consumption for those people counted at the residence. The 190 gpcpd value embodies all types of consumption ordinarily found in municipal water service, namely: single-residential, multi-unit residential, commercial, and minor industrial."

Based on this approach, the future water production requirements for the total system were estimated; results are summarized in Table 4.

TABLE 4
Summary of Projections from 1972 Engineering Report on Waterworks Improvements

		Water Requirement		
Year	**Population**	**MG/year**	**acre-feet/year**	**Average daily per capita**
1970	24,300	2,396	7,400	270
1980	40,800	4,000	12,300	269
1990	57,300	5,500	16,900	263
Actual 1990	*52,385*	*4,191*	*12,861*	*219*
1992	60,600	5,800	17,800	262

Treated Water Master Plan (1989)

Introduction

"Realizing the need to improve the existing system and to accommodate future development, the City of Longmont engaged" the report authors "to prepare a Treated Water Master Plan (TWMP). This study addresses the adequacy of existing facilities and recommends future improvements to satisfy peak water demands through the year 2010." "The scope of the TWMP included "project(ing) future service area demands based on population estimates and zoning requirements providing by the City Planning Division."

"The Longmont Area Comprehensive Plan identifies the Municipal Service Area (MSA) as that area within the City limits to which the City is providing, or intends to annex and provide, urban services over time." "There are several areas within the MSA that are not a part of the City; however, the City is considering their annexation in the near future. These small areas, called enclaves, total about 293 acres." "The MSA is not, however, the current

treated water service area, but was used for developing water demands based on proposed zoning."

"Future development in Longmont will consist of both infill with the MSA and new development within the Longmont Planning Area (LPA). The LPA… shows the areas that have been planned in advance of development. The land contained within the LPA and MSA is defined as the "study area" for this report." "Note that the total land area which may be served by the City is comprised as the sum of the MSA and LPA."

Population

"The residential population was estimated by the Longmont Planning Division." "These projections were used to develop future system demands and improvements."

Water Demand Evaluation

"To design a water distribution system, both current and future water demands must be adequately evaluated." "Existing water demands come from recent historic water consumption data within the current service area. Future water demands were computed from projections of land annexation, land use projections, population projections, and historic demand rates for the various water customer classifications."

Existing Water Demands

"To properly evaluate the water distribution system under high use conditions, the 90th percentile value (only 10 percent of the years would have greater water demands) was used for determining the design system-wide per capita water use. Based on 15 years of record from 1974 through 1988, the 90th percentile selected for evaluation of the system is 260 gpcd."

"The design year water demands… were used to develop existing demand allocations for the computer model. These demand rates, however, do not include an allocation for unaccounted-for water or provisions for delivering water during the design year. Unaccounted-for water is that which is treated and delivered to the distribution system, but is not individually metered or accounted for. This water is either used for unmetered domestic or municipal purposes, public buildings, and public facilities, or is lost through leaks or inaccuracies in metering." "If known leakage and irrigation uses are taken into account, the unaccounted-for water over the last nine years average slightly less than 18 percent. The 18 percent figure is also based on the assumption that metered and unmetered residential use is the same in the same neighborhoods."

"Since the 1987 metered demand rates… do not include provisions for unaccounted-for water or design year demands, they had to be increased by approximately 24 percent to yield the system-wide design value of 260 gpcd."

"The customer classifications used for calculating demand rates in the computer model included residential, commercial, industrial, and open space or parks. Demand rates for existing development came from 1987 water meter records for every tap served by the City. All commercial and industrial taps were converted to equivalent ¾-inch taps, and the appropriate demand rate in gpm was based on 1987 records. "

Future Water Demands

"Actual tap sizes and locations are not available for future development or redevelopment. Therefore, future demand rates and allocations cannot be made the same way as for the existing demand rates and allocations. The demand rates and allocations for the future computer model were based upon proposed zoning rather than actual tap counts. Using the land use provided for the LPA and the MSA in the Longmont Area Comprehensive Plan, acreages for each customer classification were allocated to corresponding nodes; then a per acre average day demand rate for each customer classification was applied to these acreages. The average day demand rates… are based upon historic data, proposed zoning densities, and demand values representative of the Colorado Front Range."

"According to the Longmont Planning Division land use projections, the percentage of land used for commercial/industrial will rise in the future. This rise in commercial/industrial land use will cause water demands and the system-wide per capita water use to rise also. Based on the land use data provided by the Planning Division, current water use data provided by the Water Department, and current water use patterns, future system-wide per capita water use could increase to 305 gpcd at ultimate build-out of the LPA." The future water demands as shown in Table 4-5 are summarized in Table 5.

TABLE 4-5 FROM 1989 TWMP
Summary of Projections from 1989 Treated Water Master Plan

			Water Requirement		
Year	**Population**	**Area (acres)**	**MG/year**	**acre-feet/year**	**Average daily per capita**
1990	54,500	9,758	5,200	16,000	262
1995	61,200	-	5,900	18,200	266
2000	68,600	-	6,800	20,800	271
2010	84,900	-	8,700	26,800	282
Actual 2010	*88,221*	-	*5,298*	*16,258*	*165*
Build-Out	120,900	17,997	13,500	41,300	305

Treated Water Master Plan (2000)

"The City of Longmont Treated Water Master Plan (TWMP) is a document that is used to guide the City in planning for new potable water facilities. The Master Plan contains population growth and demand projections from the present through build-out of the Longmont Planning Area (LPA), evaluations and recommendations for design criteria, assessments of water treatment facilities and recommendations for improvements, evaluations of transmission and distribution systems and an updated recommended capital improvement plan with program milestones and economic impacts."

"The City's service area is comprised of an LPA and a Municipal Service Area (MSA)… The LPA encompasses an area of 20,369 acres, the MSA encompasses a smaller area of 14,198

acres." "The Department of Community Development Planning Division has developed population and land use projections through build-out for the City.

Water use within the City has been recorded on a gross per capita basis since 1964. More detailed breakdowns of usage by customer classifications for the years 1993 through 1997 were used to evaluate water uses by category within the City."

"It is best to populate the water distribution model with demands by classification, but this is not always possible. Sometimes the water consumption records of a community do not always fit the planning criteria of land use planners. An example is the difference between residential water users and commercial or industrial users in most communities. Normally, residential water usage records can be broken down into water used by individual user categories, e.g., single family and multifamily units, which are the same units used by land use planners. Usage data for commercial and industrial accounts from the water system is normally available on the basis of water used per tap or per account. This differs from the data used by land use planners. Land planners normally project industrial and commercial land usage on the basis of gross acres, which can be further refined to a net area by multiplying the gross area by a floor area ratio (FAR). Normally, site-specific studies are accomplished within the water system to define water use for specific industrial and commercial users by gross acreage or developed floor area."

"Regardless of how they are developed, the final water demands should always be compared with the overall water system per capita usage values to ensure that the results are in line with historical information, or the differences are accountable. This comparison must also take into account the climatological effects on water usage, especially in the semiarid conditions that exist along Colorado's Front Range."

"Customer classifications inside and outside the City were identified. These records included: single and multifamily residential (flat rate and metered accounts), commercial, special (4-inch meters and larger), industrial, public uses (for parks administration, fire stations, medians/greenbelts/ROW, golf courses, public buildings, and water used at the wastewater treatment plant). Additionally, (the consultant) reviewed the City's estimates of water used in "authorized" and "unaccounted for water" categories. This assessment of demands was aimed at evaluating not only the base demand for each category of use but increases that had to be added to each base category in the form of "distributed water" to account for those demands that are not identifiable by land use projections."

"Due to climatic effects, the base volume of water used by each single family unit ranged from 313 gallons (per day) per unit in 1995, to 361 gallons (per day) per unit in 1994 for metered consumption." "The 1994 value of 361 gallons (per day) per unit, rounded down to 360 gallons per unit, is used as the base value usage for all single family housing units."

"Due to climatic effects, the volume of water used by each multifamily unit ranges from 143 gallons (per day) per unit in 1995 to 176 gallons (per day) per unit in 1994 for metered consumption. A demand rate of 175 gallons (per day) per unit, is used as the base value for multifamily units since it is representative of the higher end consumptions of multifamily water users."

"City staff have completed independent assessments of water usage within three industrial areas. These are the Longs Peak Industrial Park south of Highway 119, the Longs Peak

Industrial Park north of Highway 119 and the Saint Vrain Centre." "On a weighted basis the flows per acre ranged from 1,524 gallons (per day per gross acre) in 1993 to 3,320 gallons (per day per gross acre) in 1997. An average day industrial water use of 2,750 gallons (per day) per gross acre is recommended for system planning purposes."

"(The consultant) did an independent assessment of commercial demand for two locations within the City. These were commercial customers in the 200 and 300 blocks along Main Street, and the Twin Peaks Mall." These City water use records quantify the amount of water used by businesses at these addresses (Main Street) for 1996, which amounted to 26,651 gpd on average throughout the year. These commercial businesses cover about 9.0 acres of land, so on a gross basis they used about 2,960 gallons of water for each acres served during 1996."

"During 1996, the addresses at the mall used approximately 39.5 million gallons of water. This equates to a little more than 108,000 gallons of water per day or based upon a gross area of 100 acres, about 1,080 gallons per day per acre (gpd/ac). An average day commercial water use of 2,750 gallons per gross acre is recommended for system planning purposes."

"Records for metered public water use were reviewed for the years 1993 through 1997." "Land for parks is the only category (other than the wastewater treatment plant) where fairly definitive land use categories are projected in the land use plan, so it was necessary to establish the historical use for this category. (The consultant) analyzed water use for six arbitrarily selected parks within the City." "The data… show that, based upon gross acreage, the average daily use for each park is about 1,200 gallons per acre. The average use throughout the somewhat elongated irrigation season averaged approximately 2,000 gallons per gross acre per day."

"The water uses defined above are the base water rates for each of the individual classifications covered…" "However, to project water use into the future throughout the water system, non-unit uses such as those noted under distributed water must be added to the base water units. The distributed water uses were totaled and added to the base usage for single family and multifamily residential units based upon the pro rata percentage of these uses to the City's annual residential water consumption."

"The City's Community Development Planning Division is projecting that residential densities will fall from a current level of 2.52 persons per unit, to 2.2 persons per unit in 2016 and remain consistent at this level throughout residential build-out in 2028. Accordingly, the current levels of unit consumptions have to be revised downward to reflect future changes in density."

"Because the acreage for specific land uses has not been computed for each of the established neighborhoods, water demands in the established neighborhoods in the database have not been updated from the 1989 Treated Water Master Plan." However, "new demands that will be created by the development of approximately 2,025 in-fill residential units within the existing communities" were added.

"The projected average day water uses for build-out… were first applied to land use classifications in each Neighborhood Area within the LPA."

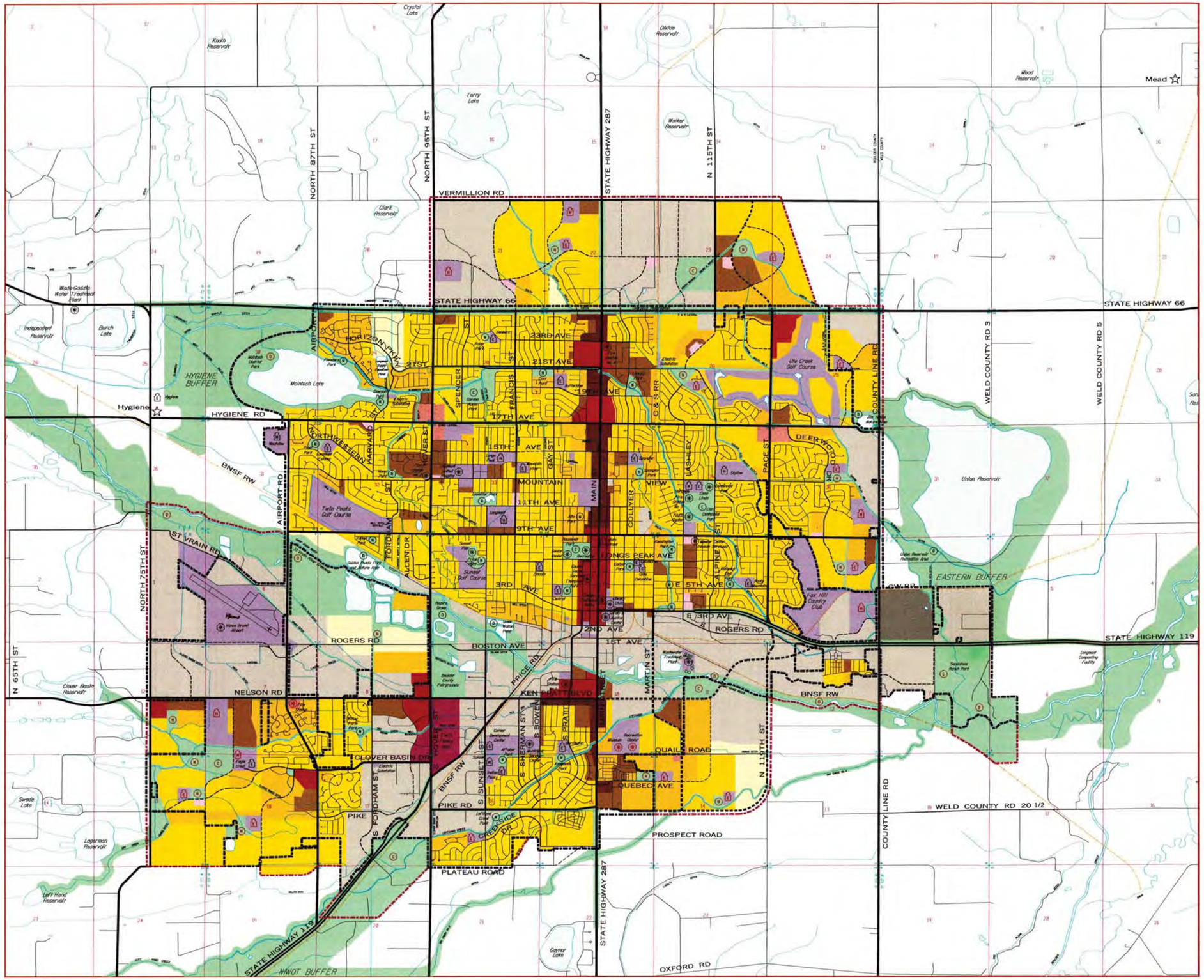
"The City maintains a sophisticated spreadsheet database to distribute demands to specific locations in the water distribution system based on the land uses associated with each location. " The use of these values produces the water demands for the City summarized in Table 7.

TABLE 7
Summary of Projections from 2000 Treated Water Master Plan

				Water Requirement		
Year	**Population**	**Area (acres)**	**MGD**	**MG/year**	**acre-feet/year**	**Average daily per capita**
1998	62,785	-	13.7	5,000	15,300	218
2010	84,000	-	20.4	7,400	22,900	243
Actual 2010	*88,221*	*-*	*14.5*	*5,298*	*16,258*	*165*
2020	94,000	-	24.6	9,000	27,500	261
2028	108,000	-	29.2	10,600	32,700	270
2048	108,000	34,567	33.0	12,000	37,000	306

ATTACHMENT 4

Longmont Area Comprehensive Plan (LACP) Map as of December 28, 1999



Comprehensive Plan Map

Longmont Area Comprehensive Plan

LAND USE

Residential

- Ultra Low Density
- Very Low Density
- Low Density
- Medium Density
- High Density

Commercial/Business

- Central Business District
- Neighborhood
- Multi-Neighborhood
- Community
- Regional
- Strip

Industrial

- Major Industrial
- Industrial/Economic Development

Other

- Park, Greenway and Open Space
- Public and Quasi-Public

COMMUNITY FACILITIES

Existing	Proposed	
		Elementary School
		Middle School
		High School
		Special School
		Neighborhood Park
		Community Park
		District Park
		Other Facilities

TRANSPORTATION

Existing	Proposed	
		Expressway
		Arterial
		Primary Collector
		Neighborhood Collector
		Local
		Railroad

PLANNING BOUNDARIES

- Municipal Service Area (MSA)
- Longmont Planning Area (LPA)

0 1000 2000 4000
Scale in Feet
1" = 2000'

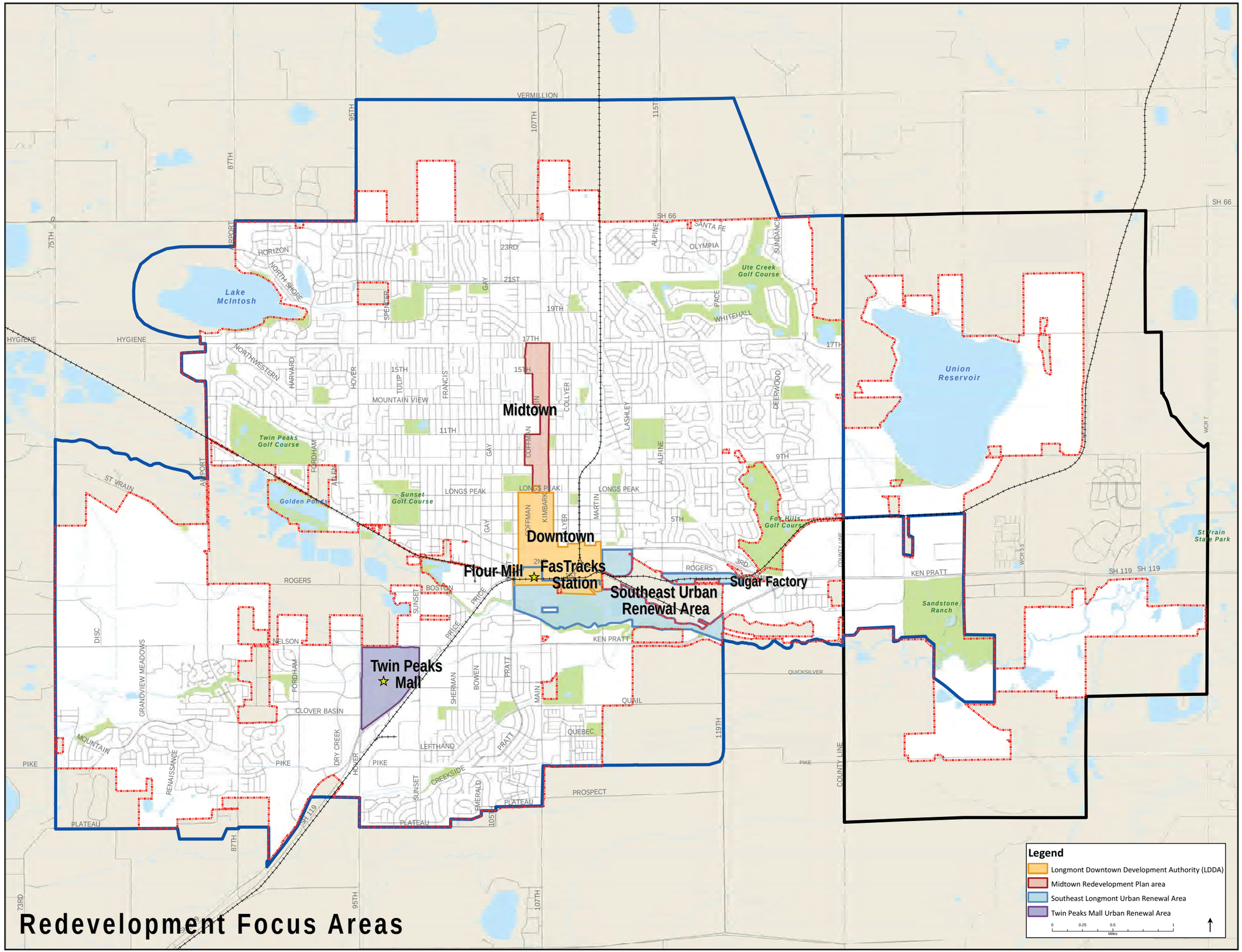
NORTH

January 24, 1995
(Revised December 28, 1999)

Planning Division
Department of
Community Development
City of Longmont, Colorado

ATTACHMENT 5

Map of Redevelopment Focus Areas



Redevelopment Focus Areas

ATTACHMENT 6

Water Demand Evaluation Assumptions

City of Longmont - Water Demand Assumptions for Reference Forecast

	What is the assumption?	Why was this assumption included?	What is the potential implication of the assumption?	If the assumption changes how much could this impact the demand (sensitivity)?	What is the estimated impact to water demand projection?
1	The Longmont Planning Area (LPA), as amended to July 2010, will provide the basis for the water service and land-use area to build-out.	To document the basis for the future buildout scenario of the City.	Changes in zoning could impact the consumption within the parcel and potentially impact water distribution system infrastructure. However, total area that could potentially change is not large as compared to existing developed areas.	Moderate	N/A
2	Rate of new development through build-out of the LPA as defined in Assumption No. 1 will occur as projected in the 2003 Raw Water Master Plan	To allow for projecting timing on City capital improvement projects and for use in tracking the City's Quality of Life Benchmark data.	Could potentially impact the schedule for implementation of project improvements and compliance with the City of Longmont's adopted Quality of Life Benchmarks	Low (may impact quality of life benchmarks but does not impact demand projections)	None
3	Undeveloped parcels within existing developments will develop in a similar fashion to the surrounding existing developments. (i.e. no significant redevelopment of existing property[1])	To allow the basis of the future projections to be based upon existing development.	Demand projections are directly related to land-use and development density assumptions. Changes to either or both have the potential to impact demand projections and water distribution system CIP improvements.	Low to Moderate, depending on scope of future changes.	1,000 to 3,000 acre-feet/year
4	Unit rate of consumption for existing customers will remain consistent with existing demands.	To tie future projections to existing use in the City.	No contingency for changes in demand patterns for existing customers	High	2,000 acre-feet/year
5	Unit rate of consumption for new development will be consistent with the unit rate of consumption for existing customers within the same land-use classification.	To allow for recalculation of future demand based upon existing demand rates rather than industry standards, which tend to be conservative and result in a higher future projection.	No contingency for potential changes in demand requirements for new development.	High	3,000 to 8,000 acre-feet/year
6	No significant new high water use industrial users will be added to the system.	There is no current basis to estimate a future high water users will be attracted to the City and to prevent over-estimation of future water demands.	No contingency for future high water use industrial users. May have economic development impacts which limit the types of industries the City may be able to attract. A future high water user, if realized, would require the City to acquire that additional water in the future.	Moderate to High	High volume water users can result in single water use demands of 1,000 to 5,000 acre-feet/year
7	Regulatory climate and laws will not impact future water consumption or uses.	Regulatory changes are not possible to predict with certainty. Future regulations have the potential to have a small to extremely large impact on demand and/or supply.	No allowance for potential future changes in federal or state law which might impact demand in the water system and/or require additional water releases for environmental purposes.	Moderate to High	100s to 1,000s of acre-feet/year
8	Climate varaibility will not affect future consumption rates.	This assumption is consistent with the 2004 RWMP Update. Scientific estimates of climate variability impact on water supply are variable and not reliable at this point. Estimates range from 6-10 percent increase in water demand due to climate change.	No new additional water demand will be ascribed to climate variability in the evaluation of future water use needs.	High	2,000 to 3,000 acre-feet/year
9	Non-consumptive water use will remain consistent with 2009 demand.	The City of Longmont does not currently have a policy that includes non-consumptive uses of water and it would be unlikely to make such a policy in the future that did not involve the ability to return that water to potable use if necessary for supply purposes.	No new consumptive uses of water for non-potable purposes such as in-stream flows, recreational uses, bulk system interconnects, etc. will occur that are not achievable through operational flexibility	Low	N/A
10	No new taps outside the water service area will be added. Consumptive use from existing outside taps, including the Town of Lyons and Hygiene, will remain at 2009 values.	It is anticipated that should future service connections occur that base water supply be provided (example: the Town of Lyons supplies raw water to Longmont for treatment and re-delivery to Lyons).	Minimal future capacity to supply potential future service areas and/or master meters. This is consistent with the City of Longmont's long-standing outside water tap policies and the current agreement with the Town of Lyons.	Low	N/A
11	Development within limits of flood plain will be similar to other similarly zoned properties and have water demand similar to that land-use classification	To document the basis of this assumption.	Changes in zoning could impact the consumption within the parcel and potentially impact water distribution system infrastructure. However, total area that could potentially change is not large as compared to existing developed areas	Moderate	100 to 1,000 acre-feet/year
12	Subdivisions in the LPA currently served by other water providers will not be served by the City.	To document the basis of this assumption.	No contingency for adding these service areas to be served by the City: Left Hand Water District, Longs Peak Water District.	Low	N/A

City of Longmont - Water Demand Variable Assumptions for Adjusted Forecast

	What is the assumption?	Why was this assumption included?	What is the potential implication of the assumption?	If the assumption changes how much could this impact the demand (sensitivity)?	What is the estimated impact to water demand projection?
1	Unit rate of consumption at build-out in the Mixed Use Corridor land use classification and Redevelopment Focus Areas (excluding WWTP and parks) will be consistent with the existing consumption in the Wallace Addition subdivision.	No significant development has occurred in the Mixed Use Corridor areas that can be used as the basis of calculating water consumption for future development in this land use or for redevelopment.	These areas represent approx. 6 percentage of the overall LPA area. A significant change in the unit rate of consumption should have a low to moderate impact on the overall water demand but potentially a high impact on water distribution system CIP improvements needed in each area.	Low to Moderate	up to 3%
2	Unit rates of consumption for residential and business land uses are adjusted to account for partially developed or partially occupied parcels.	Parcels that are partially developed or partially occupied are assumed to have lower consumption than when fully developed and occupied.	Review of parcels with the lowest rates of consumption to represent partially developed or partially vacant parcels suggests that the change is not large.	Low	up to 3%
3	Unit rate of consumption for new development will be consistent with the unit rate of consumption for existing customers within the same land-use classification in planned neighborhoods.	To evaluate the impact of basing consumption for new development on existing demand rates in planned neighborhoods which differs from established neighborhoods.	Unit rates of consumption in planned neighborhoods is higher for some land use classifications and lower for other land uses compared to the same land uses in established neighborhoods. The impact will depend on the land use classifications of new development.	Low	up to 1%
4	Economic development opportunities for high water use industrial customers	To meet the water service obligations of existing agreements.	No contingency for other future high water use customers.	High	up to 10%
5	Climate variability impact on treated water irrigation demand.	To allow for increased irrigation demands based on the climate variability.	Estimates range from 6-10 percent increase in outdoor portion of raw and treated water demand due to climate variability.	Moderate	6 to 10%
6	No Industrial Economic Development (IED) conversion to Resdiential or Mixed Use will occur	To document the basis of this assumption.	The unit demand rate for Mixed Use and High Density Residential is higher than IED.	Low to Moderate	up to 5%
7	Treated Water Distribution System water loss percentage	Water losses from the treated water distribution system are inevitable. Current water losses within the distribution system are approximately 7 to 8 percent of water produced from the WTP.	The current distribution system is efficient and has a relatively low amount of water losses. A majority of the system is conisdered new, less than ~25 years old. As pipelines age the percentage of water losses may increase if the pipes are not maintained at the current condition. An estimate of water losses with an aged system could be closer to 10 percent.	Low	2 to 3%
8	Adustment to Average Trend	When compared to the trend generated by historical WTP production values the value for 2008 is slightly below the average trend.	As addiitonal water use data is collected the average trend line may change, which would impact the required adjustment.	Low	1 to 2%
9	Dry Year Adjustment	The reference forecast demand calculation was determined using the average water use trend line. During the 2004 RWMP the dry year trend adjustment was established as 5% of total treated water demand.	Dry years may become more significant and the allowance for this adjustment may need to increase.	Moderate	up to 5%
10	Future Savings from Water Conservation	To account for currentwater savings already achieved from water conservation.	The amount of water attributed to water conservation to date has not been verified. When the amount is verified the savings from water conservation may change due to behavioral changes by customers.	Moderate to High	5 to 10%
11	Factor of Safety	Account for any unforseen impacts in water demands.	An unforseen event may occur resulting in a more significant impact than accounted for and require additional water supply.	Moderate to High	5 to 10%
12	Climate Variability of Raw Water Supply	In addition to the impact of climate variability on irrigation demand, it may also impact the raw water supply yield.	Climate variability may still impact this number further.	Low	2%
13	Climate Variability Impact on Raw Water Irrigation Demand	In addition to the impact of climate variability on treated water demand; it can also impact the raw water supply yield.	Estimates range from 6-10 percent increase in outdoor portion of raw and treated water demand due to climate variability.	Moderate	6 to 10%

ATTACHMENT 7

June 22, 2009 Meeting Summary with Planning and Development Services

Water Demand Evaluation
Task 1 Agenda Items

ATTENDEES:	Jon Robb/Longmont Barbara McGrane/Longmont Erin Fosdick/Longmont Holly Nelson/CH2M HILL	Ken Huson/Longmont Chris Huffer/Longmont Doug Simon/CH2M HILL
BY:	Holly Nelson/CH2M HILL	
SUBJECT:	Demand Projections Meeting No. 1	
MEETING DATE:	June 22, 2009	
MEETING TIME:	1:30 p.m. - 3:30 p.m. MDT	
DIAL-IN INFORMATION:	1-877-873-8016 (#915979, Host #625556)	
VENUE:	City of Longmont Service Center	

1. **Purpose of the Task –** Review existing land use and Comprehensive Land Use Planning assumptions to determine appropriate land use classifications and unit demand assumptions to be used for estimating future raw and treated water demand requirements.

2. **Existing Service Area Boundaries**
   - Treated water distribution system
   - Wastewater collection system
   - Identify areas that may be served by neighboring water districts

3. **Discuss Comprehensive Plan Map (Jan 2009) versus Zoning Map (2007)**
   - Provide GIS files of Zoning Map

4. **Land Use Classifications and Development**
   a. Land Use
      - Classifications
      - Development densities

   b. Existing Development
      - Original planning development density assumption versus actual development
      - In-fill areas within existing development
      - Unoccupied development areas (buildings with no tenants)
      - Redevelopment areas

   c. Future Development
      - Anticipated land-use classification modifications to the existing plan
      - Development densities
      - New areas of annexation

- Timing of development
- Industrial development
- Areas to be converted from treated to raw water supply

5. Unit demand rates by land-use classification (historical water meter records)

- Unit demand rates
    - i. Raw water
    - ii. Treated Water

6. Conservation

- Adjustments for older neighborhoods due to anticipated fixture replacements

Water Demand Evaluation
Project Meeting No. 1 Meeting Summary

ATTENDEES:

Erin Fosdick
Froda Greenberg
Chris Huffer
Ken Huson
Jon Robb
Michelle Majeune\CH2M HILL
Holly Nelson\CH2M HILL
Doug Simon\CH2M HILL

FROM: CH2M HILL, Inc.

DATE: July 3, 2009

PROJECT NUMBER: 390544.DM.04

A project meeting for the City of Longmont Water Demand Forecasting and Modeling Support Project was held on Monday, June 22, 2009 at the City of Longmont Service Center. The following summarizes key discussion topics, decisions, action items, and follows the meeting agenda attached.

Existing Service Area Boundaries

The different area boundaries were discussed. The Municipal Service Area (MSA) nests inside of the Longmont Planning Area (LPA). The LPA represents the extent to which the City has planned land uses. The Coordinated Planning Area (CPA) is an area that requires planning with Weld County.

In terms of water distribution planning the LPA represents the extent of water supply for the City, with the exception of some outside service taps. Ken Huson summarized the outside taps and said these are not expected to change. Outside taps include the Town of Lyons, Hygiene, and a few other small taps.

There are some areas within the LPA that are served by either the Left Hand Water District (LHWD) or Longs Peak Water District (LPWD). These areas need to be identified on the planning map for presentation and in the water distribution model for demand forecasting.

Land Use Classifications and Development

Potential development and **land use changes** discussed include:

a. Lifebridge – currently designated as LDR and mixed use.

b. Firelight – currently designated as Parks/Open Space

c. Terry Lake area – currently designated as VLDR and mixed use, may be OS and less mixed use

d. Transferred Development Rights (TDR) – There is an agreement between Boulder County and City of Longmont regarding TDRs. Areas currently zoned for another use may become

TDRs in the future which could change the land use classification. Two areas in the SW corner currently designated as VLDR are potential TDRs.

Redevelopment areas discussed include:

a. Southeast Redevelopment Area – the redevelopment plan from December 2006 was provided by planning.

b. Midtown Redevelopments Area - the redevelopment plan from December 2005 was provided by planning.

c. Twin Peaks Mall Area – Urban renewal concept from June 2009 was provided by planning. The planning is still ambiguous and its likely a mixed use water usage will be applied to the entire area.

d. FasTracks Area – A general plan of the area was provided by planning from the July 2007 analysis.

e. Downtown Area – a general map was provided from the February 2008 Council Retreat that this is a redevelopment focus area. No plan of land use available.

f. Other small focus areas include the Sugar Factory and Flour Mill areas.

Unbuilt Dwelling Unit information was provided for planned neighborhood areas.

Other

For presentation purposes a water forecast will be developed for the current Longmont Area Comprehensive Plan Map. This will give people a familiar starting point from which to comment on the assumptions for other scenarios.

Presentation materials should reflect the risks of underestimating water use (economic, etc…). Show how the Windy Gap water will contribute to the portfolio and provide stability.

Action Items

- City to identify areas on LPA map that are served by LHWD and LPWD
- City/Planning to investigate what the land use for Terry Lake area may look like for forecasting scenarios.
- CH2M HILL to investigate mixed use water usage for other communities

Next Meeting

A meeting with Jon Robb and Ken Huson was held on July 1, 2009 to discuss details of demand forecasting and water use for classifications.

Another meeting with Jon Robb and Ken Huson will be scheduled the week of July 6th to discuss water use for classifications and raw water use for irrigation.

List of Assumptions

1. For water distribution the Longmont Planning Area (LPA) represents the extent of water service area plus existing outside taps.

2. There will be no new taps outside the water service area, only existing taps will be included in forecast (including Town of Lyons and Hygiene).

3. Water Service - Firelight and Lifebridge developments will be served with water for "higher" forecast model.

4. Water Service – East of County Rd 1 & North of 17th Ave, no water service.

5. Water Service – East of County Rd 1 & South of 17th Ave, water service for minimal development.

6. Sanitary Service - Firelight and Lifebridge will not be served with sanitary sewer service from City, rather by St. Vrain Sanitary District.

7. Sanitary Service - East of County Rd 1 & North of 17th Ave, no sanitary sewer service.

8. Sanitary Service – East of County Rd 1 & South of 17th Ave, sanitary service for minimal development.

9. TDRs- Future TDRs must receive sanitary sewer service from the City (per IGA), but will not receive water service from the City.

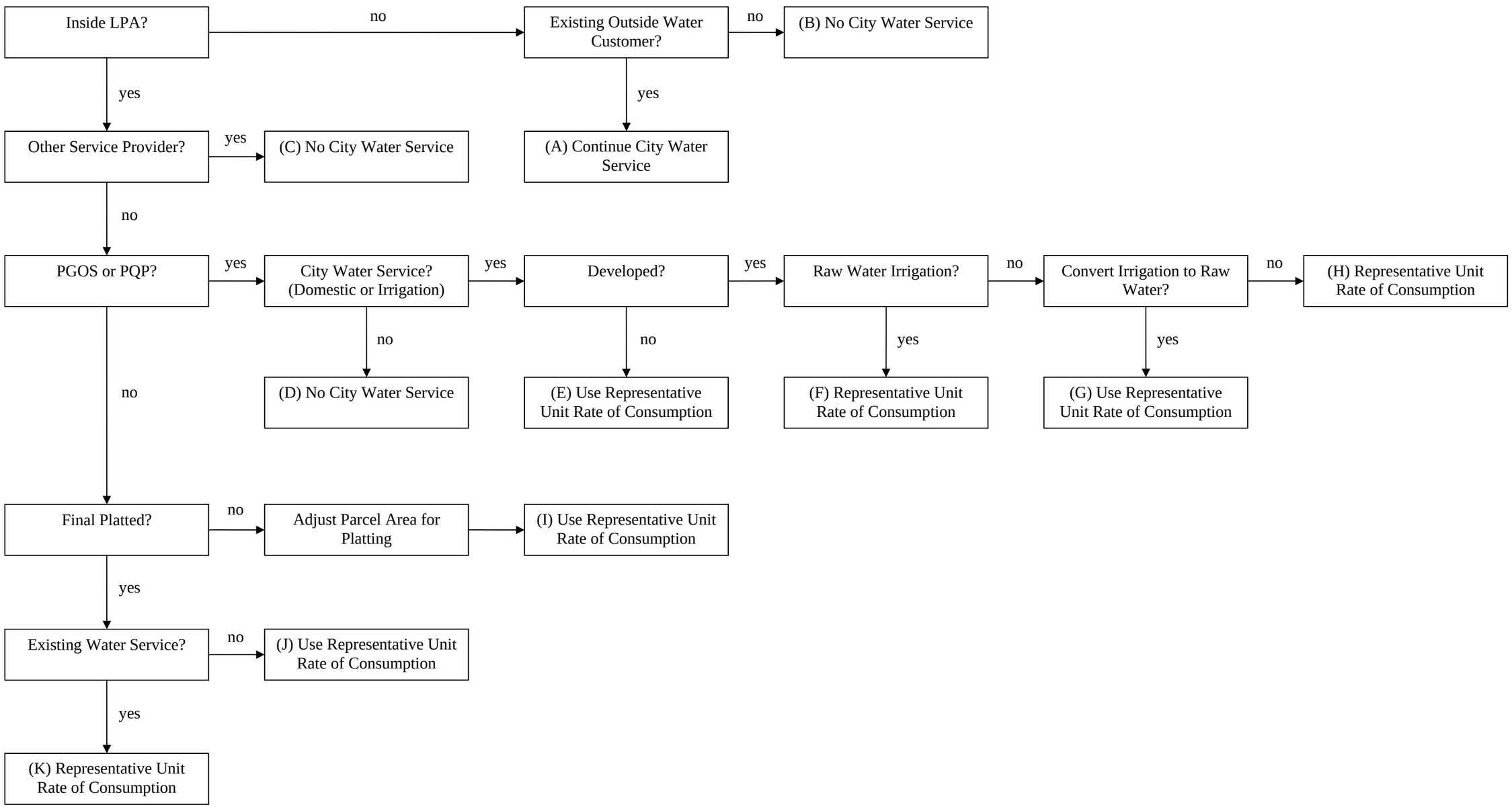
10. Raw Water – Town of Lyons will purchase their own raw water, so this demand should be removed from the raw water forecasting values.

11. Industrial – Area north/south of St. Vrain Rd will remain industrial.

ATTACHMENT 8

Treated Water Demand Evaluation Process Flowchart and Narrative

CITY OF LONGMONT TREATED WATER DEMAND EVALUATION FLOW CHART (SVVPA)



City of Longmont Treated Water Demand Evaluation Flow Chart Narrative

The flow chart was created to process the water demand assumptions for evaluating treated water service to parcels in the Saint Vrain Valley Planning Area (SVVPA). The Longmont Area Comprehensive Plan (LACP) as amended July 2010 and 2008 water consumption data provide the basis for the evaluation.

Line 1, Question 1: Is the parcel inside the Longmont Planning Area (LPA)?

> Line 1 evaluates parcels in the SVVPA but outside the LPA. As of January 2011, the City provides water service to 189 properties in the SVVPA outside the LPA. Over 80% of these services are in the Hygiene area and about 10% are in Weld County near Union Reservoir. The City also provides water service to another 88 properties in the LPA but outside the Municipal Service Area (MSA).

Line 1, Question 2: If the parcel is not inside the LPA (Line 1, Question 1), is the parcel an existing outside water customer?

> If yes, the City will continue to provide water service at the current rate of consumption unless the service is transferred from the City to another water provider.
>
> If no, the City will not provide water service to these parcels except for those applications for individual water service outside city limits that are approved by city council following the requirements of paragraphs 14.05.110 – Extraterritorial water service and 14.09.020 – Policy on considering applications for water and sewer service outside city limits of the City of Longmont Municipal Code or unless the water service is transferred to the City from another water provider.
>
> To date, the City has completed *13* tap trade agreements with the neighboring Left Hand Water District and Longs Peak Water District.

Line 2, Question 1: If the parcel is inside the LPA (Line 1, Question 1), is the parcel in a subdivision currently served by another water provider?

> If yes, the City will not provide water service to the subdivision. Longs Peak Water District currently provides water service to the Willis Heights and Wood Meadows subdivisions north of Highway 66. Left Hand Water District provides water service to the Ranch at Clover Basin, Summerlin and Schlagel subdivisions in southwest Longmont.

Line 3, Question 1: If the parcel is not in a subdivision currently served by another water provider (Line 2, Question 1), is the land use designated as Parks, Greenway and Open Space (PGOS) or Public and Quasi-Public (PQP)?

> Line 3 evaluates publicly owned parcels, primarily those owned by the City of Longmont, County of Boulder and the Saint Vrain School District. It also includes

parcels owned by the railroad and the United States government. Publicly owned parcels may use *treated* or raw water for irrigation.

Line 3, Question 2: If land use is designated as PGOS or PQP (Line 3, Question 1), will the City provide *treated* water service to the parcel?

No unless the City currently provides *treated* water service to the parcel or a proposed community facility is designated in the LACP for the parcel.

Line 3, Question 3: If the City will be providing *treated* water service to the parcel (Line 3, Question 2), is the parcel currently developed?

If no, use the representative unit rate of consumption for the type of community facility with the same raw or *treated* water irrigation to calculate the *treated* water demand.

Line 3, Question 4: If the parcel is currently developed (Line 3, Question 3), does the parcel use raw water for irrigation?

If yes, use the parcel to calculate the representative unit rate of *treated* water consumption for the designated type of community facility with raw water irrigation and use the current *treated* water consumption for the parcel.

Line 3, Question 5: If the parcel does not use raw water for irrigation (Line 3, Question 4), will the existing treated water irrigation be converted to raw water irrigation?

If yes, use the representative unit rate of consumption for the type of community facility with raw water irrigation to calculate the *treated* water demand.

If no, use the parcel to calculate the representative unit rate of *treated* water consumption for the designated type of community facility with *treated* water irrigation and use the current *treated* water consumption for the parcel.

Line 4, Question 1: If the land use is not designated as PGOS or PQP (Line 3, Question 1), is the parcel final platted?

The remaining lines evaluate privately owned parcels in the LPA expect for those served by other water providers (see Line 2). This includes 6 commercial/industrial land uses, 5 residential land uses and one mixed use corridor land use.

Large undeveloped parcels are typically platted to create smaller parcels and public right of way. The parcel areas in commercial/industrial and residential land uses in the LPA currently include approximately 87% and 79%, respectively, of the gross area. This includes platted and unplatted parcels.

For the purpose of adjusting parcel area to account for platting, assume that parcels larger than 10 acres that are classified by the county assessor as vacant land (Class 0100

through 0600) or agricultural land (Code 4117 through 4147) are not final platted. To adjust the parcel areas for final platting, assume that the final platted parcel areas will have the same parcel to gross area ratio as the overall ratios for commercial/industrial and residential land uses. Once the parcel area has been adjusted, use the representative unit rate of consumption for the designated land use to calculate the *treated* water demand.

Line 5, Question 1: Does the parcel currently receive treated water service from the City?

No if there were less than 10 monthly readings. Use the representative unit rate of consumption for the designated land use to calculate the *treated* water demand.

Yes if there were 10 or more readings in the year. Use the parcel to calculate the representative unit rate of *treated* water consumption for the designated land use and use the current *treated* water consumption for the parcel.

ATTACHMENT 9

Raw Water Summary

Raw Water Demand and Supplies at Buildout

Raw Water Demands	Total Acre-Feet	Note
Water Leases and Exchanges	5,879	1
Return Flow Obligation	11,260	2
Union Reservoir Replacement Obligation	1,390	3
Union Pumpback	2,084	4
Raw Water Irrigation	1,699	5
	22,312	

Potential Water Sources to Meet Demand	Total Acre-Feet	
Transfer Decrees	4,608	6
Union Reservoir	2,779	7
Reuse Water	9,257	8
Storage Available	1,384	9
Additional Windy Gap Reuse (from firming)	612	10
Union Enlargement (@ 13' raise)	1,770	11
	20,410	

Deficit Remaining to be Met	**1,901**

Notes

1 From summary of Long Term Fully Consumable Water Leases and Exchanges
2 From Return Flow Obligation sheet (at Buildout)
3 2001 to 2011 Union Replacement Obligation actual.
4 Based upon irrigation acreage in Longmont under exchange ditches, not including other exchanges at each ditch.
5 Per Total Raw Water Demand Sheet
6 Current and Future Transfer Cases
7 Using historical yield from 2001 to 2011 (versus 3,259 AF or 213 shares @ 15.3 AF per share)
8 Estimated reuse amount for 2011 is 4,615 AF
9 Capacity from lower reservoirs available during drought
10 3,700 AF - 2,500 existing * 51% return flow factor
11 Per Water Supply and Storage presentations to City Council - 2008

Transfer Decree Return Flow Obligations @ Buildout			
Decree Name	**Case Number**	**AC-FT**	**Note**
Current Decrees			
Longmont Supply Ditch	1981CW355 & 1987CW212	1,537	
Oligarchy Ditch	1981CW361 & 1987CW214 & 2000CW240	1,856	1
Rough & Ready Ditch	1981CW356 & 1987CW213 & 2000CW241	1,326	2
Palmerton Ditch	1981CW360	108	
Smead Ditch	1981CW357	215	
Swede Ditch	1981CW362	50	
Beckwith Ditch	1987CW215	358	
Pella Ditch	1987CW219	67	
South Flat Ditch	1987CW220	242	
Zweck & Turner Ditch	1987CW221	327	
Niwot Ditch	1987CW218	503	
Clover Basin Ditch	1987CW216	152	
PSCO Seniors	2001CW188	286	
Union Reservoir	1987CW222	0	3
Pleasant Valley Reservoir	1987CW231	*459*	
McCall Lake	1987CW232	*0*	4
Clover Basin Reservoir	1987CW233	*0*	5
Oligarchy Reservoir	1987CW235	*214*	
McIntosh Reservoir	1987CW253	*326*	
High Mountain Dams	2001CW272	*0*	6
Lyons Change	2003CW270	*0*	7
James	2000CW239	180	8
	Current Total Maximum	8,204	
Future Decrees			
Peck Ditch	2007CW330	569	9
Future Historical Transfers		1,133	10
Future Non-Historical Transfers		633	11
Future Lower Reservoirs		721	12
	Total Future Decrees	3,056	
	Total Buildout Return Flow Obligations	**11,260**	

Notes:

1) Actual Oligarchy requirement in 2011 was 90% of maximum (1,652 AF)
2) Actual Rough & Ready requirement in 2011 was 84% of maximum (1,127 AF)
3) Union Reservoir replacement obligations to be included elsewhere in RFO calculations.
4) Not currently taking delivery to WTP.
5) Available supply for Clover Basin Reservoir, as listed elsewhere, accounts for RFO's.
6) Decree for High Mountain Dams does not allow reuse, therefore no RFO's are required.
7) Return Flow Obligations are responsibility of Lyons.
8) Per decree.
9) Utilizing a crop efficiency of 54%from Ferry analysis calculations.
10) Estimate as identified in the 2004 RWMP Update.
11) Per 2004 RWMP Update.
12) Represents Longmont's projected ownership in reservoir companies previously changed.

SUMMARY OF MAXIMUM AC-FT COMMITMENTS FOR LONG TERM FULLY CONSUMABLE WATER LEASES AND EXCHANGES

LEASES - (REVENUE BASIS)

EXISTING LEASES	Term	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
A&W Water	2008 to 2027	480	540	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600	0	0	0
LWM Washout	2008 to 2028	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	0	0
Hunt	2008 to 2028	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	0	0
Union Well Augment Group	2009 to 2029	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0
Front Range	2010 to 2030	296	300	273	243	218	197	182	167	155	144	141	133	129	122	121	116	114	114	114	0
Central	2011 to 2020	600	600	600	600	600	600	600	600	600	600	0	0	0	0	0	0	0	0	0	0
Existing Lease Total		1556	1620	1653	1623	1598	1577	1562	1547	1535	1524	921	913	909	902	901	896	894	294	214	0
PROPOSED LEASES																					
TOTAL EXISTING & PROPOSED LEASES		1556	1620	1653	1623	1598	1577	1562	1547	1535	1524	921	913	909	902	901	896	894	294	214	0

EXCHANGES - (WATER for WATER)

EXISTING EXCHANGES	Term	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Public Service Company C-BT Exchange	2008 to 2080	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000
Public Service Company Senior Exchange	Perpetual	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529	529
State Park Exchange	Perpetual	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350	350
Central Exchange	2011 to 2020	500	735	1000	1000	1000	1000	1000	1000	1000	1000	0	0	0	0	0	0	0	0	0	0
Existing Exchange Total		6379	6614	6879	6879	6879	6879	6879	6879	6879	6879	5879	5879	5879	5879	5879	5879	5879	5879	5879	5879
PROPOSED EXCHANGES																					
TOTAL EXISTING & PROPOSED EXCHANGES		6379	6614	6879	6879	6879	6879	6879	6879	6879	6879	5879	5879	5879	5879	5879	5879	5879	5879	5879	5879

Notes:

1) The acre-feet numbers provided, are the maximum commitments per the pertinent Exchange and Lease Agreements.
2) A Water Supply Exchange Agreement is whereby Longmont provides water downstream and in return receives an equal amount of water into our water portfolio.

Revision Date: 7/29/2011
Printed Date: 7/29/2011

Existing Transfer Decrees Programmed to Meet Downstream Requirements

Decree Name	Case Number & Comments	AC-FT
Beckwith Ditch	1987CW215	156
Pella Ditch	1987CW219	86
South Flat Ditch	1987CW220	229
Zweck & Turner Ditch	1987CW221	139
Niwot Ditch	1987CW218	0
Clover Basin Ditch	1987CW216	0
James Ditch	33.8 shares of 39.8 share in Longmont ownership transferred. 60.0 shares total in company.	721
In-Time Return Flow Obligations	(Transfer Decrees stored at alternate points of storage)	1,575
	total	**2,904**

ASSUMPTIONS

Available, on return flows, July 1st through end of irrigation season
Niwot & Clover Basin Ditch not in priority to divert, July 1 through end of irrigation season.
James Ditch availability determined by annually maximizing of the 45-year rolling volumetric limit as set forth by decree.
James Ditch fully utilized via respective ditch headgate diversions, delivered to Dry Creek or Lykins Gulch and then to St. Vrain River.
Represents water left in the river to be applied to downstream requirements.

Future Transfer Decrees Programmed to Meet Downstream Requirements

Decree Name	Comments	AC-FT
Beckwith Ditch	95.34 shares originally transferred. 180.04 currently in Longmont ownership. 217.0 total in company.	138
Pella Ditch	220 shares originally transferred. 357 currently in Longmont ownership. 648 total in company.	54
South Flat Ditch	360 shares originally transferred. 450 currently in Longmont ownership. 960 total in company.	57
Zweck & Turner Ditch	23% originally transferred. 25% currently in Longmont ownership. 100% total in company.	0
Niwot Ditch	13.75 shares originally transferred. 27.25 currently in Longmont ownership. 30.0 total in company.	0
Clover Basin Ditch	75.5 shares originally transferred. 99.0 currently in Longmont ownership. 100.0 total in company.	0
Peck Ditch	30.75 shares proposed for transfer. 30.75 currently in Longmont ownership. 36.0 total in company.	1,238
In-Time Return Flow Obligations	(Transfer Decrees stored at alternate points of storage)	218
	total	**1,704**

ASSUMPTIONS

Available, on return flows, July 1st through end of irrigation season
Niwot & Clover Basin Ditch not in priority to divert, July 1 through end of irrigation season.
Represents water left in the river to be applied to downstream requirements.
Full transfer of current ownership in Beckwith, Pella, & South Flat Ditch.
Peck Ditch availability determined by annually maximizing of the 25-year rolling volumetric limit as set forth by decree.
Peck Ditch fully utilized via respective ditch headgate diversions, delivered to Dry Creek or Lykins Gulch and then to St. Vrain River.

SUM TOTAL OF EXISTING AND FUTURE TRANSFER DECREES PROGRAMMED TO MEET DOWNSTREAM REQUIREMENTS **4,608**

UNION RESERVOIR REPLACEMENT OBLIGATIONS	
	Replacement Obligation
Year	**Acre-feet**
2001-2002	1,197
2002-2003	1,647
2003-2004	3,684
2004-2005	1,088
2005-2006	1,479
2006-2007	545
2007-2008	2,749
2008-2009	260
2009-2010	1,681
2010-2011	479
2011-2012	479
Total	15,286
Average	1,390

ATTACHMENT 10

Raw Water Irrigation Summary

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
1	RAW WATER IRRIGATION SUMMARY TABLE																				
2	Facility Name	Facility Address	Ownership	Developed / Undeveloped[4]	Total Acres	Total Irrigated Acres	Facility Type	Available Irrigation Sources (Raw / Treated / Both)	Ditch Delivery System[2]	Water Right #1	Water Right #1 # Shares Reserved[1]	Yield / Share	Total Water Right #1 Reserved	Water Right #2	Water Right # 2 # Shares Reserved[1]	Yield / Share	Total Water Right #2 Reserved	Total Raw Water Reserved	Additional Raw Water Demand when Converted	Non-Transferable Water[7]	Union Res. Pumpback[3]
3	-	-	-	-	acres (+/-)	acres (+/-)	-	-	-	-	qty.	acre-feet	acre-feet	-	qty.	acre-feet	acre-feet	AF/year	acre-feet	acre-feet	acre-feet
4	Boulder County Fairgrounds[5]	9595 Nelson Rd.	BoCo	Developed	79.6	4.9	Open Space	Raw	South Flat	South Flat	7	2.03	14.21	None	0.00	0.0	0.0	14.2			
5	Adrian Property (Open Space)		COL	Undeveloped	191.2	151.0	Open Space	Raw	Oligarchy	Oligarchy	4.8	26.48	127.104	Burch Lake	4.80	4.7	22.4	149.5			151.1
6	Affolter Park	1301 S Judson	COL	Developed	5.3	5.0	Neighborhood Park	Both	Niwot	Niwot	0.33	83.77	27.6441	C-BT	16.44	0.8	12.5	40.1			
7	Alta Park	1000 Alta St	COL	Developed	0.4	0.4	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
8	Athletic Field	421 11th Ave	COL	Developed	3.8	3.7	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
9	Beaupreax Farms	Ute Hwy.	COL	Undeveloped	43.0	43.0	Open Space	Raw	Rough and Ready	Rough & Ready	1.5	59.96	89.94	Pleasant Valley	2.00	37.7	75.4	165.3			
10	Blue Skies Park	1520 Turin Drive	COL	Developed	11.4	11.4	Neighborhood Park	Raw	Clover Basin	Clover Basin	7	5.00	35	None	0.00	0.0	0.0	35.0			
11	Bogott Property		COL	Undeveloped	86.0	76.0	Open Space	Raw	Rough and Ready	Rough & Ready	1.2385	59.96	74.26046	Pleasant Valley	1.2385	37.7	46.7	121.0			121.0
12	Bohlender Property		COL	Undeveloped	8.8	0.0	Open Space	Raw	Rough and Ready	None							0.0	0.0			
13	Boulder Creek Estates		COL	Undeveloped	218.0	0.0	Open Space	Raw	Rural	Rural	2			Smith & Emmons	1.00		0.0	0.0			
14	Carr Park	1301 21st Ave	COL	Developed	8.4	7.1	Neighborhood Park	Both	Oligarchy	Oligarchy	1.13	26.48	29.9224	Burch Lake	1.13	4.7	5.3	35.2			32.7
15	Civic Center	350 Kimbark	COL	Developed	2.3	0.9	Municipal Office Bldg.	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
16	Clark Park	1100 Lashley St	COL	Developed	48.5	40.0	Community Park	Both	Oligarchy	Oligarchy	4.25	26.48	112.54	Burch Lake	4.25	4.7	19.8	132.3			123.2
17	Collyer Park	600 Collyer St	COL	Developed	5.2	4.8	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
18	Dawson Park	1757 Harvard St	COL	Developed	12.9	12.4	Neighborhood Park	Both	Oligarchy	Oligarchy	2	26.48	52.96	Burch Lake	2.00	4.7	9.3	62.3			58
19	Distel/Camas Donation		COL	Undeveloped	60.0		Open Space	Raw									0.0	0.0			
20	Dog Park #1	21st & Francis	COL	Developed	3.3	3.1	Dog Park	Raw	Oligarchy	Oligarchy	0.5	26.48	13.24	Burch Lake	0.50	4.7	2.3	15.6			14.5
21	Dog Park #2	St. Vrain Rd	COL	Developed	3.3	0.0	Dog Park	N/A	Niwot	Niwot	0	83.77	0	None	0.00	0.0	0.0	0.0			
22	Dry Creek Community Park		COL	Undeveloped	81.0	70.0	Community Park	Raw	Dry Creek Pond	Clover Basin	42	5.00	210	None	0.00	0.0	0.0	210.0			
23	Eckel Property		COL	Undeveloped	9.6	9.6	Open Space	Raw	Rough & Ready	Rough & Ready	0.25	59.96	14.99	Pleasant Valley	0.25	37.7	9.4	24.4			
24	Flanders Park	2997 Breakwater Dr	COL	Developed	4.1	2.8	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
25	Fox Meadows	Deerwood Dr.	COL	Undeveloped	9.0	9.0	Neighborhood Park	Raw	Rough & Ready	Rough & Ready	0.3	59.96	17.988	Pleasant Valley	0.25	37.7	9.4	27.4			
26	French Property (Open Space)		COL	Undeveloped	85.4	85.4	Open Space	Raw	Highland	Highland	5.5	24.40	134.2	C-BT	130.00	0.8	98.8	233.0		134.2	
27	French Property (water)		COL	Undeveloped	126.5	126.5	Open Space	Raw	Highland	C-BT	141	0.76	107.16	None	0.00	0.0	0.0	107.2			
28	Garden Acres	2058 Spencer	COL	Developed	41.6	31.0	Community Park	Both	Oligarchy	Oligarchy	5	26.48	132.4	Burch Lake	5.00	4.7	23.3	155.7			144.9
29	Golden Ponds	2651 3rd Ave	COL	Developed	94.0	0.0	District Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
30	Hamm Nature Area	1701 WCR 1	COL	Developed	44.9	30.9	District Park	Both	Rough & Ready	Rough & Ready	0.25	59.96	14.99	Pleasant Valley	0.25	37.7	9.4	24.4			
31	Hartman Property		COL	Undeveloped	153.4	153.4	Open Space	Raw	Highland	Highland	5	24.40	122	C-BT	45.00	0.8	34.2	156.2		122	
32	Hayes (Con. Easement)		COL	Undeveloped	120.1		Open Space	Raw	50% Coffin Meadows												
33	Hernor Property		COL	Undeveloped	147.4	147.4	Open Space	Raw	Highland	Highland	2	24.40	48.8	C-BT	100.00	0.8	76.0	124.8		48.8	
34	Hodges (Con. Easement)		COL	Undeveloped	74.0		Open Space	Raw	50% Pumb & Dailey												
35	Hover Acre Pk	1361 Charles Dr	COL	Developed	9.2	7.6	Neighborhood Park	Both	Longmont Supply	Longmont Supply	1	27.89	27.89	None	0.00	0.0	0.0	27.9			27.89
36	Izaak Walton Pk	18 S Sunset St	COL	Developed	21.5	5.9	District Park	Raw	Denio & Taylor Ditch	Denio & Taylor	15	1.63	24.45	C-BT	7.00	0.8	5.3	29.8			
37	Justice Center		COL	Developed	0.8	0.3	Municipal Office Bldg.	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
38	Kanemoto Pk	1151 S Pratt Pkwy	COL	Developed	8.7	7.5	Neighborhood Park	Both	Niwot	Niwot	0.33	83.77	27.6441	C-BT	16.44	0.8	12.5	40.1			
39	Kensington Park	100 E Longs Peak Ave	COL	Developed	18.2	15.9	Neighborhood Park	Raw	Spring Gulch #1	Feltham's	48	1.00	48	None	0.00	0.0	0.0	48.0		48	
40	Koester Property		COL	Undeveloped	75.1	60.0	Open Space	Raw	Oligarchy	Oligarchy	4	26.48	105.92	None	4.00	0.0	0.0	105.9			
41	Kubat	S. of Nelson Rd.	COL	Undeveloped	10.0	10.0	Neighborhood Park	Raw	Clover Basin	Clover Basin	6	5.00	30	None	0.00	0.0	0.0	30.0			
42	Landfill Property		COL	Undeveloped		0.0	Open Space	Raw					0				0.0	0.0			
43	Lanyon Park	300 19th Ave	COL	Developed	7.7	6.7	Neighborhood Park	Both	Oligarchy	Oligarchy	1.25	26.48	33.1	Burch Lake	1.25	4.7	5.8	38.9			36.2
44	Lefthand Channel Greenway	902 S Kimbark	COL	Developed			Greenway	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
45	Lefthand Cr Pk	1880 Creekside Dr	COL	Developed	10.0	6.8	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
46	Loomiller Pk	1700 11th Ave	COL	Developed	15.3	11.8	Neighborhood Park	Both	Longmont Supply	McCall Lake	35.4	1.00	35.4	None	0.00	0.0	0.0	35.4			
47	McCall Lake	Ute Hwy.	COL	Developed	51.0	0.0	District Park	N/A	----	----			0				0.0	0.0			
48	McIntosh Lake		COL	Developed	73.0	0.0	District Park	N/A	----	----			0				0.0	0.0			
49	Mountain Shores Property	WCR #26	COL	Undeveloped	21.1		Open Space	Raw	Highland	None	0	0.00	0	None	0.00	0.0	0.0	0.0			
50	Pavlakis		COL	Undeveloped	60.2		Open Space	Raw	Dickens Private	Dickens Private											
51	Pieschel Property		COL	Undeveloped	132.0		Open Space	Raw	Bonus	Bonus	14.5	25.18	365.11				0.0	365.1		365.1	
52	Pietrzak Property	WCR #26	COL	Undeveloped	23.7	23.7	Open Space	Raw	Union Pump Station	Union	60	1.00	60	None	0.00	0.0	0.0	60.0		60	
53	Pratt Park	1540 Ithaca Ct	COL	Developed	4.2	2.6	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
54	Price Park	1800 Longs Peak Ave	COL	Developed	1.3	1.1	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
55	Quail Campus	310 Quail Rd.	COL	Developed	18.1	3.1	Rec Center	Both	Niwot	Niwot	0.33	83.77	27.6441	C-BT	6.50	0.8	4.9	32.6			
56	Quail Campus	Quail Rd.	COL	Undeveloped	26.2	26.2	Community Park	Raw	Niwot	Niwot	0.6	83.77	50.262	C-BT	35.00	0.8	26.6	76.9			
57	Rogers Grove	220 Hover Rd	COL	Developed	10.5	0.0	District Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
58	Roosevelt Pk	940 Longs Peak Ave	COL	Developed	21.7	12.9	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
59	Roosevelt Pk Rose Gdn	700 Longs Peak Ave	COL	Developed		0.3	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
60	Rothrock Park	700 E 5th Ave	COL	Developed	6.4	5.7	Neighborhood Park	Both	Oligarchy	Oligarchy	1	26.48	26.48	Burch Lake	1.00	4.7	4.7	31.1			29
61	Rough & Ready Park	301 E 21st Street	COL	Developed	9.7	9.3	Neighborhood Park	Raw	Rough & Ready	Rough & Ready	0.33	59.96	19.7868	Pleasant Valley	0.20	37.7	7.5	27.3			27.3
62	Saint Vrain Greenway (Phase 6)	Main Street - 119	COL	Developed	65.0	20.0	Greenway	Raw	Dickens Private	Dickens Private	60	1.00	60	N/A	0.00	0.0	0.0	60.0		60	
63	Sandstone (undeveloped)	2525 E Hwy 119	COL	Undeveloped	25.0	20.0	Community Park	Both	Sping Gulch #2	Spring Gulch	40	1.00	40	Union Reservoir	20.00	1.0	20.0	60.0		60	60
64	Sandstone Ranch(developed)	3001 E Hwy 119	COL	Developed	287.0	63.5	Community Park	Both	Sping Gulch #2	Spring Gulch	127.5	1.00	127.5	Union Reservoir	63.00	1.0	63.0	190.5		127.5	190.5
65	Service Center	1100 S. Sherman St.	COL	Developed	4.3	2.5	Municipal Office Bldg.	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
66	Sherwood Option Property		COL	Undeveloped			Open Space	Raw					0				0.0	0.0			
67	Sherwood Property		COL	Undeveloped			Open Space	Raw					0				0.0	0.0			
68	Shorty Raber Pk	1701 24th Ave	COL	Developed	3.2	2.8	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
69	Sisters of St. Francis	Quail Rd.	COL	Undeveloped	80.0	65.0	Community Park	Raw	Niwot	Niwot	1.5	83.77	125.655	C-BT	85.00	0.8	64.6	190.3			
70	Smith Property	WCR #28	COL	Undeveloped	50.1	45.0	Open Space	Raw	Highland	Highland	1.25	24.40	30.5	C-BT	33.00	0.8	25.1	55.6		30.5	
71	South Clover Basin	Plateau Rd.	COL	Undeveloped	15.0	13.0	Neighborhood Park	Raw	Holland	Left Hand	20	1.35	27	None	0.00	0.0	0.0	27.0			
72	Spangler Park	200 Mtn View Ave	COL	Developed	5.1	4.8	Neighborhood Park	Raw	Longmont Supply	McCall Lake	15	1.00	15	None	0.00	0.0	0.0	15.0			
73	Spring Gulch Greenway		COL	Developed	10.0	10.0	Greenway	Raw	Spring Gulch #2	Spring Gulch #2	0	0.00	0	----	0.00	0.0	0.0	0.0	29.9		
74	Stamp Property	WCR#1	COL	Undeveloped	7.5	0.0	Open Space	Raw	Rough and Ready	Rough & Ready	0	59.96	0	Pleasant Valley	0.00	37.7	0.0	0.0			
75	Stephan Day Park	1340 Deerwood	COL	Developed	15.0	11.0	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0	45.0		
76	Sunset Golf Course	1900 Longs Peak Ave	COL	Developed	40.0	40.0	Golf Course	Treated	Denio & Taylor Ditch	----	58	1.63	94.54	C-BT	50.00	0.8	40.0	134.5	135.0	135	
77	Third Ave Entryway		COL	Developed	13.0	13.0	Arterial roadway	Raw	Oligarchy	Oligarchy	1.5	26.48	39.72	Burch Lake	1.50	4.7	7.0	46.7			43.5
78	Thompson Park	420 Bross	COL	Developed	5.4	5.3	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
79	Tice Community park	Ute Hwy.	COL	Undeveloped	70.0	60.0	Community Park	Raw	Rough & Ready	Rough & Ready	2	59.96	119.92	Pleasant Valley	1.50	37.7	56.6	176.5			176.5
80	Twin Peaks Golf Course	1200 Cornell	COL	Developed	140.0	100.0	Golf Course	Both	Denio & Taylor Ditch	Denio & Taylor	100	1.63	163	C-BT	65.00	0.8	49.4	212.4		163	
81	Union Reservoir	1000 County Rd 26	COL	Developed	14.0	8.0	District Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
82	Ute Creek Golf Course		COL	Developed	135.0	128.0	Golf Course	Raw	Rough & Ready	Rough & Ready	5	59.96	299.8	Pleasant Valley	6.70	37.7	252.5	552.3			552.3
83	Valley Park Sprinkler	28 Troxell Ave	COL	Developed	2.5	2.2	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
84	Wertman	Quebec Ave.	COL	Undeveloped	20.0	20.0	Neighborhood Park	Raw	Niwot	Niwot	0.5	83.77	41.885	C-BT	25.00	0.8	19.0	60.9			
85	West St. Vrain Park	Rodgers Rd.	COL	Undeveloped	15.0	10.0	Neighborhood Park	Raw	South Flat	South Flat	5	2.03	10.15	None	0.00	0.0	0.0	10.2			
86	Willow Farm Park	901 S. Fordham	COL	Developed	10.8	9.4	Neighborhood Park	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
87	Golden Farms		COL/BOCO	Undeveloped	96.6	96.6	Open Space	Raw	Bonus	Bonus	2	25.18	50.36	None				50.4		50.4	
88	Alpine Elementary	2005 Alpine St.	SVVSD	Developed	8.2	4.0	Elementary School	Raw	Rough & Ready	Rough & Ready	0.5	59.96	29.98	Pleasant Valley	0.25	37.7	9.4	39.4			39.4
89	Altona Middle School	4600 Clover Basin Dr.	SVVSD	Developed	19.4	10.7	Middle School	Raw	Dry Creek Pond	Clover Basin	1	5.00	5				0.0	5.0			
90	Blue Mountain Elementary	1260 Mountain Dr.	SVVSD	Developed	12.2	4.0	Elementary School	Raw	Dry Creek Pond	Clover Basin	1	5.00	5				0.0	5.0			
91	Burlington Elementary	1151 S. Pratt Parkway	SVVSD	Developed	9.8	5.0	Elementary School	Raw	Niwot	C-BT	6.5	0.76	4.94				0.0	4.9			
92	Career Development Center	1200 S, Sunset St.	SVVSD	Developed	10.0	0.0	High School	Treated	----	----	0	0.00	0	----	0.00	0.0	0.0	0.0			
93	Central School	1020 4th Ave	SVVSD	Developed			Elementary School	Treated	----	----	0	0.00	0	----	0.00	0.00	0.0	0.0			
94	Columbine School	111 Longs Peak Ave.	SVVSD	Developed			Elementary School	Treated	----	----	0	0	0	----	0.00	0.00	0.0	0.0			
95	Eagle Crest Elem.	4444 Clover Basin Dr.	SVVSD	Developed	10.7	4.0	Elementary School	Raw	Dry Creek Pond	Clover Basin	1	5.00	5				0.0	5.0			
96	Fall River Elementary	1400 Deerwood Dr.	SVVSD	Developed	10.0	5.0	Elementary School	Treated	----	----	0	0	0	----	0.00	0.00	0.0	0.0	15.0		15
97	Flagstaff Academy	1841 Lefthand Cir.	SVVSD	Developed			Elementary School	Treated	----	----	0	0	0	----	0.00	0.00	0.0	0.0			

	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
2	**Facility Name**	**Facility Address**	**Ownership**	**Developed / Undeveloped[4]**	**Total Acres**	**Total Irrigated Acres**	**Facility Type**	**Available Irrigation Sources (Raw / Treated / Both)**	**Ditch Delivery System[2]**	**Water Right #1**	**Water Right #1 # Shares Reserved[1]**	**Yield / Share**	**Total Water Right #1 Reserved**	**Water Right #2**	**Water Right # 2 # Shares Reserved[1]**	**Yield / Share**	**Total Water Right #2 Reserved**	**Total Raw Water Reserved**	**Additional Raw Water Demand when Converted**	**Non-Transferable Water[7]**	**Union Res. Pumpback[3]**
98	Fox Hill Elementary	Deerwood Dr.	SVVSD	Undeveloped	10.6	4.0	Elementary School	Raw	Rough & Ready		0.25	59.96	14.99	Pleasant Valley	0.25	37.7	9.4	24.4			24.4
99	Heritage Middle School	233 E. Mt. View Ave	SVVSD	Developed			Middle School	Treated	----	----	0	0	0	----	0.00	0.00	0.0	0.0			
100	Indian Peaks Elem	1335 S. Judson St.	SVVSD	Developed	2.9	1.3	Elementary School	Raw	Niwot	C-BT	1.5	0.76	1.14				0.0	1.1			
101	Loma Linda Elementary	333 East Mt. View Ave.	SVVSD	Developed			Elementary School	Treated	----	----	0	0	0	----	0.00	0.00	0.0	0.0			
102	Longmont Estates Elementaray	2005 Alpine St.	SVVSD	Developed	10.0		Elementary School	Treated	----	----	0	0	0	----	0.00	0.00	0.0	0.0			
103	Longmont High School	1040 Sunset Street	SVVSD	Developed	27.3	8.4	High School	Raw	Longmont Supply	----	0	0.00	0	----	0.00	0.0	0.0	0.0			27.89
104	Longs Peak Middle		SVVSD	Developed	15.8	11.5	Middle School	Raw	Oligarchy	Oligarchy	1.27	26.48	33.6296				0.0	33.6			33.6
105	Mountain View Elementary	1415 14th Ave	SVVSD	Developed			Elementary School	Treated	----	----	0	0	0	----	0.00	0.00	0.0	0.0			
106	Northridge Elem.	1200 19th Ave.	SVVSD	Developed		4.7	Elementary School	Raw	Oligarchy	Oligarchy			0				0.0	0.0			
107	Quail Rd. Elementary	Quail Rd.	SVVSD	Undeveloped	10.0	4.0	Elementary School	Raw	Niwot	Niwot	0.1	83.77	8.377	C-BT	6.00	0.8	4.6	12.9			
108	Rocky Mountain Elementary	800 East 5th. Ave.	SVVSD	Developed	8.1	2.9	Elementary School	Raw	Oligarchy	Oligarchy			0				0.0	0.0			
109	Sanborn Elementary	2235 Vivian St.	SVVSD	Developed			Elementary School	Treated	----	----	0	0	0	----	0.00	0.00	0.0	0.0			
110	Silver Creek High	4901 Nelson Rd.	SVVSD	Developed	48.0	30.0	High School	Raw	Clover Basin	Clover Basin	1	5.00	5				0.0	5.0			
111	Skyline High School[6]	600 E. Mt. View Ave.	SVVSD	Developed	45.9	28.2	High School	Raw	Rough & Ready	Rough & Ready	1	59.96	59.96	Pleasant Valley	1.00	37.7	37.7	97.7			97.7
112	Spangler Elementary	1440 Spangler St.	SVVSD	Developed		2.0	Elementary School	Raw	Spring Gulch #1	McCall Lake	6	1.00	6				0.0	6.0			
113	St. Vrain Valley Adult Education	619 Bowen Street	SVVSD	Developed			High School	Treated	----	----	0	0	0	----	0.00	0.00	0.0	0.0			
114	Sunset Middle School	1300 S. Sunset St.	SVVSD	Developed	21.2	12.5	Middle School	Raw	Niwot				0				0.0	0.0			
115	Trail Ridge Middle School	1000 Button Rock Dr.	SVVSD	Developed	27.9	18.0	Middle School	Raw	Rough & Ready	Rough & Ready	0.65	59.96	38.974	Pleasant Valley	0.50	37.7	18.9	57.8			57.8
116	Twin Peaks Charter Academy	820 Main St.	SVVSD	Developed			Elementary School	Treated	----	----	0	0	0	----	0.00	0.00	0.0	0.0			
117	Westview Middle	1651 Airport Rd.	SVVSD	Developed	31.0	15.0	Middle School	Raw	Denio & Taylor Ditch	C-BT	50	0.80	40	None	0.00	0.0	0.0	40.0			
118	**Total**				**3,886**	**2,172**											**Total**	**4,963**	**225**	**1,405**	**2,084**
119																					
120	**Notes:**																		**Total Raw Water Required[8]**		**1,699**
121	[1] Number of shares reserved is the amount of water historically dedicated from water rental program.																				
122	[2] Spring Gulch and Felthams water rights are unincorporated ditches and do not have shares associated with it. Used # ac-ft required for # shares reserved.																				
123	[3] Union Pumpback Pipeline would deliver water to all facilities under the Oligarchy, Longmont Supply, Rough and Ready, and Spring Gulch at buildout.																				
124	[4] Undeveloped facilities have a demand of 3 ac-ft/acre. Dedicated water is 2/3 native basin and 1/3 transbasin.																				
125	[5] Boulder County Fairgrounds demand is based on area. By agreement the City dedicated 48 shares South Flatt to Boulder County.																				
126	[6] For Skyline High School the amount reserved is less than historically leased.																				
127	[7] Non-transferable water only includes water that is not proposed to be transferred to municipal use.																				
128	[8] Total Water Required = Total Raw Water Reserved + Add. Raw Water Demand When Converted - NonTransferable Water - Union Pumpback																				
129																					

ATTACHMENT 11

Land Use Areas in Longmont Planning Area (LPA)

Description of Attachment 11: Land Use Areas in Combined Municipal Service Area and Longmont Planning Area

Detail for Table 10 – Summary of Parcel Area to Gross Area in Combined Municipal Service Area and Longmont Planning Area

Gross Areas in Combined Municipal Service Area and Longmont Planning Area
The table of gross areas is based on a GIS union of the Longmont Area Comprehensive Plan and the Neighborhood Planning Areas as amended through July 27, 2010. The land uses are shown in the columns. The counties, neighborhood types (EN = established neighborhood and PN = planned neighborhood) and the neighborhoods are shown in the rows. Union Reservoir and the adjacent areas are identified as the Union Reservoir neighborhood to avoid leaving the neighborhood blank.

Boulder County Parcels in Combined Municipal Service Area and Longmont Planning Area - The table of parcel areas in Boulder County in the MSA/LPA is based on a GIS intersection of the Gross Areas in Longmont Planning Area with the Boulder County Assessor Parcel layer. Newer condominium parcels are shown as full sized stacked polygons for each owner. To correctly sum areas, the area of each polygon is divided by the number of stacked polygons so that the summation of the weighted areas equals the actual area. The land uses are shown in the columns. The neighborhood types (EN = established neighborhood and PN = planned neighborhood) and the neighborhoods are shown in the rows.

Weld County Parcels in Combined Municipal Service Area and Longmont Planning Area
The table of parcel areas in Weld County in the MSA/LPA is based on a GIS intersection of the Gross Areas in Longmont Planning Area with the Weld County Assessor Parcel layer. The land uses are shown in the columns. The neighborhood types (EN = established neighborhood and PN = planned neighborhood) and the neighborhoods are shown in the rows.

Right of Way Areas in Combined Municipal Service Area and Longmont Planning Area
The table of right of way in Boulder and Weld counties in the MSA/LPA is the difference between the gross areas in the MSA/LPA and the parcel areas in Boulder and Weld counties in the MSA/LPA. The land uses are shown in the columns. The counties and neighborhood types are shown in the rows.

Parcel/Gross Area Ratios in Combined Municipal Service Area and Longmont Planning Area - The table of parcel to gross area ratios is the parcel areas divided by the corresponding gross areas.

Parcel Area Adjustment for Step I in Attachment 8 - The table of gross and parcel areas and the ratio of parcel to gross areas is copied from the tables above. The parcel areas in Boulder County in the MSA/LPA for Step I in the Treated Water Demand Evaluation Flow Chart in Attachment 8 are subtracted from both the gross and parcel areas and remaining parcel areas is divided by the remaining gross area to calculate the parcel area adjustment for Step I. The land uses are grouped into 3 general categories (business, residential and public) and copied in Table 10.

GROSS AREAS IN COMBINED MUNICIPAL SERVICE AREA AND LONGMONT PLANNING AREA

Details for Table 10 - Summary of Parcel Area to Gross Area in Combined Municipcal Service Area and Longmont Planning Area

Include: yes

Sum of Area_Acres			LandUse														
County	TYPE_1	NGHBRHD	CBD	HDR	IED	LDR	MDR	MNC	MUC	NC	PGOS	PQP	RC	SC	ULDR	VLDR	Grand Total
Boulder	EN	Central Business District	118				1					8		9			135
		Central Industrial	14		192		2				59	15					283
		Clark Centennial		12	20	565	77			1	73	69					816
		East Industrial	4	4	508						105	76					697
		Garden Acres		39		656	55	27			78	18		7			881
		Kensington		52		572	35			9	58	23		6			754
		Lanyon		74		222	54				16						366
		Longmont Estates		69	12	649	48			4	133	152				35	1,101
		Loomiller		74		537	101	10		10	18	165		1			916
		McIntosh		14		213	190	13			529	1				75	1,035
		North Commercial		7		2	5	93			9	2		136			255
		South Commercial		12				28			4		1	59			103
		South Industrial			719		19	23			109	125	99	10			1,104
		Southmoor		40		339	58				30	36		25			527
		Sunset	1	2	1	432	95				47	56					634
	EN Total		137	399	1,452	4,188	739	195		23	1,267	747	100	253		110	9,608
	PN	Airport			837						162	262					1,260
		East Side		62	223	1,149	294	55		10	395	442	55				2,685
		Longmont Tech Center							72		795		108		170		1,145
		Lower Clover Basin				196	53				37	11				205	501
		Pike			92	215	108				33						447
		Quail		47	46	221	123	4			331	45	104	0		63	984
		Schlagel		50	185	334	35			14	29	1	64			42	753
		Terry Lake				98			333		64	10			198	266	969
		Upper Clover Basin		69		325	238	23			163	97					914
		West St. Vrain			296		55				330	3	64			158	906
		Westview										27					27
	PN Total			228	1,679	2,537	906	82	405	24	2,338	897	394	0	368	735	10,592
Boulder Total			137	627	3,131	6,725	1,645	276	405	46	3,605	1,644	494	253	368	845	20,201
Weld	PN	McLane		14	200		108				373		77				771
		Union Reservoir									1,609						1,609
	PN Total			14	200		108				1,981		77				2,380
Weld Total				14	200		108				1,981		77				2,380
Grand Total			137	641	3,331	6,725	1,753	276	405	46	5,587	1,644	571	253	368	845	22,580

BOULDER COUNTY PARCELS IN COMBINED MUNICIPAL SERVICE AREA AND LONGMONT PLANNING AREA

Include	yes

Sum of Weighted Acres		LandUse														
TYPE_1	NGHBRHD	CBD	HDR	IED	LDR	MDR	MNC	MUC	NC	PGOS	PQP	RC	SC	ULDR	VLDR	Grand Total
EN	Central Business District	70				0					5		6			81
	Central Industrial	9		142		2				57	8					218
	Clark Centennial		9	19	424	62			0	67	63					645
	East Industrial	2	3	415						86	69					575
	Garden Acres		31		488	41	21			58	17		6			662
	Kensington		41		404	29			7	36	19		3			540
	Lanyon		58		162	41				13						274
	Longmont Estates		55	11	488	38			2	131	149				32	906
	Loomiller		56		394	79	8		7	16	144		1			705
	McIntosh		10		151	136	10			528	1				61	898
	North Commercial		6		2	4	79			4	2		103			200
	South Commercial		10				23			3		0	45			82
	South Industrial			615		13	19			82	114	89	7			940
	Southmoor		29		241	49				22	34		17			392
	Sunset	1	1	1	324	72				38	52					489
EN Total		83	309	1,203	3,079	566	161		17	1,140	676	90	190		93	7,607
PN	Airport			796						158	260					1,214
	East Side		56	197	882	244	47		9	327	436	52				2,249
	Longmont Tech Center							72		749		103		170		1,095
	Lower Clover Basin				185	47				35	10				189	466
	Pike			79	167	67				28						341
	Quail		38	36	185	107	3			322	44	86			59	881
	Schlagel		45	171	260	25			11	22	1	51			39	625
	Terry Lake				83			329		40	10			195	261	918
	Upper Clover Basin		60		259	196	20			157	93					785
	West St. Vrain			278		52				324	2	56			149	861
	Westview										25					25
PN Total			199	1,557	2,022	738	70	402	20	2,163	880	348		365	697	9,460
Grand Total		83	509	2,760	5,101	1,303	231	402	37	3,303	1,556	438	190	365	790	17,067

WELD COUNTY PARCELS IN COMBINED MUNICIPAL SERVICE AREA AND LONGMONT PLANNING AREA

	Include	yes															
	Sum of Area_Acres		LandUse														
	TYPE_1	NGHBRHD	CBD	HDR	IED	LDR	MDR	MNC	MUC	NC	PGOS	PQP	RC	SC	ULDR	VLDR	Grand Total
	PN	McLane		14	188		108				339		75				724
		Union Reservoir									1,586						1,586
	PN Total			14	188		108				1,925		75				2,310
	Grand Total			14	188		108				1,925		75				2,310

RIGHT OF WAY AREAS IN COMBINED MUNICIPAL SERVICE AREA AND LONGMONT PLANNING AREA

	Sum of Area_Acres		LandUse														
County	TYPE_1	NGHBRHD	CBD	HDR	IED	LDR	MDR	MNC	MUC	NC	PGOS	PQP	RC	SC	ULDR	VLDR	Grand Total
Boulder	EN Total		54	89	249	1,109	174	34	0	6	127	71	10	63	0	17	2,002
	PN Total		0	29	122	515	168	12	3	4	175	17	46	0	4	38	1,132
Boulder Total			54	118	371	1,624	342	46	3	9	302	88	56	63	4	55	3,134
Weld	PN			0	12		0				56		1				69
Grand Total			54	118	382	1,624	342	46	3	9	358	88	57	63	4	55	3,203
																	14.2%

PARCEL /GROSS AREA RATIOS IN COMBINED MUNICIPAL SERVICE AREA AND LONGMONT PLANNING AREA

Include: yes

Sum of Area_Acres			LandUse														
County	TYPE_1	NGHBRHD	CBD	HDR	IED	LDR	MDR	MNC	MUC	NC	PGOS	PQP	RC	SC	ULDR	VLDR	Grand Total
Boulder	EN	Central Business District	0.60				0.54					0.58		0.65			0.60
		Central Industrial	0.64		0.74		0.67				0.95	0.55					0.77
		Clark Centennial		0.78	0.96	0.75	0.80			0.63	0.93	0.91					0.79
		East Industrial	0.60	0.71	0.82						0.81	0.91					0.82
		Garden Acres		0.79		0.74	0.74	0.78			0.75	0.90		0.88			0.75
		Kensington		0.78		0.71	0.83			0.81	0.63	0.83		0.57			0.72
		Lanyon		0.79		0.73	0.76				0.80						0.75
		Longmont Estates		0.79	0.92	0.75	0.80			0.58	0.99	0.98				0.92	0.82
		Loomiller		0.76		0.73	0.79	0.81		0.76	0.89	0.87		0.87			0.77
		McIntosh		0.75		0.71	0.72	0.79			1.00	1.00				0.81	0.87
		North Commercial		0.88		0.74	0.85	0.85			0.44	0.79		0.76			0.79
		South Commercial		0.87				0.82			0.88		0.47	0.78			0.80
		South Industrial			0.86		0.68	0.82			0.75	0.91	0.91	0.71			0.85
		Southmoor		0.71		0.71	0.84				0.73	0.95		0.70			0.74
		Sunset	0.76	0.61	0.98	0.75	0.76				0.81	0.92					0.77
	EN Total		0.60	0.78	0.83	0.74	0.77	0.83		0.75	0.90	0.90	0.90	0.75		0.84	0.79
	PN	Airport			0.95						0.98	1.00					0.96
		East Side		0.91	0.88	0.77	0.83	0.85		0.87	0.83	0.98	0.95				0.84
		Longmont Tech Center							1.00		0.94		0.96		1.00		0.96
		Lower Clover Basin				0.95	0.88				0.94	0.93				0.92	0.93
		Pike			0.86	0.78	0.62				0.87						0.76
		Quail		0.81	0.79	0.84	0.87	0.83			0.97	0.98	0.83	0.00		0.93	0.89
		Schlagel		0.91	0.93	0.78	0.72			0.83	0.77	1.01	0.81			0.92	0.83
		Terry Lake				0.85			0.99		0.62	1.00			0.98	0.98	0.95
		Upper Clover Basin		0.87		0.80	0.82	0.86			0.97	0.96					0.86
		West St. Vrain			0.94		0.96				0.98	0.60	0.87			0.95	0.95
		Westview										0.92					0.92
	PN Total			0.87	0.93	0.80	0.81	0.85	0.99	0.84	0.93	0.98	0.88	0.00	0.99	0.95	0.89
Boulder Total			0.60	0.81	0.88	0.76	0.79	0.83	0.99	0.80	0.92	0.95	0.89	0.75	0.99	0.94	0.84
Weld	PN	McLane		1.00	0.94		1.00				0.91		0.98				0.94
		Union Reservoir									0.99						0.99
	PN Total			1.00	0.94		1.00				0.97		0.98				0.97
Weld Total				1.00	0.94		1.00				0.97		0.98				0.97
Grand Total			0.60	0.82	0.89	0.76	0.80	0.83	0.99	0.80	0.94	0.95	0.90	0.75	0.99	0.94	0.86

PARCEL AREA ADJUSTMENT FOR STEP 1 IN ATTACHMENT 8 (TREATED WATER DEMAND EVALUATION PROCESS FLOWCHART)

	LandUse														
	CBD	HDR	IED	LDR	MDR	MNC	MUC	NC	PGOS	PQP	RC	SC	ULDR	VLDR	Grand Total
Gross Area (acres)	137	627	3,131	6,725	1,645	276	405	46	3,605	1,644	494	253	368	845	20,201
Parcel Area (acres)	83	509	2,760	5,101	1,303	231	402	37	3,303	1,556	438	190	365	790	17,067
Parcel / Gross Ratio	0.60	0.81	0.88	0.76	0.79	0.83	0.99	0.80	0.92	0.95	0.89	0.75	0.99	0.94	0.84
Step I Parcels		44	828	415	200	31	327		468		118		266	287	3,370
Ratio without Step I Parcels	0.60	0.80	0.84	0.74	0.76	0.81	0.96	0.80	0.90	0.95	0.85	0.75	0.97	0.90	0.81

Classification	Business	Residential	Public	Total
gross	4,742	10,210	5,249	20,201
parcel	4,140	8,068	4,859	17,067
ratio	0.87	0.79	0.93	0.84
Step I	1,305	1,211	468	3,370
ratio	0.82	0.76	0.92	0.81

STEP I ADJUSTMENT

Classification	gross	parcel	ratio	Step I	ratio
Business	4,742	4,140	0.87	1,305	0.82
Residential	10,210	8,068	0.79	1,211	0.76
Public	5,249	4,859	0.93	468	0.92
Total	20,201	17,067	0.84	3,370	0.81

ATTACHMENT 12

Treated Water Demand for MSA & LPA Parcels

Description of Attachment 12: Treated Water Demand for MSA & LPA Parcels

Detail for Table 11 – Summary of Unit Demand Rates by Land Use Classification

2008 Water Consumption - existing water services only (1000 gallons) - The table shows the water consumption in 2008 (TGAL08 = 1000 gallons during 2008) for the steps in the Treated Water Demand Evaluation Flow Chart in Attachment 8 that have representative unit rates of consumption. The land uses are shown in the columns. The steps are shown in the columns. Steps J and K are grouped as J/K because parcel aren't necessarily receiving water service every year. Given that there are 28,232 parcels in Boulder County inside the MSA/LPA and only 44 in Weld County inside the MSA/LPA, only Boulder County parcels were used to calculate the unit demand rates.

Corresponding Parcel Acreage - The table shows the weighted area in acres of the parcels receiving water service in 2008 for the steps in the Treated Water Demand Evaluation Flow Chart in Attachment 8 that have representative unit rates of consumption. Newer condominium parcels are shown as full sized stacked polygons for each owner. To correctly sum areas, the area of each polygon is divided by the number of stacked polygons so that the summation of the weighted areas equals the actual area. The land uses are shown in the columns. The steps are shown in the columns. Steps J and K are grouped as J/K because parcel aren't necessarily receiving water service every year.

Rate of Consumption (gallons per day per parcel acre) - The table of rates of consumption divides the 2008 water consumption (1000 gallons) by the corresponding parcel acreage and converts the units to gallons per day per parcel acre. The land uses are shown in the columns. The steps are shown in the columns. Steps J and K are grouped as J/K because parcel aren't necessarily receiving water service every year.

Detail for Table 17 - Summary of Build-Out Reference Forecast for Treated Water Demand (Boulder County Parcels)

2008 Water Consumption - All Boulder Parcels in Saint Vrain Valley Planning Area - The table shows water consumption in 2008 (TGAL08 = 1000 gallons during 2008) for all parcels in Boulder County in the Saint Vrain Valley Planning Area. The land uses are shown in the columns. The water service in 2008 and groupings of the steps in the Treated Water Demand Evaluation Flow Chart in Attachment 8 are shown in the columns. Parcels received water service in 2008 (SERV08) if there were 10 or more monthly readings in 2008. The steps are grouped where Step A is "Outside", Steps B, C and D are "No TWS" (TWS = treated water service), Step E (using Step F rates) is "Future", Steps F, H and J/K are "Exist or Future", Step F (converting to raw water) = "Convert to RWI" (RWI = raw water irrigation) and Step I = "Future - unplatted".

Corresponding Parcel Acreage - The table shows the weighted area in acres for all parcels in Boulder County in the Saint Vrain Planning Area. Newer condominium parcels are shown as full sized stacked polygons for each owner. To correctly sum areas, the area of each polygon is divided by the number of stacked polygons so that the summation of the weighted areas equals the actual area. The land uses are shown in the columns. The water service in 2008 and groupings of the steps in the Treated Water Demand Evaluation Flow Chart in Attachment 8 are shown in the columns.

Step I (Unplatted Parcel) Adjustment - The area adjustments for unplatted parcel in Step I in the Treated Water Demand Evaluation Flow Chart in Attachment 8 grouped in 3 general categories (business, residential and public) are copied from Attachment 11.

Rate of Consumption (gallons per day per parcel acre) - The rates of consumption for each land use and Step are copied from Attachment 11. "Public w/ Raw Water Irrigation" corresponds to the representative rate of consumption from Step F. "Public w/ Treated Water Irrigation" corresponds to the representative rates of consumption for Step H. "Private" corresponds to the representative rates of consumption for Step K.

Build-Out Reference Forecast for Treated Water Demand (Boulder County Parcels) - The table uses the 2008 water consumption for "Exist or Future" with 2008 water service and for "Outside" water services. The parcel area for "Future - unplatted" is multiplied by the corresponding unplatted parcel adjustment then the area is multiplied by the corresponding representative rate of consumption. No treated water service is shown for "No TWS". The parcel areas for the remaining groupings are multiplied by the corresponding representative rate of consumption. The grand total for parcels in Boulder County in the combined MSA/LPA is shown in Table 17. The outside water services in Boulder County is added to the outside water services in Weld County and also shown in Table 17.

Detail for Table 17 - Summary of Build-Out Reference Forecast for Treated Water Demand (Weld County Parcels)

2008 Water Consumption - All Weld Parcels in Saint Vrain Valley Planning Area - The table shows water consumption in 2008 (TGAL08 = 1000 gallons during 2008) for all parcels in Boulder County in the Saint Vrain Valley Planning Area. The land uses are shown in the columns. The water service in 2008 and groupings of the steps in the Treated Water Demand Evaluation Flow Chart in Attachment 8 are shown in the columns. Parcels received water service in 2008 (SERV08) if there were 10 or more monthly readings in 2008. The steps are grouped where Step A is "Outside", Steps B and D are "No TWS" (TWS = treated water service) and Steps F, H and J/K are "Exist or Future".

Corresponding Parcel Acreage - The table shows the area in acres for all parcels in Boulder County in the Saint Vrain Planning Area. The water service in 2008 and groupings of the steps in the Treated Water Demand Evaluation Flow Chart in Attachment 8 are shown in the columns.

Rate of Consumption (gallons per day per parcel acre) - The rates of consumption for each land use and Step are copied from Attachment 11. "Public w/ Raw Water Irrigation" corresponds to the representative rate of consumption from Step F. "Public w/ Treated Water Irrigation" corresponds to the representative rates of consumption for Step H. "Private" corresponds to the representative rates of consumption for Step K.

Build-Out Reference Forecast for Treated Water Demand (Weld County Parcels) - The table uses the 2008 water consumption for "Exist or Future" with 2008 water service and for "Outside" water services. No treated water service is shown for "No TWS". The parcel areas for the remaining groupings are multiplied by the corresponding representative rate of consumption. The grand total for parcels in Weld County in the combined MSA/LPA is shown in Table 17. The outside water services in Weld is added to the outside water services in Boulder County and also shown in Table 17.

Detail for Table 11 - Summary of Unit Demand Rates by Land Use Classification

2008 Water Consumption - existing water services only (1000 gallons)

SERV08 yes
STEP_TYPE Exist or Future

Sum of TGAL08	LandUse																
STEP	CBD	HDR	IED	LDR	MDR	MNC	NC	PGOS	PQP	RC	SC	VLDR	Grand Total	Commercial	Industrial	Residential	Public
F								38,952	30,276				69,228	0	0	0	69,228
H			355					77,644	229,603		0		307,601	0	355	0	307,247
J/K	55,750	406,794	628,606	2,432,583	608,470	87,276	16,843	3,240	575	105,722	96,638	17,361	4,459,857	362,229	628,606	3,465,207	3,814
Grand Total	55,750	406,794	628,961	2,432,583	608,470	87,276	16,843	119,836	260,453	105,722	96,638	17,361	4,836,686	362,229	628,961	3,465,207	380,289

Corresponding Parcel Acreage

SERV08 yes
STEP_TYPE Exist or Future

Sum of WgtdArea	LandUse																
STEP	CBD	HDR	IED	LDR	MDR	MNC	NC	PGOS	PQP	RC	SC	VLDR	Grand Total	Commercial	Industrial	Residential	Public
F								11,302,936	30,164,236				41,467,171	0	0	0	41,467,171
H			117,520					14,250,468	27,514,295		18,715		41,900,998	18,715	117,520	0	41,764,763
J/K	3,237,326	17,945,015	52,666,825	179,893,873	39,744,462	7,491,252	1,001,727	769,194	13,410	10,522,641	7,277,495	2,596,113	323,159,334	29,530,441	52,666,825	240,179,464	782,604
Grand Total	3,237,326	17,945,015	52,784,345	179,893,873	39,744,462	7,491,252	1,001,727	26,322,598	57,691,940	10,522,641	7,296,210	2,596,113	406,527,503	29,549,156	52,784,345	240,179,464	84,014,538

Rate of Consumption (gallons per day per parcel acre)

SERV08 yes
STEP_TYPE Representative

GPM/Parcel Acre	LandUse																
STEP	CBD	HDR	IED	LDR	MDR	MNC	NC	PGOS	PQP	RC	SC	VLDR	Grand Total	Commercial	Industrial	Residential	Public
F								410	120				200				200
H								650	990				870	0	360		880
J/K	2,050	2,700	1,420	1,610	1,820	1,390	2,000			1,200	1,580	800	1,640	1,460	1,420	1,720	580
Grand Total													1,420				

Notes: MUC 2370

"TGAL08" equals 2008 treated water consumption in thousand gallons.
Weighted area ("WgtdArea") equals the parcel area in square feet divided by the number of "stacked" polygons in the County Assessor parcel layer.
2008 treated water consumption equals [TGAL08 * 1000 gallons/TGAL * 1 year/366 days] / [WgtdArea * 1 acre/43560 sq ft].
Existing treated water consumption by privately owned parcels in PGOS or PQP land uses and one City owned parcel in IED/LDR land use as highlighted in yellow were not used in analysis.
MUC equals the average rate of consumption for all commercial land uses plus 50% of the medium residential land use.

Detail for Table 17 - Summary of Build-Out Reference Forecast for Total Treated Water Demand (Boulder County Parcels)

2008 Water Consumption - All Boulder Parcels in Saint Vrain Valley Planning Area

Sum of TGAL08		LandUse															
SERV08	STEP_TYPE		CBD	HDR	IED	LDR	MDR	MNC	MUC	NC	PGOS	PQP	RC	SC	ULDR	VLDR	Grand Total
no	Exist or Future		10	370	163	8,136	752	1,885	0	0	0	144	222	0	0	0	11,681
	Future										0	0				0	0
	Future - unplatted			0	0	0	0	0	0		0		0		0	0	0
	No TWS	0		0	0	0	0	0	0		0	0	0	0	0	0	0
no Total		0	10	370	163	8,136	752	1,885	0	0	0	144	222	0	0	0	11,681
yes	Convert to RWI										7,643	563					8,205
	Exist or Future		55,750	406,794	628,961	2,432,583	608,470	87,276		16,843	119,836	260,453	105,722	96,638		17,361	4,836,686
	Future										239						239
	Future - unplatted				413												413
	No TWS	48,395									35						48,430
	Outside	17,689															17,689
yes Total		66,084	55,750	406,794	629,374	2,432,583	608,470	87,276		16,843	127,752	261,016	105,722	96,638		17,361	4,911,663
Grand Total		66,084	55,759	407,164	629,537	2,440,719	609,222	89,161	0	16,843	127,752	261,159	105,944	96,638	0	17,361	4,923,344

Corresponding Parcel Acreage

Sum of WgtdAcre		LandUse															
SERV08	STEP_TYPE		CBD	HDR	IED	LDR	MDR	MNC	MUC	NC	PGOS	PQP	RC	SC	ULDR	VLDR	Grand Total
no	Exist or Future		6	64	507	417	139	26	56	4	15	24	73	20	13	156	1,519
	Future										330	61				30	420
	Future - unplatted			68	768	579	108	31	357		80		133		154	279	2,557
	No TWS	25,181		1	164	162	1	0	0		1,995	141	11	1	164	326	28,147
no Total		25,181	6	132	1,440	1,157	248	57	413	4	2,420	225	216	21	331	790	32,642
yes	Convert to RWI										14	10					24
	Exist or Future		74	412	1,212	4,130	912	172		23	604	1,324	242	167		60	9,333
	Future										9						9
	Future - unplatted				118												118
	No TWS	273									31						304
	Outside	974															974
yes Total		1,247	74	412	1,329	4,130	912	172		23	658	1,334	242	167		60	10,761
Grand Total		26,428	80	544	2,769	5,287	1,160	229	413	27	3,079	1,559	458	189	331	850	43,403

Step I (Unplatted Parcel) Adjustment

Unplatted Parcel Adjustment			0.82	0.76	0.82	0.76	0.76	0.82	0.82	0.82	0.92	0.92	0.82	0.82	0.76	0.76

Rate of Consumption (gallons per day per parcel acre)

	LandUse														
	CBD	HDR	IED	LDR	MDR	MNC	MUC	NC	PGOS	PQP	RC	SC	ULDR	VLDR	
Public w/ Raw Water Irrigation									410	120					
Public w/ Treated Water Irrigation									650	990					
Private	2,050	2,700	1,420	1,610	1,820	1,390	2,370	2,000			1,200	1,580	800	800	

Build-Out Reference Forecast for Treated Water Demand (Boulder County Parcels)

TGAL		LandUse															
BUILDOUT	STEP_TYPE		CBD	HDR	IED	LDR	MDR	MNC	MUC	NC	PGOS	PQP	RC	SC	ULDR	VLDR	Grand Total
no	Exist or Future		4,481	62,898	263,660	245,429	92,273	13,305	48,358	3,156	2,259	1,032	32,118	11,813	3,671	45,584	830,038
	Future										49,465	2,661				30	52,155
	Future - unplatted			50,773	327,371	259,380	54,892	12,920	253,855		11,069		47,810		34,228	62,094	1,114,391
	No TWS																
no Total		0	4,481	113,671	591,030	504,809	147,164	26,225	302,213	3,156	62,794	3,693	79,928	11,813	37,899	107,707	1,996,584
yes	Convert to RWI										2,152	441					2,592
	Exist or Future		55,750	406,794	628,961	2,432,583	608,470	87,276		16,843	119,836	260,453	105,722	96,638		17,361	4,836,686
	Future										1,324						1,324
	Future - unplatted				50,172												50,172
	No TWS																
	Outside	17,689															17,689
yes Total		17,689	55,750	406,794	679,133	2,432,583	608,470	87,276	0	16,843	123,312	260,894	105,722	96,638	0	17,361	4,908,464
Grand Total		17,689	60,231	520,465	1,270,163	2,937,392	755,635	113,501	302,213	19,999	186,105	264,587	185,650	108,452	37,899	125,067	6,905,048

Notes:	Outside	17,689
	MSA_LPA	6,887,359
Consumption report review corrected report error for SC service and reduced rate of consumption by 50% (-350 ac-ft/yr).		
Previous adjustment for unplatted parcels used the overall ratio instead of the ratio of only the platted parcels (-200 ac-ft/yr).	mgd	18.8
Joining instead of intersecting GIS layers changed the land use of some parcels that overlapped more than one land use (remaining -330 ac-ft/yr).	ac-ft/yr	21,138

Detail for Table 17 - Summary of Build-Out Reference Forecast for Treated Water Demand (Weld County Parcels)

2008 Water Consumtion - All Weld Parcels in Saint Vrain Valley Planning Area

Sum of TGAL08		LandUse						
SERV08	STEP_TYPE	IED	MDR	PGOS	PQP	RC	(blank)	Grand Total
no	Exist or Future	0	0			0		0
	No TWS			1	0		0	1
no Total		0	0	1	0	0	0	1
yes	Exist or Future	8,275		2,277				10,552
	Outside						2,323	2,323
yes Total		8,275		2,277			2,323	12,876
Grand Total		8,275	0	2,278	0	0	2,323	12,876

Corresponding Parcel Acreage

Sum of WgtdAcre		LandUse						
SERV08	STEP_TYPE	IED	MDR	PGOS	PQP	RC	(blank)	Grand Total
no	Exist or Future	36	152			67		255
	No TWS			1,572	11		9,535	11,118
no Total		36	152	1,572	11	67	9,535	11,372
yes	Exist or Future	154		330				485
	Outside						363	363
yes Total		154		330			363	848
Grand Total		190	152	1,902	11	67	9,898	12,220

Rate of Consumption (gallons per day per parcel acre)

	LandUse				
	IED	MDR	PGOS	PQP	RC
Public w/ Raw Water Irrigation			410	120	
Public w/ Treated Water Irrigation			650	990	
Private	1,420	1,820			1,200

Build-Out Reference Forecast of Treated Water Demand (Weld County Parcels)

TGAL		LandUse						
BUILDOUT	STEP_TYPE	IED	MDR	PGOS	PQP	RC	(blank)	Grand Total
no	Exist or Future	18,517	101,217			29,466		149,199
	No TWS							
no Total		18,517	101,217	0	0	29,466	0	149,199
yes	Exist or Future	8,275		2,277				10,552
	Outside						2,323	2,323
yes Total		8,275		2,277			2,323	12,876
Grand Total		26,792	101,217	2,277	0	29,466	2,323	162,075

Outside	2,323
MSA_LPA	149,199
mgd	0.4
ac-ft/yr	458

ATTACHMENT 13

Existing and Potential Arterial Irrigation

Description of Attachment 13: Existing and Potential Arterial Irrigation

The linear feet of existing irrigated arterial right of way and potential future irrigated right of way were estimated based on the arterial streets in the Longmont Area Comprehensive Plan. The Build-Out Arterial Treated Water Consumption for the Reference Forecast assumes that the consumption is proportional to the footage of irrigated right of way.

2009 Arterial Landscaping

East-West Arterials

Street Name	Potential Irrigated ROW		Existing Irrigated ROW
	LF		LF
Vermillion	0		0
HWY 66	34,592		1,870
17th Ave	8,260		30,603
9th Ave	7,055		17,550
Nelson Rd	14,398		18,898
Clover Basin Drive	1,620		8,974
Pike Road	0		10,388
Ken Pratt Blvd - Hwy 119	12,200		17,763
3rd Ave	0		8,590

North-South Arterials

Street Name	Potential Irrigated ROW		Existing Irrigated ROW
	LF		LF
County Line Road	20,300		0
119th Street	5,588		0
Pace Street	3,920		24,860
N 115th	5,100		0
Main Street	7,025		14,074
Hover St	12,956		37,024
Airport Rd	13,900		23,000
75th Street	12,057		1,708

TOTAL	158,971	215,302
Total lineal Miles	30.11	40.78
Total Street Miles	15.05	20.39

Potential / Existing 74%

ATTACHMENT 14

Variable Assumptions Supporting Data

Description of Attachment 14: Variable Assumptions Supporting Data

Adjustment for partially developed or partially occupied parcels - Since the water consumption data cannot indicate if a parcel is partially developed or partially occupied, it was assumed that the 10 percent of parcels with the lowest rate of water consumption in each quartile represent partially developed or partially occupied parcels. The rate of water consumption for each quartile was recalculated using the average water consumption of the remaining 90 percent in each area applied to the entire area. Each table divides the parcels into the 4 quartiles (rows) and the parcels in and out of the bottom 10% of each quartile (columns). The rate of consumption in the third table divides the water consumption in the first table by the area in the second table. The fourth table multiples the rate of consumption for the remaining 90% of each quartile times the areas for both the bottom 10 % and the remaining 90%.

New Development will have Planned Neighborhood Rates of Consumption - The rates of consumption for the land uses were calculated separately for established and planned neighborhoods to evaluate whether using the rates from planned neighborhoods instead of the overall rates would change the treated water demands following the process in Attachment 12.

Details for Table 22

Assumption 2: Adjustment for partially developed or partially occupied parcels

2008 Water Consumption (1000 gallons)

Sum of TGAL08	AQ_Bot10%		
AreaQuartile	no	yes	Grand Total
1	264,256	925	265,181
2	207,295	851	208,146
3	344,792	877	345,669
4	171,764	76	171,840
Grand Total	988,107	2,729	990,835

Area (Parcel Acres)

Sum of WgtdAcre	AQ_Bot10%		
AreaQuartile	no	yes	Grand Total
1	423	47	470
2	422	49	471
3	413	56	469
4	372	105	477
Grand Total	1,630	257	1,887

Rate of Consumption (gallons per day per parcel acre)

Sum of WgtdAcre	AQ_Bot10%		
AreaQuartile	no	yes	Grand Total
1	1,707	54	1,542
2	1,341	47	1,206
3	2,279	43	2,014
4	1,263	2	985
Grand Total	1,656	29	1,435

Water consumption with lowest rate of consumption for 10% of area in each quartile replaced with rate of remaining 90%

Sum of WgtdAcre	AQ_Bot10%		
AreaQuartile	no	yes	Grand Total
1	264,256	29,406	293,661
2	207,295	24,080	231,374
3	344,792	46,413	391,205
4	171,764	48,588	220,352
Grand Total	988,107	148,487	1,136,593

Difference (MG/year):	146
Difference (mgd):	0.4
Difference (acre-ft/year):	447

Note:

Based on business parcels with existing water service in 2008.

Details for Table 22 - Assumption 3: New Development will have Rate of Consumption in Planned Neighborhoods

SERV08	yes													
STEP_TYPE	Exist or Future													
NghbrhdType	PN													
Sum of TGAL08	LandUse													
STEP	HDR	IED	LDR	MDR	MNC	NC	PGOS	PQP	RC	Grand Total	Commercial	Industrial	Residential	Public
F							5,497	12,448		17,945				17,945
H							28,134	3,765		31,899				31,899
J/K	95,407	157,328	805,958	284,320	13,459	4,393	76		61,246	1,422,187	79,097	157,328	1,185,685	
Grand Total	95,407	157,328	805,958	284,320	13,459	4,393	33,707	16,213	61,246	1,472,030				
SERV08	yes													
STEP_TYPE	Exist or Future													
NghbrhdType	PN													
Sum of WgtdArea	LandUse													
STEP	HDR	IED	LDR	MDR	MNC	NC	PGOS	PQP	RC	Grand Total	Commercial	Industrial	Residential	Public
F							3,485,684	15,096,306		18,581,990				18,581,990
H							5,283,004	12,377,966		17,660,969				17,660,969
J/K	4,866,042	15,898,130	52,868,901	17,877,656	1,110,373	280,407	432,093		6,660,688	99,994,291	8,051,468	15,898,130	75,612,599	
Grand Total	4,866,042	15,898,130	52,868,901	17,877,656	1,110,373	280,407	9,200,781	27,474,271	6,660,688	136,237,250				
SERV08	yes													
STEP_TYPE	Representative													
GPM/Parcel Acre	LandUse													
STEP	HDR	IED	LDR	MDR	MNC	NC	PGOS	PQP	RC	Grand Total	Commercial	Industrial	Residential	Public
F							190	100		110				110
H							630	40		210				210
J/K	2,330	1,180	1,810	1,890	1,440	1,860			1,090	1,690	1,170	1,180	1,870	
Grand Total										1,290				
										MUC	2115			

Notes:

"TGAL08" equals 2008 treated water consumption in thousand gallons.

Weighted area ("WgtdArea") equals the parcel area in square feet divided by the number of "stacked" polygons in the County Assessor parcel layer.

2008 treated water consumption equals [TGAL08 * 1000 gallons/TGAL * 1 year/366 days] / [WgtdArea * 1 acre/43560 sq ft].

Existing treated water consumption by privately owned parcels in PGOS or PQP land uses and one City owned parcel in IED/LDR land use as highlighted in yellow were not used in analysis.

MUC equals the average rate of consumption for all commercial land uses plus 50% of the medium residential land use.

Substitute business and residential rates of consumption in "Table16-BoCo" for Adjusted Buildout Consumption (-95 MG/year = -0.2 mgd = -291 acre-ft/year

ATTACHMENT 15

Water Demand Evaluation – Raw Water Supply Modeling Task Memorandum, October 2011

DEERE & AULT
CONSULTANTS, INC.

Water Demand Evaluation – Raw Water Supply Modeling

TASK MEMORANDUM

October, 2011

EXECUTIVE SUMMARY

Deere & Ault Consultants, Inc. ("D&A") adapted and utilized a model previously developed for the City of Longmont to evaluate the ability of its raw water supply system to meet demands through a 1-in-100 year drought at buildout according to the Longmont Area Comprehensive Plan ("LACP"). The analysis built upon previous efforts (especially late 2010/early 2011) and utilized most of the recommendations presented in the Draft Water Demand Evaluation ("Water Demand Evaluation") report prepared by CH2MHill, dated August, 2011 (revised October, 2011).

This analysis used a total municipal raw water demand of approximately 32,620 acre-feet per year for treatment plus contract raw water demands ranging from 4,273 to 6,775 acre-feet per year. Results show that the water rights portfolio projected to be provided through the Raw Water Requirement Policy, along with the existing raw water supply infrastructure, will not quite meet Longmont's demand at build-out of the LACP through a 1-in-100 year drought when future projected demands are considered.

Three future infrastructure projects – participating in the Windy Gap Firming Project for 6,000 acre-feet of storage, constructing the Union Reservoir raw water pipeline, and enlarging Union Reservoir – were evaluated for their ability to increase the yield of Longmont's raw water supply system sufficiently to meet the projected demand. Two projects – Windy Gap Firming and the Union Reservoir pipeline – improve the system's yield and performance such that the projected drought demands can be met during a 1-in-100 year drought at buildout.

We suggest that this analysis be updated as Longmont continues to review and proof the recommendations from the Water Demand Evaluation, especially the "Variable Assumptions" provided in Table 22 thereof. For example, should the legal/regulatory climate in Colorado change such that the yields of Longmont's existing or future supplies may be negatively impacted, Longmont may conclude that increasing the factor of safety used in projecting its future water supply need (Variable Assumption #11) is an appropriate consideration.

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WATER DEMAND UPDATE

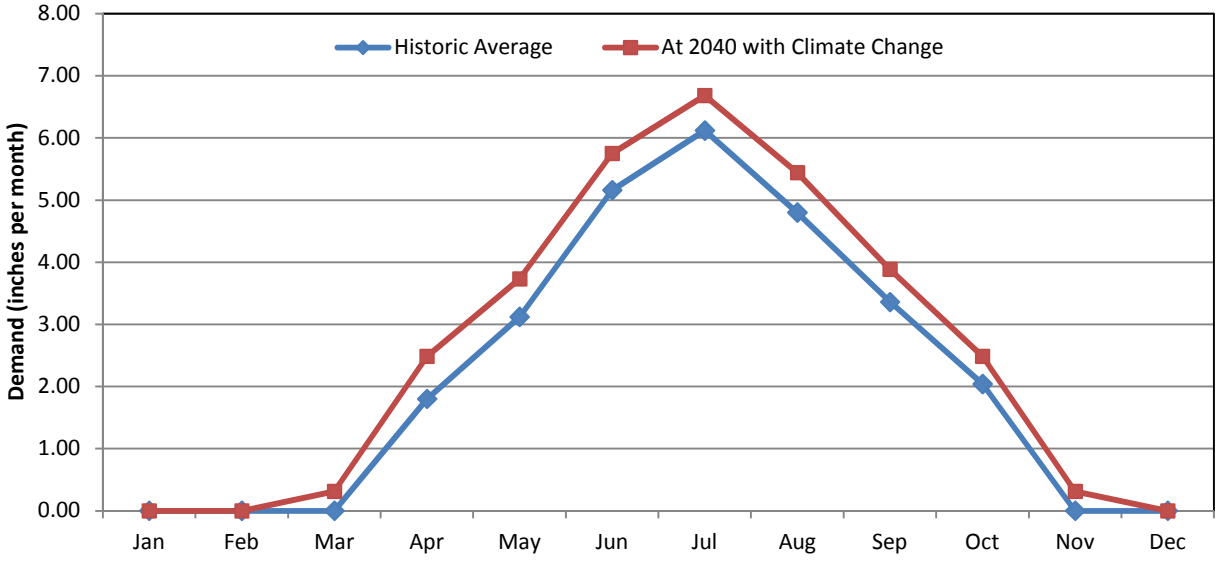
The Water Demand Evaluation report describes the methodology used to prepare an updated projection of Longmont's water demands at buildout of the LACP. According to that document "The estimated total amount of water required to meet the City of Longmont's needs for the current LACP, and accounting for a mid-level range in variability of water demand and supply assumptions, is 32,840 ac-ft." Included in that amount is consideration of increased future demands during droughts, and as a result of a possibly warmer and drier climate.

Variability Assumption #9, Dry Year Adjustment adds to the projected demand at buildout due to increased water use during dry years. Variability Assumption #5, Climate Variability Impact on Irrigation Demand, adds additional demand for outdoor uses because of the possibility of warmer temperatures and less precipitation in the future. It is appropriate to consider both these adjustments because under warmer and drier future conditions generally, it is reasonable to conclude that droughts can be more severe than historically observed.

The D&A evaluation of potential increased demand of lawn grass in response to climate change used the results of Global Climate Model (GCM) outputs downscaled to the Longmont area. Results of 112 GCMs were examined to obtain monthly average temperatures and precipitation amounts at 2040 (represented as the average of the modeled years 2025-2054) and 2070 (represented as the average for years 2055-2084). Those data were then used to compute the potential consumptive use of lawn grass and compared to the potential consumptive use on a monthly basis for a baseline period of 1950-1999.

Results show potential for an 18 percent increase in average annual lawn grass consumptive use requirement for the 30-year period around 2040 (roughly equivalent to an 8 percent in overall water use) and about a 28 percent increase for the 30-year period around 2070. The results also show a redistribution of monthly demand over a longer irrigation season. Figure 1 shows the historical and 2040 projected consumptive use demand by lawn grass assuming the higher demand associated with a potential change in climate. For purposes of the raw water supply analysis it was assumed that Longmont water users would increase and retime their water use in proportion to any increase and retimed lawn grass demand resulting from climate change.

Figure 1
Lawn Grass Consumptive Use Requirement



Based on D&A's analysis, the increased outdoor water use in Longmont at buildout of the LACP averages 2,144 acre-feet per year. Likewise, because the total water use is increased, the 5 percent increase for dry years as compared to average years also goes up. In D&A's modeling, the 5 percent dry year demand increase represents an additional 1,445 acre-feet per year.

All of the remaining Variable Assumptions in the Water Demand Evaluation report, Table 22, were aggregated into one factor for purposes of adapting them to D&A's model. The net effect of combining those items (including savings from water conservation and factor of safety) is approximated as 3 percent of Longmont's Treated Water Demand. The resulting modeled water demand at buildout is 32,616 acre-feet per year as summarized in Table 1. This is essentially equal to the Total Water Demand with Recommended Variability of 32,840 ac-ft from the Water Demand Evaluation.

Table 1
Modeled Annual Raw Water Demands at Buildout During 1-in-100 Year Drought
(acre-feet)

Description	Amount	Notes
Residential Use	14,067	Water Demand Evaluation, Attachment 12
Business and Industrial Use[1]	9,189	Water Demand Evaluation, Attachment 12
Treated Parks	1,585	Water Demand Evaluation, Attachment 12
Subtotal - Metered Use	**24,841**	
Authorized Uses	248	1% of Metered Use
System Losses	1,739	7% of Metered Use
Net of Remaining Variable Assumptions[2]	745	3% of Metered Use
Subtotal - WTP Production	**27,573**	
Raw Water and WTP Losses	1,454	5% of WTP Raw Water Requirement
WTP Raw Water Requirement	**29,027**	
Increased Drought Year Raw Water Requirement[3]	1,445	5% increase on all demand and losses
Increased Climate Change Irrigation Demand[4]	2,144	18% increase on lawn irrigation use for 2040
Total Modeled Municipal Raw Water Requirement	**32,616**	

In addition to Longmont's municipal demands, this evaluation considered that Longmont's current level of raw water provision by contract would continue through buildout. Between trades (where the partnering entity provides raw water to Longmont in return for deliveries) and straight multi-year leases, Longmont's contract deliveries of raw water to others during the modeled drought range from 4,273 acre-feet per year to 6,775 acre-feet per year and average 4,916 acre-feet per year over the 7 drought years. The amount varies because a large portion of this demand is tied to the amount of water provided by its partners as determined by the annual C-BT quota. Fully consumable municipal effluent after municipal use by Longmont is the highest priority source used for satisfying these demands. The annual municipal, contract and total raw water demands are shown in Table 2.

Table 2
Annual Raw Water Demands at Buildout During 1-in-100 Year Drought
(acre-feet)

Type	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Average
Municipal	32,616	32,616	32,616	32,616	32,616	32,616	32,616	32,616
Contract	6,775	5,274	4,273	4,273	4,273	4,273	5,274	4,916
Total	39,391	37,890	36,889	36,889	36,889	36,889	37,890	37,532

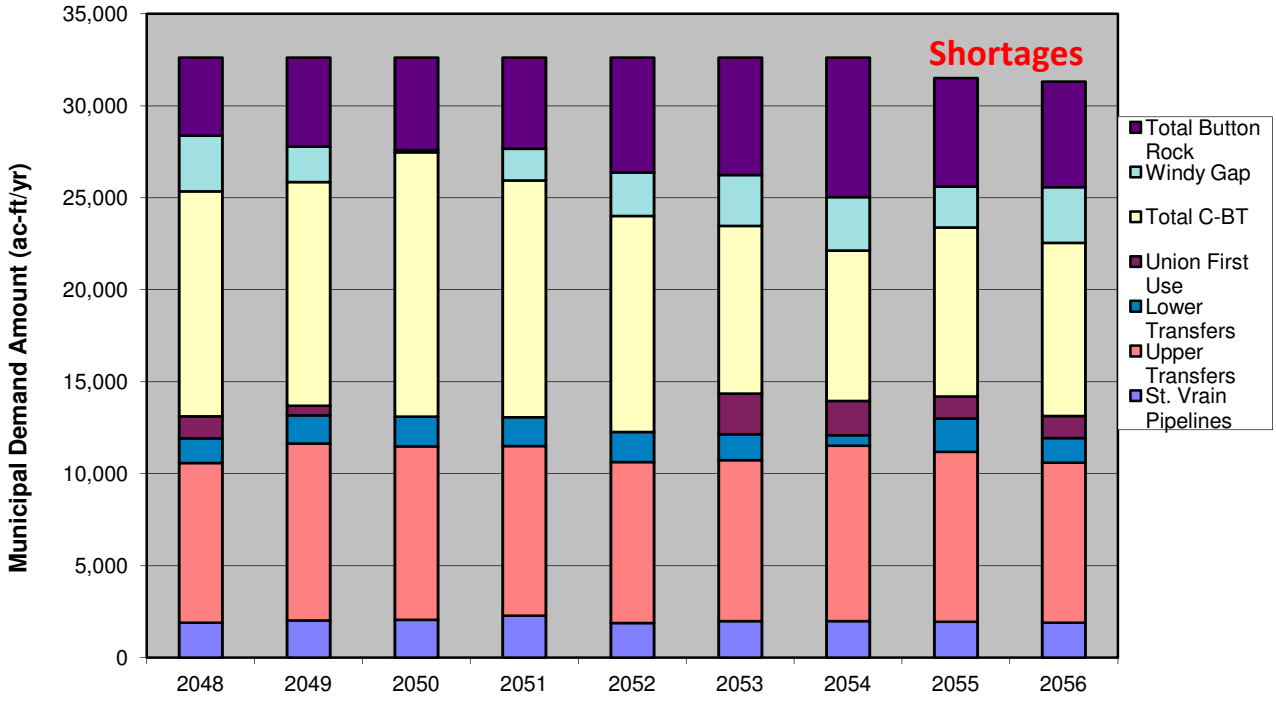
[1] Includes Water Demand Evaluation Table 22 Variable Assumption 4 Economic development for high demand industrial uses.
[2] Net of Variable Assumptions 1, 2, 3, 6, 7, 8, 10, 11, 12 and 13 (Table 22 of the Water Demand Evaluation), expressed as a percent of Metered Use.
[3] Equivalent of Table 22 Variable Assumption 9 Dry year adjustment.
[4] Equivalent of Table 22 Variable Assumption 5 Climate variability impacts.

Results

Baseline Condition – D&A evaluated Longmont's ability to meet its projected demand at buildout of the LACP with its projected water rights portfolio and existing raw water infrastructure to determine if the raw water supply will be adequate to meet the projected demand of 32,616 acre-feet per year plus additional raw water contract deliveries totaling up to 6,775 acre-feet per year.

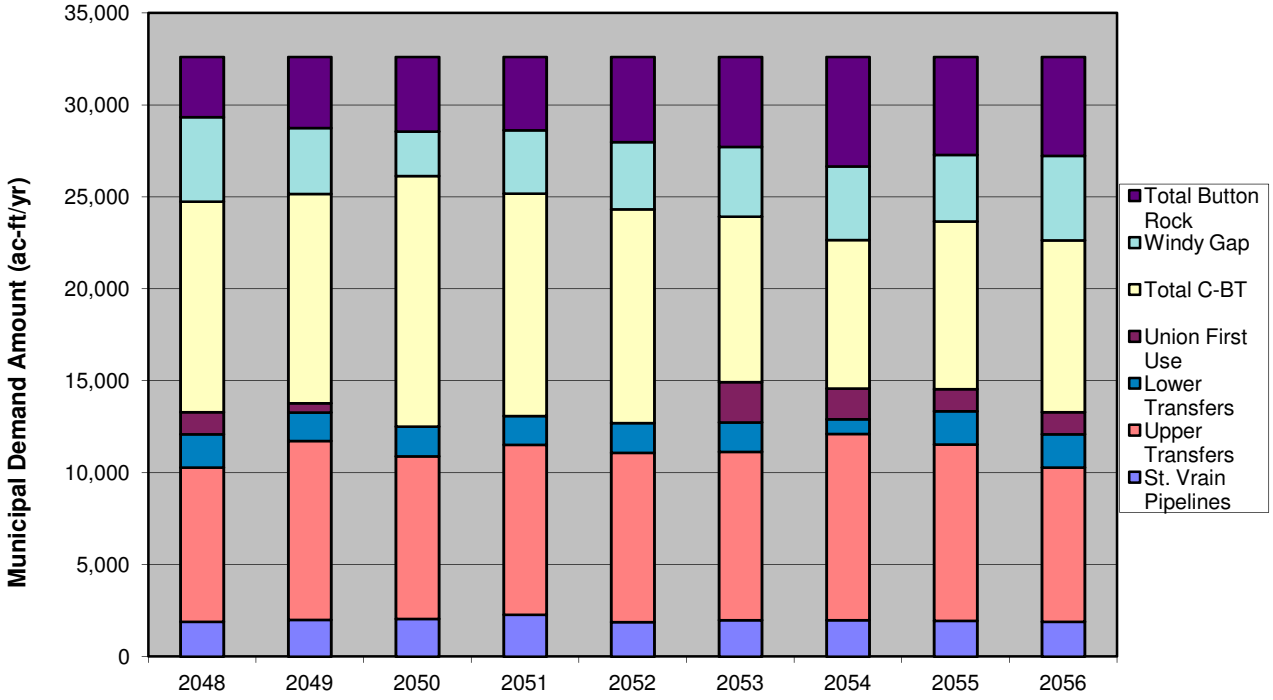
Results show that during the first 6 years of the 7 year drought, the supply would meet all of Longmont's demands. However, in the last year of the drought, there would be an unmet demand of 1,013 acre-feet (3.4 percent of the 32,616 acre-feet of municipal demand). Because of low storage reserves, an additional 1,291 acre-feet (4.0 percent of the municipal demand) of the municipal demand would not be met in the year following the drought. The contract raw water demand would be met throughout the drought because it largely relies on sources not directly available for municipal use (primarily reusable municipal return flows). Figure 2 shows the annual distribution of raw water supplies used to meet Longmont's demand and shows the shortages in the last year of the drought and the year following that.

Figure 2
Allocation of Supplies for Baseline



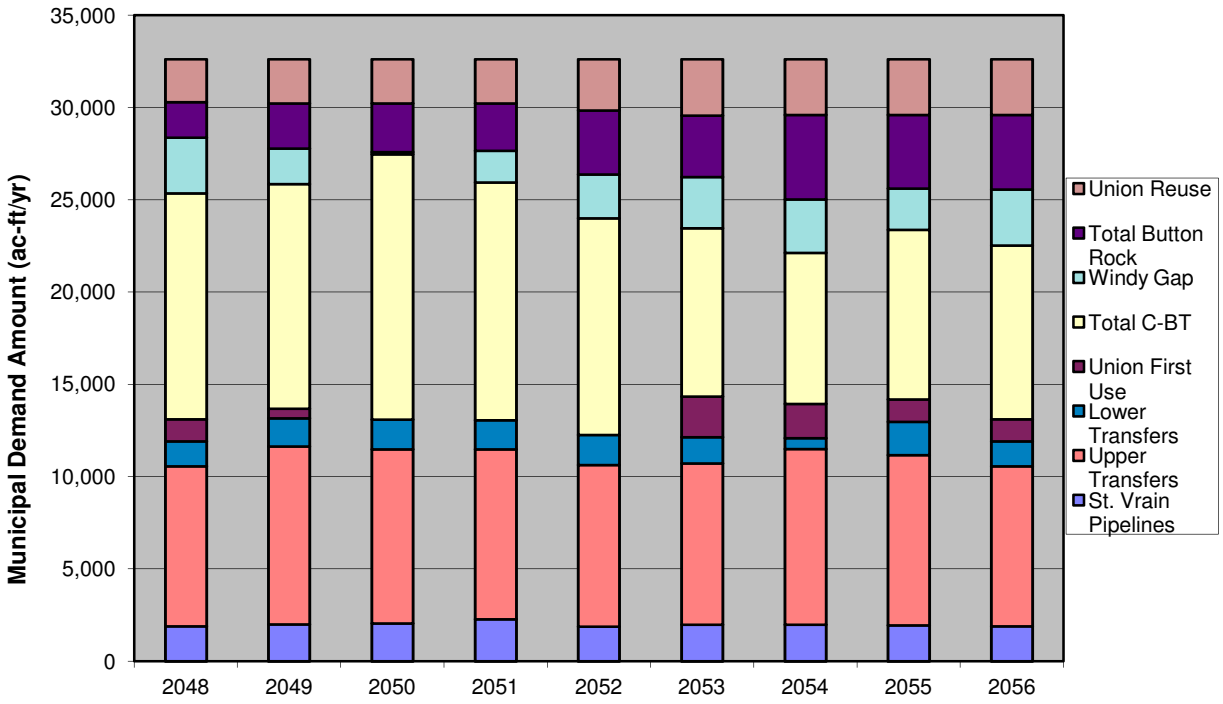
Windy Gap Firming – D&A evaluated Longmont's ability to meet the projected demand at buildout of the LACP if the Windy Gap firming project adds 6,000 acre-feet of storage and its associated firm yield of water from that project. At a storage ratio of 2.42:1 the new storage would firm the yield for approximately 28.5 units of Windy Gap to 86.8 acre-feet per share, or a total firm yield of 2,474 acre-feet per year. Adding this supply allows the system to meet the projected municipal and contract raw water demands through buildout of the LACP during the 1-in-100 year drought. Figure 3 shows the supply source allocation for this analysis and shows that the municipal demands are met during each year of the analysis.

Figure 3
Allocation of Supplies with Windy Gap Firming (6,000 acre-feet)



Union Reservoir Raw Water Pipeline – D&A also evaluated the benefit of constructing a 10 cfs capacity (approx. 6.5 mgd) pipeline to pump raw water from Union Reservoir back to the water treatment plants, thus making raw water stored in Union Reservoir available for municipal use year-round. The modeling shows that adding this component to the system would allow Longmont to meet the projected municipal and contract raw water demands through buildout of the LACP during the 1-in-100 year drought (see Figure 4). The buildout demand cannot be met with only the addition of this component if the pipeline is not completed to the water treatment plants, and thus is only available for exchange with area ditches during the April through October season. Under the seasonal scenario, the shortages in the last year of the drought and the following year are 949 acre-feet (2.9%) and 1,291 acre-feet (4.0%), respectively, nearly the same shortages as the baseline scenario.

Figure 4
Allocation of Supplies with Union Reservoir Raw Water Pipeline



Union Reservoir Enlargement – Enlarging the storage capacity at Union Reservoir was also evaluated. The modeled enlargement was 12,280 acre-feet which would be created by raising the storage level 13 feet. Because there is no new supply in this scenario, and because it does not provide water directly to the water treatment plants like the Union Reservoir raw water pipeline, adding additional storage at Union Reservoir alone does not improve the performance of Longmont's water supply system during the 1-in-100 year drought. The supply deficits in the last year of the drought and the following year are the same as the baseline scenario 1,103 acre-feet (3.4%) and 1,291 acre-feet (4.0%), respectively.