

# CITY OF DACONO



## WATER MASTER PLAN August 2007



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## EXECUTIVE SUMMARY

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The City of Dacono is a growing Front Range community with a current population of 4,100 people. The City's Comprehensive Plan shows a final build-out population of 56,600 people. Like other Colorado Front Range municipalities, Dacono is faced with the challenges of meeting water demands associated with its large anticipated growth. Currently, the City relies on the Colorado Big Thompson (CBT) project for all of its raw water.

The City's water is treated by Central Weld County Water District (CWCWD). CWCWD has a water treatment plant at the base of Carter Lake. Dacono transfers its CBT to CWCWD on an annual basis for CWCWD to treat and deliver. Dacono and CWCWD entered into an agreement in 1987 for CWCWD to be the water provider for the City. The first term of the agreement is for 20 years with automatic ten-year renewals. The contract will renew in November 2007 for a ten-year period. CWCWD treats and delivers water to Master meters located at various points surrounding City limits. CWCWD is responsible for delivering water through its infrastructure, which it owns, operates and maintains, up to the Master meters. After the Master meters, the City is responsible for operating and maintaining its distribution system to its customers.

### **Water Master Plan Objective**

Being solely reliant on CBT makes Dacono "one-dimensional" with its water portfolio. The goal of this Water Master Plan is to provide the City's decision makers with the information and education needed to make sound decisions associated with its water portfolio to best position the City for its future. This Water Master Plan is not designed to be strict and narrow, but flexible with the ability to evolve and adjust as the City grows. This plan was developed to give the City a framework on how to move forward... a starting point. Because this plan is flexible, the key is to start. The City will have the opportunity to adapt policies as it grows. The bulk of NISP funding will be due at the start of construction, which is currently estimated at 2010. We do not have much time to act.

### **Key Findings and Recommendations**

1. The City should switch from a 100% CBT dedication policy to an 80% CBT-20% Cash-In-Lieu policy in 2008. This new policy will help the City to generate \$1.1 million by 2010 and \$9.8 million by 2030 to assist in the payment of its 1,300 ac-ft in NISP, which is currently estimated at \$13.1 million.
2. Under the 80% CBT-20% CIL policy, Dacono will have sufficient water supplies through 2039. There will be a 1,291 ac-ft water supply to demand deficit in 2050.

3. Dacono should begin accepting Lower Boulder Ditch, Coalridge Ditch, and FRICO-Standley water on a case-by-case basis. This water can be used for non-potable irrigation and can be treated for potable use in the future should the City construct a local water treatment facility. Use of these water supplies for irrigation is more efficient and will extend the life of the City's potable supplies.
4. Dacono should also consider NT wells on a case-by-case basis. This water can be used up to 98% extinction. Concerns of water quality and cost to pump and maintain this water should be addressed prior to accepting this water supply source.
5. To address the 1,291 ac-ft deficit, the City can: 1) acquire new supplies, 2) convert to non-potable water sources for irrigation, and/or 3) implement water conservation. Because the State currently has grant monies available for water conservation planning and implementation, water conservation is the best opportunity for Dacono to meet some of this deficit.

### Target Water Portfolio

Table ES.1 – Water Portfolio Shift

Year	CBT (units)	NISP (ac-ft)
2006	1,748	0
2015	2,756	1,300
2050	4,137	1,300

### Water Master Plan Update

The City is on the cusp of much anticipated growth. As this growth occurs and progress toward a new water portfolio is monitored, this plan will need to be revised. It is recommended that the City update this Water Master Plan in five years.

## CHAPTER 1 – INTRODUCTION

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The City of Dacono is a fast-growing community located southeast of the intersection of I-25 and Hwy 52. Figure 1.1 shows the general location of the City and its growth boundary. The City's current population is estimated at 4,100 people. The build-out City limits will extend four miles south of Hwy 52 to Weld County Road 6 and six miles east of I-25 to Weld County Road 21. It is projected in the City's Comprehensive Plan that the population will reach 56,600 people.

Like other Colorado Front Range municipalities, Dacono is faced with the challenges of meeting water demands associated with its large anticipated growth. The completion of E-470 and Denver International Airport has provided access to the City from the south, which is contributing to growth in the region. The high demand for water to meet this growth is causing water to become less available and more expensive with time. Dacono has completed this Water Master Plan to provide clear direction for proactive water acquisitions and water policies. This plan will assist City Council and staff to make sound decisions for the City's future.

Dacono's sole source of water supply is Colorado Big Thompson (CBT) water. CBT water originates in the Colorado River Basin in Lake Granby. Lake Granby, Grand Lake and Shadow Mountain Reservoir provide storage in the CBT system prior to delivery through the Adam's Tunnel to the east slope at Estes Park. Water in Estes Park is delivered to several Front Range reservoirs to serve the needs of many irrigators, municipalities and water districts. With only CBT in the City's water portfolio, the City is very "one-dimensional" and must target a water portfolio that is more diverse.

The City's water is treated by Central Weld County Water District (CWCWD). CWCWD has a water treatment plant (WTP) at the base of Carter Lake. Carter Lake receives CBT water after it leaves Estes Park. Dacono and CWCWD entered into an agreement in 1987 for CWCWD to be the water provider for the City. The first term of the agreement is for 20 years with automatic ten-year renewals. The contract will renew in November 2007 for a ten-year period. CWCWD treats and delivers water to Master meters located at various points surrounding City limits. CWCWD is responsible for delivering water through its infrastructure, which it owns, operates and maintains, up to the Master meters. After the Master meters, the City is responsible for operating and maintaining its distribution system to its customers.

CWCWD treats water for several water providers including the City of Dacono and the Towns of Firestone, Frederick, La Salle, Milliken, Kersey, and Gilcrest. Like these other entities, Dacono owns the CBT water it uses and transfers its CBT water to CWCWD on an annual basis through Northern Colorado Water

Figure 1.1



Conservancy District (NCWCD) for CWCWD to treat and deliver to the Master meters serving the City.

The agreement between Dacono and CWCWD states that CWCWD is the exclusive water provider to the City and has a clause which limits Dacono's water deliveries to a 10% increase from the average minimum flow over the previous three years. The City needs to be aware that should CWCWD enforce this clause, the City will not be able to grow at more than 10% per year. These conditions limit the flexibility and alternatives for the City to grow and develop a water portfolio that makes sense for its future. In the short term, as Dacono experiences a much higher rate of growth, this restriction could be problematic. With CWCWD as the exclusive water provider, Dacono is limited to water sources that can be treated in CWCWD's system, unless Dacono builds its own water treatment facility like the Town of Milliken. Potable supplies that are treatable at CWCWD's WTP are CBT, Windy Gap and/or Northern Integrated Supply Project (NISP) water. Thus, unless CWCWD or Dacono develops the ability to treat other water supplies, Dacono's water sources are limited.

The CWCWD-Dacono agreement requires the City to transfer CBT equal to 120% of the City's water usage the previous year plus additional water to meet anticipated growth. This requirement places a burden on Dacono's water supplies. Although Dacono owns the water, the 20% loss factor prevents the City from committing it to future water demands. As the City's demand grows, the amount of water associated with the 20% loss factor grows and thus more and more water becomes "tied up." The City continues to carry this 20% from year to year, and in essence, cannot use a portion of its water supplies under this requirement.

This Water Master Plan had to consider these limitations. In order to successfully develop a plan that the City can achieve, this plan must work within the confines of CWCWD's system and the agreement between the City and CWCWD.

## CHAPTER 2 – DEFINITION OF TERMS

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<i>Acre-foot:</i>	The amount of water it would take to cover one acre of land to a depth of one foot; approximately 325,851 gallons.
<i>Augmentation:</i>	One-for-one replacement of water to the stream system for groundwater that is consumptively used. Well pumping from shallow wells requires augmentation.
<i>CBT:</i>	Colorado Big Thompson
<i>CDOLA:</i>	Colorado Department of Local Affairs
<i>Consumptive Use:</i>	The portion of a water supply that is completely used and thus not returned to the river system.
<i>CWCB:</i>	Colorado Water Conservation Board
<i>CWCWD:</i>	Central Weld County Water District, the entity who treats and delivers water to Master meters surrounding the City.
<i>CWRPDA:</i>	Colorado Water Resources and Power Development Authority
<i>NCWCD:</i>	Northern Colorado Water Conservancy District
<i>NISP:</i>	Northern Integrated Supply Project
<i>Non-tributary Groundwater:</i>	Water that is not hydraulically connected to the river system. Use of this water does not require augmentation and can be used to 98% extinction. Dawson, Denver, Arapahoe, and Laramie-Fox Hills aquifers supply non-tributary groundwater.
<i>Not Non-Tributary Groundwater:</i>	Deep groundwater that is hydraulically connected to the river system. Use of this water requires augmentation. Depletions associated with use of this water have extremely delayed impacts. Portions of the Dawson, Denver, Arapahoe, and Laramie-Fox

Hills aquifers supply not non-tributary groundwater.

*SFE:* Single Family Equivalent, unit of measure used in planning to adjust water use for multi-family dwellings, such as townhomes or condominiums, to a single residential equivalent.

*Tributary Groundwater:* Water that is hydraulically connected to the river system. Use of this water requires augmentation.

*Windy Gap:* Windy Gap water is delivered through the CBT system. It shares CBT infrastructure and storage.

*WTP:* Water Treatment Plant

## CHAPTER 3 – WATER DEMAND PROJECTIONS

The City currently has two customer categories by which it tracks its water usage, Residential and Commercial. Projections were completed within each of these categories through 2050. As the City grows, it will be beneficial to begin tracking additional categories of water use, particularly parks and open space which is currently included within Commercial.

### Residential Water Demand

To properly assess future water demands for the Residential customer category, it is first necessary to conduct an analysis of historical and projected population growth. Colorado Department of Local Affairs (CDOLA) data was used for population projections. CDOLA uses Census data as well as research performed by the State Demographer's Office to estimate populations of municipalities throughout Colorado. City staff was also consulted regarding the population estimates.

The City anticipates significant growth over the next several years with the rate leveling off in the future. To project the population, a 6% growth rate is used in 2007, 8% in 2008, and 10% through 2010 with the rate eventually leveling off at 3%. A long-term growth rate of 3% fits within expected growth for the region.

Based on 2000-2005 residential water usage and actual number of residential taps measured by the City, Dacono has an average persons-per-tap ratio of 2.7. The historical water use, in ac-ft per Single Family Equivalent (SFE), is shown in the table below.

**Table 3.1 – Past Water Use per SFE**

Year	Estimated Population	No. of SFE	Persons Per SFE	Per SFE Water Use (ac-ft/SFE)
2000	3015	1104	2.7	0.31
2001	3162	1126	2.8	0.30
2002	3167	1145	2.8	0.37
2003	3193	1190	2.7	0.25
2004	3309	1248	2.7	0.25
2005	3408	1342	2.5	0.24
		Average	2.7	0.29

Most planners expect a persons-per-tap ratio between 2.5 and 2.9, so the City's data matches well with industry-standard planning values. Accordingly, to project future water demands for the Residential customer category, 2.7 persons per tap is used. The 2.7 persons-per-tap ratio reflects the new development occurring within Dacono and is anticipated to be representative of the City's future

single-family homes. This is slightly higher than the 2.5 persons per tap used in the City's Comprehensive Plan, but will better suit the purposes of this study.

In addition, the water use per SFE is an important planning value. The generally expected range of water use for most new developments is 0.5 to 0.6 ac-ft per SFE. This is based on a standard home with approximately 4,000 square feet of lawn and water-saving devices used throughout the home.

The past water usage for the City averages 0.3 ac-ft per SFE. Although 0.3 ac-ft is much lower than the expected range, City staff believes this number is accurate due to existing portions of the City where indoor and outdoor water usage is less than typical. Many of the current residential lots within the City are small with little or no outdoor irrigation. With the proposed new developments, however, it is anticipated that this average use per SFE will increase. New development will bring additional standard homes into the City with more typical outdoor irrigation. To project Residential water demand, the water use per SFE is increased over time. More specifically, a water use of 0.35 ac-ft per SFE is used through 2008, 0.45 ac-ft per SFE for 2009 and 2010, and 0.5 ac-ft per SFE beyond 2010.

The water use projections for Residential are shown in Table 3.2. Residential water demand is anticipated to reach 3,794 ac-ft by 2050. This is an increase of approximately 3,300 ac-ft from current use.

**Table 3.2 – Projected Residential Water Demand**

Year	Estimated Population	Population Growth Rate (%)	Persons Per SFE	No. of SFE's	Per SFE Water Use (ac-ft/SFE)	Residential Water Usage (MG)	Residential Water Usage (ac-ft)
2006	3893	5.8%	2.7	1442	0.35	164.4	505
2007	4127	6.0%	2.7	1528	0.35	174.3	535
2008	4457	8.0%	2.7	1651	0.35	188.3	578
2009	4902	10.0%	2.7	1816	0.45	266.2	817
2010	5393	10.0%	2.7	1997	0.45	292.9	899
2011	5824	8.0%	2.7	2157	0.50	351.4	1,079
2012	6290	8.0%	2.7	2330	0.50	379.6	1,165
2013	6604	5.0%	2.7	2446	0.50	398.5	1,223
2014	6935	5.0%	2.7	2568	0.50	418.5	1,284
2015	7281	5.0%	2.7	2697	0.50	439.4	1,348
2016	7500	3.0%	2.7	2778	0.50	452.6	1,389
2017	7725	3.0%	2.7	2861	0.50	466.1	1,431
2018	7957	3.0%	2.7	2947	0.50	480.1	1,473
2019	8195	3.0%	2.7	3035	0.50	494.5	1,518
2020	8441	3.0%	2.7	3126	0.50	509.4	1,563
2021	8694	3.0%	2.7	3220	0.50	524.6	1,610
2022	8955	3.0%	2.7	3317	0.50	540.4	1,658
2023	9224	3.0%	2.7	3416	0.50	556.6	1,708
2024	9501	3.0%	2.7	3519	0.50	573.3	1,759
2025	9786	3.0%	2.7	3624	0.50	590.5	1,812
2026	10079	3.0%	2.7	3733	0.50	608.2	1,867
2027	10382	3.0%	2.7	3845	0.50	626.5	1,923
2028	10693	3.0%	2.7	3960	0.50	645.2	1,980
2029	11014	3.0%	2.7	4079	0.50	664.6	2,040
2030	11344	3.0%	2.7	4202	0.50	684.5	2,101
2031	11685	3.0%	2.7	4328	0.50	705.1	2,164
2032	12035	3.0%	2.7	4457	0.50	726.2	2,229
2033	12396	3.0%	2.7	4591	0.50	748.0	2,296
2034	12768	3.0%	2.7	4729	0.50	770.5	2,364
2035	13151	3.0%	2.7	4871	0.50	793.6	2,435
2036	13546	3.0%	2.7	5017	0.50	817.4	2,508
2037	13952	3.0%	2.7	5167	0.50	841.9	2,584
2038	14370	3.0%	2.7	5322	0.50	867.2	2,661
2039	14802	3.0%	2.7	5482	0.50	893.2	2,741
2040	15246	3.0%	2.7	5647	0.50	920.0	2,823
2041	15703	3.0%	2.7	5816	0.50	947.6	2,908
2042	16174	3.0%	2.7	5990	0.50	976.0	2,995
2043	16659	3.0%	2.7	6170	0.50	1,005.3	3,085
2044	17159	3.0%	2.7	6355	0.50	1,035.4	3,178
2045	17674	3.0%	2.7	6546	0.50	1,066.5	3,273
2046	18204	3.0%	2.7	6742	0.50	1,098.5	3,371
2047	18750	3.0%	2.7	6945	0.50	1,131.4	3,472
2048	19313	3.0%	2.7	7153	0.50	1,165.4	3,576
2049	19892	3.0%	2.7	7367	0.50	1,200.3	3,684
2050	20489	3.0%	2.7	7588	0.50	1,236.4	3,794

## Commercial Water Demand

In order to project Commercial water usage, data from 2000-2005 was analyzed. Most of the commercial water users currently within the City are low-use customers, i.e. industrial users and warehouse commercial. In the future, it is anticipated that Dacono will attract higher water use commercial such as restaurants and car washes. Furthermore, as stated earlier, park and open space irrigation is currently included within the Commercial customer category. Due to this, it is extremely difficult to project water use for future parks and open space. The following table summarizes the Commercial water usage for this time period.

**Table 3.3 – Past Commercial Water Use per Tap**

Year	Commercial Water Usage (gal)	No. of Commercial Taps	Commercial Per Tap Usage (gal/tap)
2000	6,600,000	33	200,000
2001	9,500,000	34	279,412
2002	9,700,000	37	262,162
2003	8,800,000	38	231,579
2004	10,900,000	39	279,487
2005	15,000,000	47	319,149

As the City grows, the commercial water usage per tap will increase due to the addition of higher use commercial and parks and open space areas. For projecting water use in this category, it is assumed that the City will develop five new taps per year. As can be seen in Table 3.4, the per-tap water usage is increased gradually to one million gallons of use per tap from the current average of 260,000 gallons. This increase is due to the additional per-tap usage from park and open space irrigation. It will be important for the City to immediately develop two new customer categories within its accounting system, one for Parks and one for Open Space.

Projecting park and open space water use on a per-tap basis is not ideal due to varying sizes of irrigated area. This water use can be more accurately projected using a per-acre water demand. By tracking the water use for parks and open space separate from commercial use, future updates of this Water Master Plan can more accurately project water demand. However, for the purposes of this study, Commercial water demand is anticipated to reach 829 ac-ft by 2050. This is an increase of nearly 800 ac-ft from current commercial use.

**Table 3.4 – Projected Commercial Water Demand**

Year	No. of Commercial Taps	Commercial Per Tap Usage (gal/tap)	Commercial Water Usage (MG)	Commercial Water Usage (ac-ft)
2006	50	260,000	13.0	40
2007	55	260,000	14.3	44
2008	60	260,000	15.6	48
2009	65	300,000	19.5	60
2010	70	300,000	21.0	64
2011	75	340,000	25.5	78
2012	80	340,000	27.2	83
2013	85	340,000	28.9	89
2014	90	340,000	30.6	94
2015	95	450,000	42.8	131
2016	100	450,000	45.0	138
2017	105	450,000	47.3	145
2018	110	450,000	49.5	152
2019	115	450,000	51.8	159
2020	120	450,000	54.0	166
2021	125	600,000	75.0	230
2022	130	600,000	78.0	239
2023	135	600,000	81.0	249
2024	140	600,000	84.0	258
2025	145	600,000	87.0	267
2026	150	750,000	112.5	345
2027	155	750,000	116.3	357
2028	160	750,000	120.0	368
2029	165	750,000	123.8	380
2030	170	750,000	127.5	391
2031	175	1,000,000	175.0	537
2032	180	1,000,000	180.0	552
2033	185	1,000,000	185.0	568
2034	190	1,000,000	190.0	583
2035	195	1,000,000	195.0	598
2036	200	1,000,000	200.0	614
2037	205	1,000,000	205.0	629
2038	210	1,000,000	210.0	644
2039	215	1,000,000	215.0	660
2040	220	1,000,000	220.0	675
2041	225	1,000,000	225.0	690
2042	230	1,000,000	230.0	706
2043	235	1,000,000	235.0	721
2044	240	1,000,000	240.0	737
2045	245	1,000,000	245.0	752
2046	250	1,000,000	250.0	767
2047	255	1,000,000	255.0	783
2048	260	1,000,000	260.0	798
2049	265	1,000,000	265.0	813
2050	270	1,000,000	270.0	829



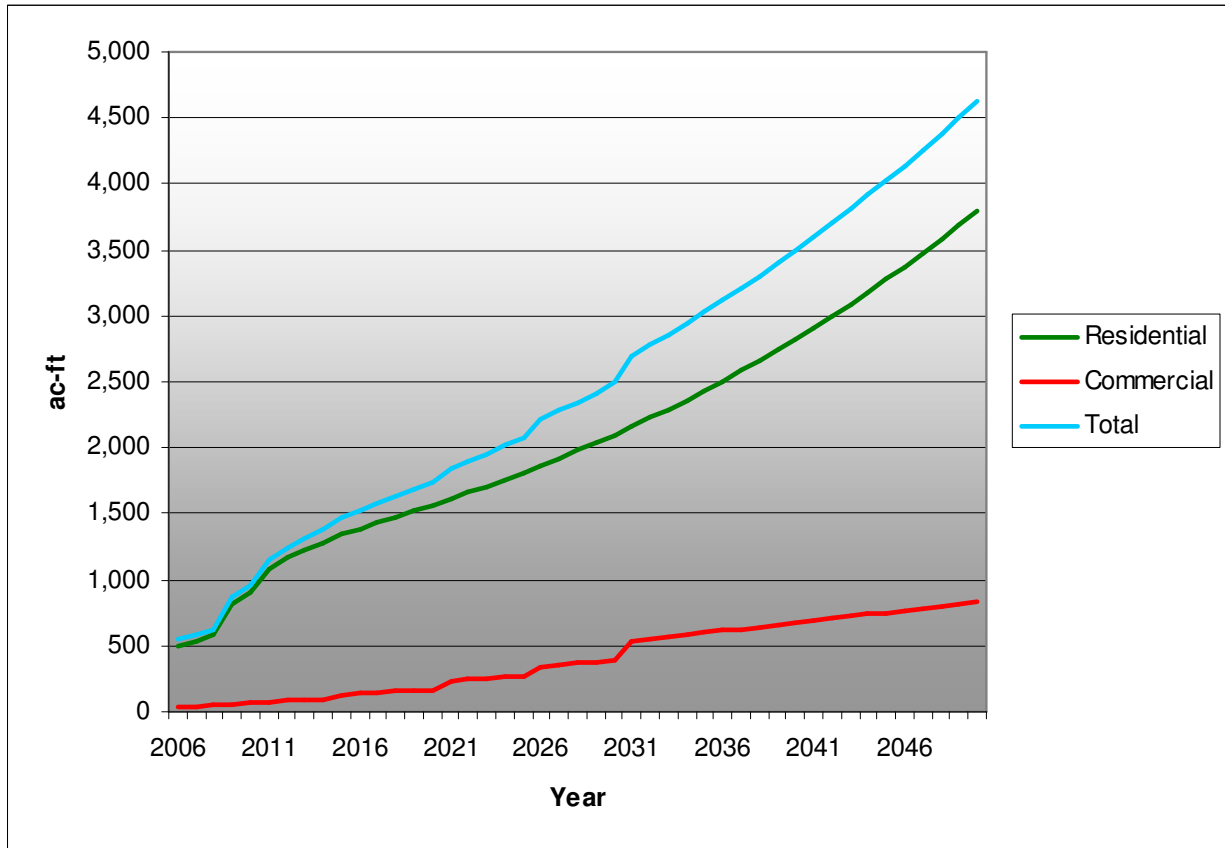
The total projected water demand for the City of Dacono is summarized below.

**Table 3.5 – Total Projected Water Demand**

Year	Residential (ac-ft)	Commercial (ac-ft)	Total (ac-ft)
2006	505	40	545
2007	535	44	579
2008	578	48	626
2009	817	60	877
2010	899	64	963
2011	1,079	78	1,157
2012	1,165	83	1,248
2013	1,223	89	1,312
2014	1,284	94	1,378
2015	1,348	131	1,480
2016	1,389	138	1,527
2017	1,431	145	1,576
2018	1,473	152	1,625
2019	1,518	159	1,676
2020	1,563	166	1,729
2021	1,610	230	1,840
2022	1,658	239	1,898
2023	1,708	249	1,957
2024	1,759	258	2,017
2025	1,812	267	2,079
2026	1,867	345	2,212
2027	1,923	357	2,279
2028	1,980	368	2,348
2029	2,040	380	2,419
2030	2,101	391	2,492
2031	2,164	537	2,701
2032	2,229	552	2,781
2033	2,296	568	2,863
2034	2,364	583	2,948
2035	2,435	598	3,034
2036	2,508	614	3,122
2037	2,584	629	3,213
2038	2,661	644	3,306
2039	2,741	660	3,401
2040	2,823	675	3,498
2041	2,908	690	3,598
2042	2,995	706	3,701
2043	3,085	721	3,806
2044	3,178	737	3,914
2045	3,273	752	4,025
2046	3,371	767	4,138
2047	3,472	783	4,255
2048	3,576	798	4,374
2049	3,684	813	4,497
2050	3,794	829	4,623

The total projected water demand for the City is expected to reach 4,623 ac-ft by 2050. This is an increase of nearly 4,100 ac-ft from current demand. Figure 3.1 graphically displays the City's projected future water demand.

**Figure 3.1 – Total Projected Water Demand**



The City's Comprehensive Plan projects a build-out population of 56,600 people. Using this population, combined with anticipated commercial, industrial, parks, and open space growth, we project the total build-out water demand for the City of Dacono to reach 12,000 ac-ft.

## CHAPTER 4 – CURRENT WATER SUPPLY

### CBT Water

The City currently owns 1,748 units of CBT, which is its only source of water. Over the years, Dacono has received more CBT water through dedication than allowed by NCWCD regulations. Resolution D-962-02-95 from NCWCD deals with limitations of ownership issues and is summarized as follows:

*For municipalities and domestic water purveyors, the limitation on unit ownership will be calculated and determined as the lesser of the following:*

1. *(Demand x 2) – (Average Yield of Native Supplies) = Max. No. of CBT Units Allowed to be Owned*

*or*

2. *(Demand) – (Firm Yield of Native Water Supplies) = Max. Volume of Firm Yield CBT Water Allowed to be Owned*

*The maximum number of CBT units allowed to be owned shall be determined by dividing the volume of CBT water allowed to be owned by 0.5 for variable-quota contracts and 0.7 for fixed-quota contracts*

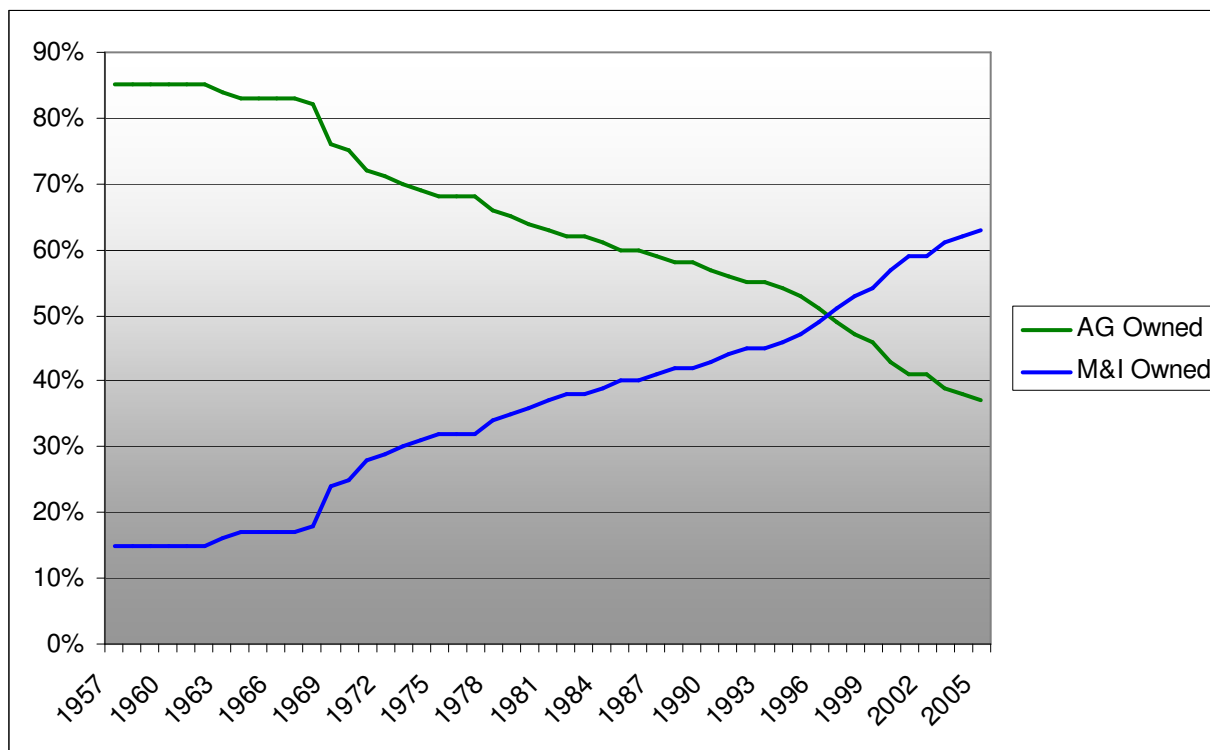
*Demand is based on a 10-year average of per-tap usage times the total number of taps currently supplied and taps committed to supply in the future.*

This Resolution was established to preserve the CBT system and prevent speculative purchases of its water. The CBT system was originally designed as a supplemental supply to native water rights with agriculture as the primary user. The quota was established based on water demand. In a dry year when water demands are high, the quota would be set higher, up to 100%. In a wet year, when native supplies are plentiful and demands are low, the quota would be set lower, i.e. 50%. The years 2002 and 2003 were an exception when, for the first time in the system's history, the quota was set based on limited supply.

Because Dacono has exceeded its CBT ownership per the above Resolution, the City is "capped" and cannot purchase additional CBT supplies through the open market. Therefore, the City must rely on CBT acquisition through dedication from new development. This NCWCD requirement puts a burden on the City to figure out other sources of domestic supply since it cannot purchase additional CBT water.

CBT water is in great demand and is converting from agricultural use to municipal/industrial (M&I) use rapidly. In the late 1950's, CBT ownership was 85% agricultural owned and 15% M&I owned. Today, the estimated ownership is 65% M&I and 35% agricultural. The chart below shows the ownership transition.

**Figure 4.1 – CBT Ownership Transition**



Because of this transition, the market for CBT water has become very competitive. Dacono must be prepared with other sources of water when CBT is no longer available.

### **NISP Participation**

The City originally signed up to participate in 1,000 ac-ft of NISP. NCWCD began the National Environmental Policy Act (NEPA) permitting process with 40,000 ac-ft. The 40,000 ac-ft consisted of both yield and firming storage. The viability of the firming storage component was challenged, and at this point during the process, the NISP project was converted to solely a yield project versus a yield plus firming storage project. The volume of water requested by all participants at this time was 31,000 ac-ft. By this time, NCWCD was deep into the permitting process for 40,000 ac-ft. NCWCD asked participants if they would increase their participation by a prorata amount to keep the project at 40,000 ac-ft. Thus, Dacono's participation in NISP has increased to 1,300 ac-ft.

The anticipated schedule for NISP is preliminary and difficult to predict. For the purposes of this study, it is estimated that NISP delivery will begin in 2015. The current

cost of NISP is estimated at \$10,100 per ac-ft. Thus, the total cost for the City's 1,300 ac-ft is \$13.1 million. NISP will consist of two reservoirs, Glade and Galeton. Construction of Glade Reservoir is anticipated to begin in 2010 or 2011. A substantial amount of the total project cost will be due at this time.

### Water Dedication Policy

The City of Dacono accepts 100% CBT dedication for the raw water requirement associated with new development. The City uses a water demand spreadsheet model to determine the amount of CBT dedication required for each proposed development. This water demand model factors in parameters such as lawn size, type and level of landscaping, household water-use fixtures, Dacono system loss, and the 20% loss factor to CWCWD. Water use demands are estimated for the development, and using a 0.5 ac-ft per CBT unit, the total number of CBT units required to be dedicated is determined.

### Current Water Supply vs. Demand

The City currently owns 1,748 units of CBT. In an average CBT quota year, which is 70%, the City has sufficient water supplies to meet its demand. Receiving 0.7 ac-ft per CBT unit in most years provides Dacono with excess supplies, which it leases to other users on an annual basis.

The following table shows the current water supply versus demand for the City with varying levels of CBT quota.

**Table 4.1 – Water Supply vs. Demand Under Varying CBT Quota Scenarios**

	70% Quota Scenario		60% Quota Scenario		50% Quota Scenario	
CBT Ownership =	1,748	units	1,748	units	1,748	Units
CBT Quota =	0.7	ac-ft per unit	0.6	ac-ft per unit	0.5	ac-ft per unit
CBT Water (ac-ft) =	1,224	ac-ft	1,049	ac-ft	874	ac-ft
Current Water Demand =	545	ac-ft	545	ac-ft	545	ac-ft
Current Water Demand + 20% of Previous Year =	649	ac-ft	649	ac-ft	649	ac-ft
Remaining CBT w/o Carryover =	575	ac-ft	400	ac-ft	225	ac-ft
CBT Carryover =	350	ac-ft	350	ac-ft	203	ac-ft
Remaining CBT w/ Carryover =	924	ac-ft	749	ac-ft	428	ac-ft

As can be seen, the City has more supplies than water demand under the various quota scenarios. This is due to the fact that some developments have pre-dedicated CBT supplies to the City before their water demands have occurred. As these developments are constructed, this excess will gradually be used. At some point in the future, the City will need to consider how to safeguard itself from a severe drought situation as in 2002.

Several consecutive 50% quota years would put the City in a potential water shortage situation.

A strategy to protect the City against a drought is through NCWCD's Carryover Program. The amount of carryover allowed for the City is the lesser of 1) 90% of its October 31<sup>st</sup> quota account or 2) 20% of CBT ownership. As can be seen in Table 4.1, CBT carryover provides additional supplies and security should an unforeseen drought occur. If Dacono pays for its carryover and in mid-summer the City decides that it does not need it, the City can lease its excess supplies to recover the money, or it will be reimbursed through the new Regional Pool Program established by NCWCD. The Regional Pool Program puts the unused CBT in the "carryover bucket" within the CBT system on the open market for lease. Any proceeds generated through this program will be prorated and sent to CBT Allottees that paid for their carryover water that particular year. The City will likely manage a higher rate if it leases its excess supplies on its own. By renting its excess CBT to interested third parties, the City can avoid "paying twice" for the water. If managed correctly, this is a little or no-cost water insurance policy for Dacono and an effective measure against drought.

## CHAPTER 5 – POTENTIAL NEW SOURCES OF SUPPLY

The 1987 Water Supply Agreement between Dacono and CWCWD specifies that CWCWD is the sole water provider for the City. Due to this clause in the Agreement, the City is limited to only those sources of water that CWCWD is able to treat at its Carter Lake water treatment facility. The current sources listed in the 1987 Agreement are CBT and Windy Gap, although the City has received verbal confirmation that NISP water is suitable. However, since CWCWD provides water for many rapidly growing municipalities including Dacono, there will be continued pressure on CWCWD to investigate other options to provide water outside of the CBT system and eventually upgrade its WTP to treat other sources of water.

The sources of water analyzed in this plan may potentially suit Dacono's needs, but some are not currently feasible due to: 1) location of the source, 2) unavailability of the source, and 3) overall cost to acquire and use the water source. Unless the City constructs a local WTP, which currently is not feasible, these rights cannot be used for potable uses. However, the potential sources of water investigated could be used for non-potable irrigation of parks and open space areas. Non-potable irrigation could significantly extend the life of the City's existing potable supplies, and thus should be considered as part of Dacono's water portfolio. However, only senior water rights should be considered for irrigation. Senior water rights that have a firm dry-year yield can be relied upon as a substitute to potable water for irrigation.

### **Lower Boulder Ditch**

The Lower Boulder Ditch is a mutual ditch company with preferred shares and common shares. The preferred shares are very senior. Its headgate is on Boulder Creek in Section 16, Township 1N, Range 69W in the 6<sup>th</sup> P.M. in Boulder County. The ditch has 200 preferred shares and 200 common shares under six different priorities. Its most senior priorities are 10-1-1859, 5-1-1863 and 2-1-1865. The preferred shares yield 23.1 ac-ft per share, and the common shares yield 7.7 ac-ft per share on average. Lower Boulder Ditch Company owns 440 units of CBT, which it uses to supplement deliveries for its common shares. Even with these supplemental deliveries, the common shares are very junior and do not yield in a dry year.

The current cost of Lower Boulder Ditch is \$190,000 for preferred shares and \$30,000 for common shares. This equates to \$8,300 and \$3,900 per ac-ft, respectively.

The Lower Boulder Ditch crosses I-25 approximately 3,500 feet north of Hwy 52. The ditch runs south and crosses Hwy 52 into Dacono's growth boundary before

turning due north near County Road 11. Lower Boulder can be used for non-potable uses as it is very senior. However, since the lands within Dacono are above the ditch, irrigation with this water will require pumping and a change of use in Water Court.

### Advantages

- Lower Boulder preferred shares are very senior, and thus suitable for non-potable irrigation.
- The ditch runs very close to City limits, so use of the water is feasible.
- The cost per ac-ft of the preferred shares is cheaper than the other local ditch systems.

### Disadvantages

- Use for non-potable irrigation will require pumping and a change of place of use in Water Court since lands within City limits are above the ditch and thus not historically irrigated with Lower Boulder water.

### Recommendation

Due to the location of the Lower Boulder Ditch, it is not recommended that the City actively pursue this water right at this time. However, the City should evaluate accepting this water through dedication if the opportunity presents itself. This water is a reliable supply that is suitable for irrigation and can be treated for potable use should Dacono construct a water treatment facility in the future.

## **FRICO-Standley Water**

The Standley Ditch carries Farmers Reservoir and Irrigation Company (FRICO) water. The ditch originates at Standley Lake in Section 21, Township 2S, Range 69W in the 6<sup>th</sup> P.M. in Jefferson County. There are 2,000 shares in the FRICO-Standley system with an average yield of 6.5 ac-ft per share. This ditch is senior with priority dates of 4-15-1877 and 3-4-1902. FRICO-Standley water costs approximately \$80,000 per share or \$12,300 per ac-ft. This water right is approximately 85% municipal owned and in very high demand, which is reflected in the price per share. Its availability is limited.

The FRICO-Standley water flows from Standley Lake through Standley Ditch in the northeasterly direction to the City. The ditch bisects the build-out City limits, which makes its location ideal for non-potable irrigation. There currently are areas within Dacono, namely Clem DuFour Park, that with minimal infrastructure could be irrigated with FRICO-Standley water. In order to irrigate with this water right, FRICO approval must be obtained. In addition, potential irrigation of future lands above the ditch will require pumping and a change of place of use in Water Court.



### Advantages

- FRICO-Standley water is very senior, and thus suitable for non-potable irrigation.
- FRICO-Standley water has a storage component, which provides reliability of delivery.
- The ditch runs through City limits, so use of the water for irrigation of parks and open space would be simple.
- There are some lands below the ditch that can be converted from potable irrigation to FRICO-Standley irrigation simply without Water Court.

### Disadvantages

- Use for non-potable irrigation may require pumping and a change of place of use in Water Court since a portion of the lands within City limits are above the ditch and thus not historically irrigated with FRICO-Standley water.
- This water costs approximately \$80,000 per share or \$12,300 per ac-ft. This is expensive water to use for irrigation.

### Recommendation

The City should accept FRICO-Standley water for raw water dedication as the water becomes available through lands annexing into Dacono. The City should not actively pursue this water for purchase at this time due to the cost. However, acquiring the water helps to diversify the City's water portfolio. Due to the cost of this water and the limited availability, the City currently has better options for water acquisition. It is recommended that the City only acquire FRICO-Standley water through annexation. This is a very low-risk water supply as there is high demand for this water in the event Dacono should need to sell. In addition, this water right can be treated for potable use should the City ever construct its own local water treatment facility.

### **Coalridge Ditch**

The Coalridge Ditch water right shares the Lower Boulder Ditch. Deliveries associated with the Coalridge water right are measured in Section 25, Township 2N, Range 68W in the 6<sup>th</sup> P.M. in Weld County. Coalridge Ditch owns 48 preferred shares of Lower Boulder. It does not own any other water rights or priorities. There are 2,100 shares in the Coalridge Ditch. The shares cost approximately \$3,000 each and yield 0.5 ac-ft per share.

### Advantages

- This water right is relatively inexpensive at \$6,000 per ac-ft.
- Since Coalridge diverts under the Lower Boulder priority, it is senior and suitable for non-potable irrigation.

### Disadvantages

- Use for non-potable irrigation will require pumping and a change of place of use in Water Court since lands within City limits are above the ditch and thus not historically irrigated with the Coalridge Ditch water right.

### Recommendation

The City should not actively pursue Coalridge Ditch water rights at this time. However, the City should evaluate accepting this water through dedication if the opportunity presents itself. This right is cheaper than the other options and is suitable for non-potable irrigation. In addition, this water is reliable and can be treated for potable use should Dacono construct a water treatment facility in the future.

### **Windy Gap**

Windy Gap water is delivered through the CBT system infrastructure, and thus can be delivered to Carter Lake and treated by CWCWD. Windy Gap water is junior to CBT. If water in CBT storage spills, Windy Gap water spills first. NCWCD is in the permitting process to construct Windy Gap firming storage. Although several alternatives are being evaluated, Chimney Hollow Reservoir near Carter Lake is the preferred alternative.

The true benefit of Windy Gap, once it is firming, is that the water is fully consumable and thus can be used and reused to extinction. Similar to CBT, Windy Gap water is sold in units. One unit of Windy Gap equals 100 ac-ft. The estimated price of Windy Gap is \$8,500 per ac-ft un-firmed. Firming storage may add an additional \$10,000 per ac-ft.

### Advantages

- This water is fully consumable.
- Windy Gap is delivered through the CBT system and is a source that CWCWD can readily treat and deliver to the City.

### Disadvantages

- Until firming storage is constructed, this water right is vulnerable to CBT system spills.
- There are uncertainties with the project, which may affect the final yield of Windy Gap units.

### Recommendation

Windy Gap is a good future alternative for the City. The water right shares the CBT delivery system and can readily be treated by CWCWD. However, until the City has a

need for the reusable component of Windy Gap, the City should not pursue this water right. This water right certainly can be considered if an opportunity presents itself, but is too expensive for the City to pursue in the open market.

### **Shallow Groundwater Wells**

From the standpoint of flexibility, shallow groundwater wells are ideal for non-potable irrigation. Wells can be operated on demand and are not tied to the normal seasonal fluctuations of surface water rights. The downside to well use is power costs from pumping and use of groundwater requires augmentation. Augmentation is the one-for-one replacement back to the stream for every gallon of water that is pumped and consumptively used.

#### Advantages

- Irrigation from wells provides the most flexibility.

#### Disadvantages

- Groundwater from shallow wells is considered tributary, so use of it will require an augmentation plan and Water Court.
- Water quality concerns have been raised regarding use of the shallow groundwater in the area for irrigation without pretreatment.
- This source of water is expensive as compared to using surface water rights.

#### Recommendation

At Dacono's current size, it is recommended that the City avoid well use and augmentation at this time. Augmentation is expensive because it requires Water Court and the purchase of water rights and storage. Although non-potable irrigation from shallow wells is ideal for operational flexibility, the augmentation requirement makes this option unfeasible at this time. In the future, the City could consider drilling shallow wells throughout the City for irrigation and augment with Windy Gap water and other local water rights. A benefit-cost analysis would need to be completed for this alternative to determine long-term viability for Dacono. At this time there are better alternatives for the City, and thus well use for non-potable irrigation should not be considered further.

### **Deep Groundwater Wells**

The deep groundwater underlying the City is limited in both production rate and total volume. Most of the groundwater is classified as not non-tributary (NNT). NNT water is hydraulically connected to the river system, but impacts from pumping NNT water are much more delayed than with tributary water. NNT augmentation obligations from well pumping may extend hundreds of years into the future from pumping today.

The available NNT water below the City is from both the Lower Arapahoe and Laramie Fox Hills aquifers. This water is located at approximately 600-800 feet below the ground surface on the western portion of the City and 150-300 feet below the ground surface on the eastern portion of the City. Pumping NNT water is not feasible due to the cost of pumping the deep water and the long-term impacts to the river system. In addition, drilling wells into these deep sources is expensive.

There is a limited amount of non-tributary (NT) groundwater located on the eastern and southeastern portions of build-out City limits. The small amount of NT water is borne from the Laramie Fox Hills aquifer and is located approximately 800-900 feet below the ground surface. NT water is different than NNT in that it is hydraulically separated from the surface water system. NT water can be used up to 98% extinction without augmentation. The State allocates NT water based on a 100-year aquifer life, so it is a finite resource.

### Advantages

- Irrigation from wells provides flexibility.
- NT groundwater can be used and reused to 98% extinction.

### Disadvantages

- NNT water requires augmentation for hundreds of years into the future for pumping today.
- NT and NNT sources are deep, and the cost to drill wells into these formations are expensive.
- Both sources have limited production capability, yielding 15-20 gpm on average and a maximum of 50 gpm.
- Pumping these sources of water is expensive for non-potable irrigation.
- NT groundwater is a finite water source, so should only be used as a supplemental supply.

### Recommendation

NNT groundwater will never be a good option for the City due to the augmentation obligations and should not be considered. NT groundwater is a potential option for non-potable irrigation. The City should not drill its own NT wells, but can consider them on a case-by-case basis through annexation. Water quality analysis should be required by the developer prior to any NT well acquisition. NT water is deep and can be expensive to pump for irrigation.

## CHAPTER 6 – ALTERNATIVES ANALYSIS

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Since it is not feasible for the City to construct a local water treatment facility at this time, potable supplies for the City are currently limited to those CWCWD can treat – CBT, Windy Gap and NISP. An alternatives analysis was completed to address:

1. Which water rights will the City target for potable water?
2. How much NISP should the City participate in?
3. How can the City pay for its NISP participation?

This alternatives analysis considers the City's current NISP participation of 1,300 ac-ft and also provides a plan to ensure that growth pays for itself.

### **Anticipated CBT Acquisition with Current Policies**

CBT is transitioning from agricultural to M&I ownership at approximately one percent per year. It is difficult to project when CBT will no longer be available, particularly in the context of other regional water projects such as Windy Gap firming and NISP. These projects may take some pressure off of the current CBT demand, thus slowing the rate CBT shifts from agricultural to M&I. It is anticipated that there will be a small portion of CBT that will permanently remain in agriculture. Projections indicate that available CBT will be in M&I ownership by 2028 to 2030. For purposes of this analysis, it is assumed that CBT will be available until 2030.

The following table shows the anticipated new CBT units that the City would acquire through annexation under its current policy of 100% CBT dedication and an average of 0.9 CBT units per residential tap. The 0.9 CBT unit average is a reasonable illustration of current acquisition according to City staff.

**Table 6.1 – Estimated New CBT Acquisition with Average of 0.9 CBT Units per Tap**

Year	Residential				Commercial				Total New CBT Units
	Total Taps	Additional Taps	CBT Units Per Tap	New CBT Units	Total Ac-ft	Additional Ac-ft	CBT Quota	New CBT Units	
2006	1442				40				
2007	1528	87	0.9	78	44	4	0.7	6	84
2008	1651	209	0.9	188	48	8	0.7	11	199
2009	1816	374	0.9	336	60	20	0.7	28	365
2010	1997	555	0.9	500	64	25	0.7	35	535
2011	2157	715	0.9	644	78	38	0.7	55	698
2012	2330	888	0.9	799	83	44	0.7	62	861
2013	2446	1004	0.9	904	89	49	0.7	70	974
2014	2568	1127	0.9	1014	94	54	0.7	77	1091
2015	2697	1255	0.9	1129	131	91	0.7	130	1260
2016	2778	1336	0.9	1202	138	98	0.7	140	1343
2017	2861	1419	0.9	1277	145	105	0.7	150	1427
2018	2947	1505	0.9	1355	152	112	0.7	160	1515
2019	3035	1593	0.9	1434	159	119	0.7	170	1604
2020	3126	1684	0.9	1516	166	126	0.7	180	1696
2021	3220	1778	0.9	1600	230	190	0.7	272	1872
2022	3317	1875	0.9	1687	239	199	0.7	285	1972
2023	3416	1974	0.9	1777	249	209	0.7	298	2075
2024	3519	2077	0.9	1869	258	218	0.7	311	2180
2025	3624	2182	0.9	1964	267	227	0.7	324	2289
2026	3733	2291	0.9	2062	345	305	0.7	436	2498
2027	3845	2403	0.9	2163	357	317	0.7	453	2616
2028	3960	2519	0.9	2267	368	328	0.7	469	2736
2029	4079	2637	0.9	2374	380	340	0.7	486	2859
2030	4202	2760	0.9	2484	391	351	0.7	502	2986

Table 6.1 quantifies the total number of new residential taps increased from 1,442 in 2006. These were taken from Table 3.2. Based on these numbers, it is anticipated that the City will obtain 2,484 new CBT units from residential development by 2030.

For commercial use, the ac-ft increase per year was calculated based on data quantified in Table 3.4. Using 0.7 ac-ft per CBT unit, the total additional CBT units acquired from commercial development is estimated at 502 new units by 2030. Although a 60% quota is used for planning purposes for this study, using 70% in this case is conservative because it will not overestimate CBT acquisition from commercial development.

The total anticipated number of new CBT units to be obtained by the City through annexation is 2,986 units.

### **Alternatives Analysis**

The City of Dacono's dedication policy accepts CBT to meet raw water requirements, and thus CBT is the City's only source of water. To fund water acquisition such as NISP, a system was developed which considered the existing water portfolio and dedication policy. Various blends of CBT dedication and cash-in-lieu (CIL) of water were evaluated:

- Alternative A – 100% CBT Dedication and 0% CIL
- Alternative B – 80% CBT Dedication and 20% CIL
- Alternative C – 70% CBT Dedication and 30% CIL

Under each alternative, a 50% CBT quota plus 10% carryover is evaluated. Per the NCWCD Annual Carryover Program Procedures,

*The Board and District staff will review the advantages and consequences of the Annual Carryover Program on a continuing basis. While the Board recognizes the Program's benefit to many CBT Allottees, it may modify or discontinue the Annual Carryover Program at any time.*

Considering this procedure, a 50% planning quota would be the most conservative. However, this plan is developed with the position that this Carryover Program is much too valuable to the CBT Allottees, and NCWCD will do everything it can to keep the program intact. On an annual basis the City is allowed to carryover up to 20%, so including 10% firm carryover is reasonable. Thus, a 60% planning quota (50% quota and 10% firm carryover) is used for this study.

As CBT becomes less available, the increased demand should drive up the price. This future price, however, is extremely difficult to predict. This is in part due to the uncertainty of how much pressure projects such as NISP and Windy Gap will take off of the CBT system. It is assumed that the price of CBT will remain constant at \$10,500 through 2015. After 2015, the price of CBT is escalated at 3% per year. The CIL

program for Alternatives B and C are estimated to begin in 2008. The City's CIL price should be set near the price of CBT. It can be set slightly higher due to simplifying the process for developers, i.e. developers do not have to find, purchase and bring CBT to the City.

Currently, CWCWD requires the City to dedicate anticipated current year water use plus 20% of the previous year's water use. The City has approached CWCWD about reducing this amount to 10%, which is a much more reasonable loss factor. For this alternatives analysis, we keep this requirement at 20% until 2008 and reduce it to 10% beginning in 2009, which staff concurred was a good approach.

#### Alternative A – 100% CBT Dedication and 0% CIL

This alternative is the “do nothing” or baseline alternative. At the 60% quota under this scenario, Dacono has sufficient supplies to meet water demands past 2030. Since no money will be generated through CIL, the City must find other funding under this alternative to finance NISP.

Table 6.2 shows the projections of CBT acquisition at the current average of 0.9 units of CBT per residential unit.



**Table 6.2 – Alternative A – 100% CBT Dedication, 0% CIL**

Year	Total Water Usage (ac-ft)	Additional Dedication to CWCWD (ac-ft)	Total CBT Dedication to CWCWD (ac-ft)	100% CBT Dedication					
				Estimated CBT Ownership (units)	Planning Quota (ac-ft/unit)	CBT Water (ac-ft)	CBT Carryover (ac-ft)	Total CBT w/Carryover (ac-ft)	Cash-In Lieu (\$)
2006	545	104	649	1,748	0.5	874	175	1049	
2007	579	109	688	1,832	0.5	916	183	1099	\$0
2008	626	116	741	1,947	0.5	974	195	1168	\$0
2009	877	63	939	2,113	0.5	1056	211	1268	\$0
2010	963	88	1051	2,283	0.5	1141	228	1370	\$0
2011	1157	96	1253	2,446	0.5	1223	245	1468	\$0
2012	1248	116	1364	2,609	0.5	1305	261	1566	\$0
2013	1312	125	1437	2,722	0.5	1361	272	1633	\$0
2014	1378	131	1509	2,839	0.5	1420	284	1703	\$0
2015	1480	138	1617	3,008	0.5	1504	301	1805	\$0
2016	1527	148	1675	3,091	0.5	1545	309	1854	\$0
2017	1576	153	1728	3,175	0.5	1588	318	1905	\$0
2018	1625	158	1783	3,263	0.5	1631	326	1958	\$0
2019	1676	163	1839	3,352	0.5	1676	335	2011	\$0
2020	1729	168	1897	3,444	0.5	1722	344	2066	\$0
2021	1840	173	2013	3,620	0.5	1810	362	2172	\$0
2022	1898	184	2082	3,720	0.5	1860	372	2232	\$0
2023	1957	190	2146	3,823	0.5	1912	382	2294	\$0
2024	2017	196	2213	3,928	0.5	1964	393	2357	\$0
2025	2079	202	2281	4,037	0.5	2018	404	2422	\$0
2026	2212	208	2420	4,246	0.5	2123	425	2548	\$0
2027	2279	221	2500	4,364	0.5	2182	436	2618	\$0
2028	2348	228	2576	4,484	0.5	2242	448	2690	\$0
2029	2419	235	2654	4,607	0.5	2304	461	2764	\$0
2030	2492	242	2734	4,734	0.5	2367	473	2840	\$0

As shown, it is anticipated that the City will own a total of 4,734 units of CBT by 2030 under a 100% dedication policy.

The City has a policy in which it can evaluate the actual water usage at a development and assess additional water dedication if the actual water usage exceeds the original CBT dedication. Most of the developments within Dacono are new with limited historical water use data. Once the City is able to evaluate actual usage at these new developments and compare the demand to the original CBT dedication, it can better evaluate its dedication policy and revise the water demand model as necessary.

#### Alternative B – 80% CBT Dedication and 20% CIL

Alternative B considers a blend of CBT dedication and CIL to generate income for NISP participation. This alternative allows developers to dedicate 80% of raw water requirements as CBT and the remaining 20% as cash. The following table shows the details of this alternative.

**Table 6.3 – Alternative B – 80% CBT Dedication, 20% CIL**

Year	Total CBT Dedication to CWCWD (ac-ft)	Alternative B - 80% CBT Dedication					Cash-In Lieu (\$)
		Estimated CBT Ownership (units)	Planning Quota (%)	CBT Water (ac-ft)	CBT Carryover (ac-ft)	Total CBT w/Carryover (ac-ft)	
2006	649	1,748	0.5	874	175	1049	\$0
2007	688	1,832	0.5	916	183	1099	\$0
2008	741	1,907	0.5	954	191	1144	\$418,532
2009	939	2,040	0.5	1020	204	1224	\$766,407
2010	1051	2,176	0.5	1088	218	1306	\$1,123,384
2011	1253	2,307	0.5	1153	231	1384	\$1,466,800
2012	1364	2,437	0.5	1218	244	1462	\$1,808,597
2013	1437	2,527	0.5	1263	253	1516	\$2,044,396
2014	1509	2,621	0.5	1310	262	1573	\$2,291,203
2015	1617	2,756	0.5	1378	276	1654	\$2,645,777
2016	1675	2,822	0.5	1411	282	1693	\$2,903,984
2017	1728	2,890	0.5	1445	289	1734	\$3,180,168
2018	1783	2,960	0.5	1480	296	1776	\$3,475,473
2019	1839	3,031	0.5	1516	303	1819	\$3,791,111
2020	1897	3,105	0.5	1552	310	1863	\$4,128,371
2021	2013	3,246	0.5	1623	325	1947	\$4,694,742
2022	2082	3,326	0.5	1663	333	1996	\$5,094,106
2023	2146	3,408	0.5	1704	341	2045	\$5,520,145
2024	2213	3,492	0.5	1746	349	2095	\$5,974,523
2025	2281	3,579	0.5	1789	358	2147	\$6,459,005
2026	2420	3,747	0.5	1873	375	2248	\$7,262,208
2027	2500	3,840	0.5	1920	384	2304	\$7,831,079
2028	2576	3,937	0.5	1968	394	2362	\$8,436,871
2029	2654	4,035	0.5	2018	404	2421	\$9,081,855
2030	2734	4,137	0.5	2068	414	2482	\$9,768,440

Notes:

Assumes available CBT in M&I ownership by 2030.

Assumes deliveries from NISP will begin in 2015.

= Last year in which water supply is sufficient to meet water demand

Under Alternative B, Year 2017 is the last year in which the City’s water supply is sufficient to cover the City’s water demand, including the additional loss dedication required by CWCWD. This alternative generates approximately \$1.1 million by 2010 and \$9.8 million by 2030 to provide capital for the City to fund a portion of NISP. Deliveries from NISP are anticipated to begin in 2015. Alternative B provides additional cash and enough water supplies to meet demands until NISP is online.

The following graph shows the City’s water situation under Alternative B.

**Figure 6.1 – Water Supply vs. Water Demand Under Alternative B – 80% CBT Dedication, 20% CIL**

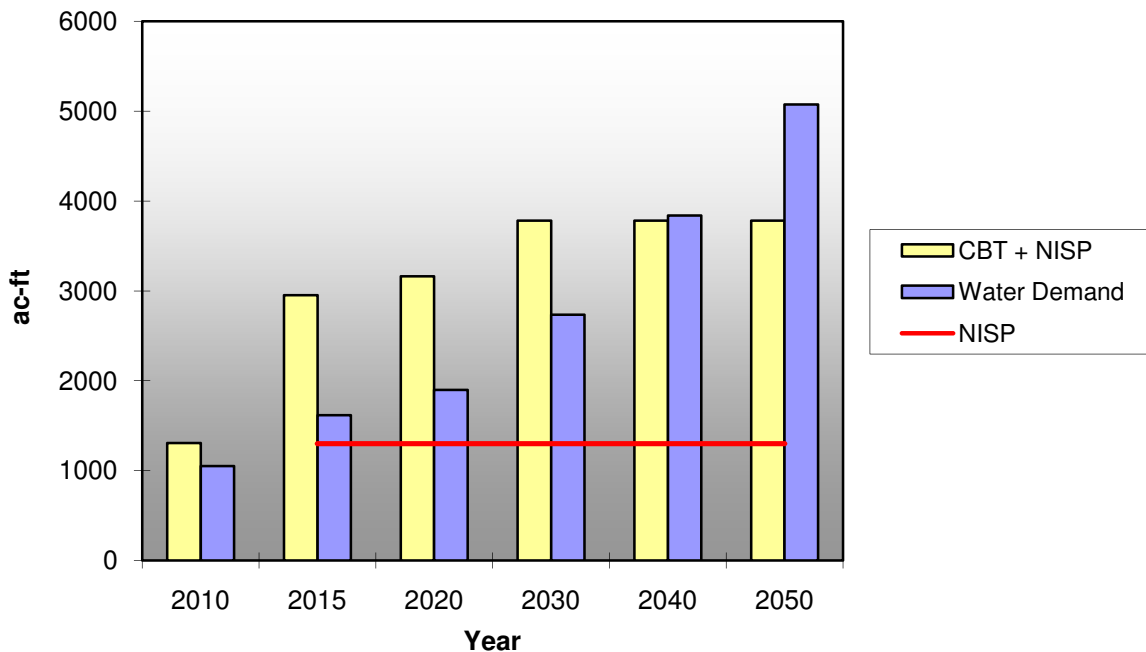


Figure 6.1 illustrates that with 1,300 ac-ft of NISP participation and an 80% CBT-20% CIL dedication policy, the City will have sufficient water supplies through 2039. In 2050, the water demand is 5,073 ac-ft and the total supply is 3,782 ac-ft. A new source of supply will be required to account for this 1,291 ac-ft deficit. This can be met by a combination of water conservation, water supply acquisition or substitution of non-potable sources for uses currently met by potable supplies.

Since construction of NISP will begin in 2010 or 2011, the \$1.1 million generated under this alternative by 2010 will assist the City with required payments.

**Alternative C – 70% CBT Dedication and 30% CIL**

Like Alternative B, Alternative C is a blend of CBT and CIL for the City’s water dedication policy. Alternative C examines a more aggressive CIL policy, 70% CBT dedication and 30% CIL. Table 6.4 shows this alternative.

**Table 6.4 – Alternative C – 70% CBT Dedication, 30% CIL**

Year	Total CBT Dedication to CWCWD (ac-ft)	Alternative C - 70% CBT Dedication					
		Estimated CBT Ownership (units)	Planning Quota (%)	CBT Water (ac-ft)	CBT Carryover (ac-ft)	Total CBT w/Carryover (ac-ft)	Cash-In Lieu (\$)
2006	649	1,748	0.5	874	175	1049	\$0
2007	688	1,832	0.5	916	183	1099	\$0
2008	741	1,888	0.5	944	189	1133	\$627,798
2009	939	2,003	0.5	1002	200	1202	\$1,149,611
2010	1051	2,122	0.5	1061	212	1273	\$1,685,075
2011	1253	2,237	0.5	1118	224	1342	\$2,200,200
2012	1364	2,351	0.5	1175	235	1411	\$2,712,895
2013	1437	2,429	0.5	1215	243	1458	\$3,066,594
2014	1509	2,512	0.5	1256	251	1507	\$3,436,804
2015	1617	2,630	0.5	1315	263	1578	\$3,968,666
2016	1675	2,688	0.5	1344	269	1613	\$4,355,975
2017	1728	2,747	0.5	1374	275	1648	\$4,770,252
2018	1783	2,808	0.5	1404	281	1685	\$5,213,209
2019	1839	2,871	0.5	1435	287	1722	\$5,686,666
2020	1897	2,935	0.5	1468	294	1761	\$6,192,556
2021	2013	3,059	0.5	1529	306	1835	\$7,042,113
2022	2082	3,129	0.5	1564	313	1877	\$7,641,159
2023	2146	3,201	0.5	1600	320	1920	\$8,280,218
2024	2213	3,274	0.5	1637	327	1965	\$8,961,785
2025	2281	3,350	0.5	1675	335	2010	\$9,688,508
2026	2420	3,497	0.5	1748	350	2098	\$10,893,312
2027	2500	3,579	0.5	1789	358	2147	\$11,746,618
2028	2576	3,663	0.5	1832	366	2198	\$12,655,306
2029	2654	3,749	0.5	1875	375	2250	\$13,622,782
2030	2734	3,838	0.5	1919	384	2303	\$14,652,660

Notes:

Assumes available CBT in M&I ownership by 2030.

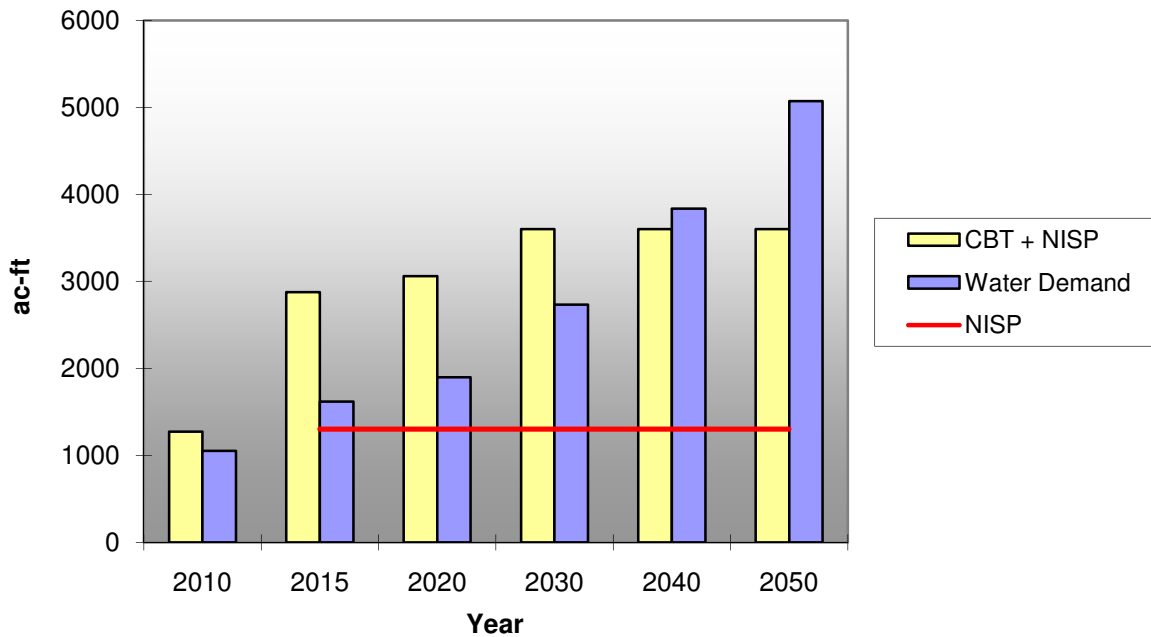
Assumes deliveries from NISP will begin in 2015.

= Last year in which water supply is sufficient to meet water demand

As shown in Table 6.4, the water supplies are sufficient to cover water demand through 2014. Alternative C generates approximately \$1.7 million by 2010 and \$14.7 million by 2030.

Figure 6.2 outlines the City’s water situation under Alternative C.

**Figure 6.2 – Water Supply vs. Water Demand Under Alternative C – 70% CBT Dedication, 30% CIL**



If the City participates in 1,300 ac-ft of NISP, Alternative C will have sufficient supplies through 2037. The total water demand in 2050 is 5,073 ac-ft and the supply is 3,603 ac-ft. A new water supply will be needed to address this 1,470 ac-ft deficit. This can be met by a combination of water conservation, water supply acquisition or substitution of non-potable sources for uses currently met by potable supplies.

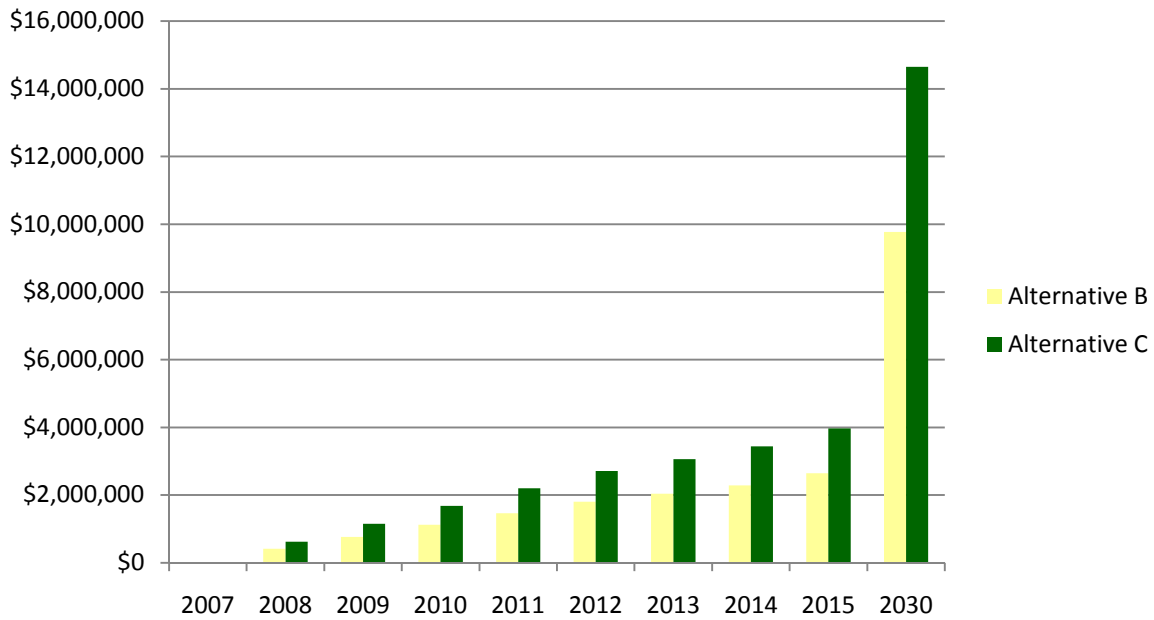
Although this alternative generates more cash to pay for NISP, the downside is water supplies are short of demands in 2014. Assuming NISP water is not available for delivery until 2015, there is a one-year gap that needs to be met.

### Cash Generated from Alternatives B and C

Alternative B and C are strategies to generate cash through dedication to assist with the funding of NISP. Current cost estimates for NISP are \$10,100 per ac-ft. The City’s participation in 1,300 ac-ft will cost \$13.1 million.

Assuming available CBT is M&I owned by 2030, the following figure shows the total potential revenue generated under each alternative.

**Figure 6.3 – Cash Generated Under Alternative B vs. Alternative C**



Alternative C, the more aggressive CIL policy, generates sufficient revenue to pay for the City’s NISP participation by 2030. However, the potential water shortage between 2014 and 2015 makes this alternative risky to implement. The City must be conservative to ensure a blended CBT and CIL policy does not cause water shortage issues until NISP is online and delivering full yields.

## CHAPTER 7 – RECOMMENDED ALTERNATIVE

As stated earlier, the average of 0.9 units of CBT per residential tap is sufficient for growth to pay for itself through 2030. The City should continue to monitor its raw water requirement to ensure the level of dedication is adequate to meet water demands and revise the model as necessary. CBT is a finite resource that is in very high demand, so we want to obtain sufficient supplies while it is still available. The success of this master plan relies on a sufficient water dedication model.

### Comparison of Alternatives

**Table 7.1 – Comparison of Alternatives B and C**

Alternative Scenarios	B	C
	80% CBT/20% CIL	70% CBT/30% CIL
Dedication Policy	0.9 ac-ft per tap average	
Year CBT meets demand	2017	2014
Year CBT and NISP meets demand	2039	2037
NISP participation	1,300	1,300
2050 water deficit	1,291	1,470
Money generated in 2010	\$1,123,384	\$1,685,075
Money generated in 2030	\$9,768,440	\$14,652,660

### Recommended Alternative

Alternative B is the recommended alternative. It provides sufficient supplies for the City until NISP is online. A more aggressive policy can be evaluated in future updates of this Master Plan.

### New Water Dedication Policy

The City should change its water dedication policy to an 80% CBT and 20% CIL versus 100% CBT in 2008. Most developers may prefer bringing CIL as it is typically easier than finding and purchasing CBT. However, there will be developments proposed within the City where the developer already owns CBT. This policy should remain flexible in that some developments are allowed to bring all CBT and others all cash. That said, City staff will need to closely monitor dedication to ensure that the City is maintaining an 80% CBT-20% CIL balance as it collects raw water dedication. It will be important that this ratio be maintained, so water supply shortages are not created while the City is generating cash for water acquisition.



## CHAPTER 8 – WATER PORTFOLIO SHIFT AND REVENUE REQUIREMENTS

As shown in the previous chapter, the recommended alternative predicts an estimated 1,291 ac-ft deficit in 2050. This deficit can be met in a variety of ways including additional water purchase, water conservation and/or shifting to irrigation with non-potable supplies. Each of these strategies is discussed below.

### **Additional Water Purchase**

Since CWCWD has exclusive rights to provide water to the City of Dacono, future water supplies are limited to those CWCWD has the ability to treat. The current contract between CWCWD and the City lists CBT and/or Windy Gap as the only supplies that can be conveyed on an annual basis to meet Dacono's water needs, although the City has received verbal confirmation that NISP will qualify as an adequate supply source.

The City's current water portfolio is 1,748 units of CBT and 1,300 ac-ft of NISP. Although Windy Gap is a potential new water supply alternative, its value is the 100% reuse component. Until the City has a need for the successive uses of Windy Gap water, this water right should not be purchased for the City's portfolio. However, this water right can be evaluated if a developer presents it for raw water dedication. Furthermore, the City has too much invested in the CWCWD system and cannot move to other water sources to serve potable needs at this point. Thus, CBT and NISP are the best continued water sources for Dacono.

To make up the 1,291 ac-ft deficit of water supply versus demand by 2050, the City should consider increasing its participation in NISP. By increasing its NISP participation, Dacono can secure additional supplies while they are still available at a reasonable cost. The current cost of NISP is estimated at \$10,100 per ac-ft. Even if the final costs increase to \$12,000 per ac-ft, this is still the cheapest water supply source for the City considering the cost of water and capital invested in CWCWD's infrastructure.

At this point in the NISP permitting, Dacono would have to purchase additional NISP participation through another existing participant. This can occur up to the commencement of construction, estimated at 2010 to 2011. It is anticipated that several entities will reduce their participation in NISP, so the City would be able to acquire additional water if it chooses.

### **Water Conservation**

The most practical funding sources for NISP participation include the Colorado Water Conservation Board (CWCB) or the Colorado Water Resources and Power Development Authority (CWRPDA) as these two entities have the most favorable interest rates for water-related projects. Dacono's total cost for NISP is

estimated at \$13.1 million. Shifting the City to an 80% CBT and 20% CIL policy will generate \$1.1 million by 2010 and \$9.8 million by 2030. Money collected from water rates may provide additional revenue for the City's NISP participation. However, the revenue shortfall will need to be borrowed.

CWCB requires any entity seeking financing from CWCB and/or CWRPDA to complete a State-approved water conservation plan. CWCB is offering grant money for entities to complete a water conservation plan per CWCB's guidelines. Grant money rules state that only *covered* entities can qualify for a grant to complete a water conservation plan. A *covered* entity is any entity that is or will soon be at an annual water demand of 2,000 ac-ft. However, the passing of recent legislation now makes the grant money available to all entities regardless of their annual water demand.

Without completing a water conservation plan, it is difficult to determine how much water can be saved by the City. However, any water savings from water conservation will extend the life of the City's existing potable water supplies. For example, if the City can save 10% through water conservation, it can reduce its demands over 500 ac-ft by 2050. This will delay the need for additional water purchases and reduce the Year 2050 water supply versus demand deficit of 1,291 ac-ft to 784 ac-ft. It is prudent for the City to do what it can to conserve water for itself and the region. In addition, with it being a prerequisite for State funding, completing a water conservation plan is a must.

### **Shift to Non-Potable Supplies**

Unfortunately, many of the local water supplies are junior, unavailable and/or very expensive. It is recommended that the City acquire Lower Boulder, Coalridge and FRICO-Standley water to irrigate parks and open space areas within the City. Because these water rights are expensive, the City should only consider acquisition of these rights through annexation versus purchasing the water in the open market at this time. In the future, these water rights may be considered for purchase, but their availability may be limited.

In addition, the City should consider NT groundwater on a case-by-case basis as it is made available through annexation. NT groundwater is a good source for non-potable irrigation, although production rate, water quality and pumping costs are a concern. These issues should be evaluated as this source is proposed with development.

## Target Water Portfolio

The City will make the following shift in its water portfolio.

**Table 8.1 – Water Portfolio Shift**

Year	CBT (units)	NISP (ac-ft)
2006	1,748	0
2015	2,756	1,300
2050	4,137	1,300

Irrigation water rights, Windy Gap and NT groundwater can be considered if proposed with new development.

## Revenue Requirements

Under Alternative B, the City of Dacono will generate \$1.1 million by 2010 and \$9.8 million by 2030. NISP is expected to cost \$13.1 million with the bulk of the money due in 2010. The City will need to finance up to \$12 million. Annualized payments for a loan of \$12 million are \$607,000 using a 3% interest rate over a 30-year term.

Table 8.2 shows the anticipated revenue generated each year and cumulative total under Alternative B.

**Table 8.2 – Annual Revenue Generated from CIL vs. Estimated Loan Payment for NISP**

Year	Cash-in Lieu (\$)	Estimated NISP Loan Payment (\$)
2006	\$0	
2007	\$0	
2008	\$418,532	
2009	\$347,875	
2010	\$356,976	\$607,110
2011	\$343,416	\$607,110
2012	\$341,797	\$607,110
2013	\$235,799	\$607,110
2014	\$246,807	\$607,110
2015	\$354,574	\$607,110
2016	\$258,206	\$607,110
2017	\$276,184	\$607,110
2018	\$295,305	\$607,110
2019	\$315,638	\$607,110
2020	\$337,260	\$607,110
2021	\$566,371	\$607,110
2022	\$399,364	\$607,110
2023	\$426,039	\$607,110
2024	\$454,378	\$607,110
2025	\$484,482	\$607,110
2026	\$803,203	\$607,110
2027	\$568,870	\$607,110
2028	\$605,792	\$607,110
2029	\$644,984	\$607,110
2030	\$686,585	\$607,110
<b>Total</b>	<b>\$9,768,440</b>	<b>\$12,749,310</b>

As shown, the annual revenue generated from the blended CBT-CIL policy will need to be supplemented with other revenue to cover the anticipated annualized cost to fund NISP. If the City begins this policy in 2008, it will generate approximately \$1.1 million over the next three years to help cover the payment shortfall in 2010. If the City maintains this dedication policy through 2030, the revenue generated pays \$9.8 million of the loan.

This is a very broad-brush financial analysis and shown to give Council and staff an idea of what the financial requirements associated with NISP will be and how the blended CBT-CIL policy will help to offset a portion of those requirements. Since the City is borrowing money for the project, actual cost will depend on the final interest rate and how aggressively the City pays down debt service as it grows and generates more revenue through water rates.

## CHAPTER 9 – CONCLUSIONS AND RECOMMENDATIONS

It is important for City Council and staff to have a clear understanding of the direction it will take regarding its water resources and policy. The conclusions and recommendations in this chapter will provide the needed steps that should be completed for successful implementation of the Water Master Plan. City Council and staff can be confident that the recommendations proposed in this plan will adequately cover the City's needs as it moves toward the future.

Following is a list summarizing the recommendations with this plan. The intent of this list is to provide the key decision makers an easy reference point upon which to guide the City by keeping the decision makers on the same page. This chapter should be referenced periodically to ensure the proper steps are taken for successful implementation.

1. **Shift water dedication policy from 100% CBT dedication to 80% CBT dedication and 20% CIL in 2008.** This dedication policy will allow the City to continue to collect sufficient CBT to meet growth while generating revenue to assist in the payment of NISP. The policy should remain flexible to allow some developers to dedicate 100% CBT or 100% CIL. However, City staff must carefully monitor this ratio to ensure water shortages are not created through insufficient CBT dedication as the City is collecting CIL for NISP. The 80% CBT-20% CIL should be maintained.
2. **Monitor raw water dedication.** The premise of this plan is that the City will collect sufficient water supplies to meet new development, which currently averages 0.9 units per residential tap. The water dedication model will need continual evaluation and monitoring to ensure it is predicting an adequate level of water dedication as the City grows.
3. **Complete a water conservation plan.** In order to qualify for the excellent funding currently available through CWCB and/or CWRPDA for NISP, CWCB requires the City to complete a State-approved water conservation plan. Recent legislation allows Dacono to apply for grant money to complete the water conservation plan. Not only will the State give grant money to complete the plan, it also has grant monies available for water conservation implementation. This program is a very good opportunity for the City to take advantage of grants to pay for water conservation. As identified in the plan, there is a 1,291 ac-ft deficit by 2050. Water conservation is the best way for the City to eliminate a portion of this deficit.
4. **Consider increasing participation in NISP.** The City should consider increasing its NISP participation. Under Alternative B with 1,300 ac-ft of NISP, the City has sufficient water to meet demands through 2039.

Although the cost of NISP is overwhelming, it is the best source of future water supply for Dacono at this time. The City should participate in as much NISP as it feels comfortable with under its current situation.

5. **Acquire Lower Boulder, Coalridge and FRICO-Standley water through annexation.** As lands historically irrigated with FRICO-Standley water annexes into the City, this water should be acquired. Standley Ditch runs through City limits and can be used for irrigation of parks and open space. In addition, Lower Boulder and Coalridge Ditch water should be considered through annexation. A shift to irrigation of parks and open space with ditch water will extend the life of the City's potable water supplies. These rights can also be treated for potable use if the City constructs its own WTP in the future, either individually or cooperatively with surrounding entities.
6. **Consider CBT carryover and rent additional supplies in the summer or fall if there is excess.** Within the next three years, the City should begin participating in the CBT carryover program. The City will grow into its current excess supplies and will face potential water shortages in an extended drought. The City should carry over its full entitlement each year to safeguard against drought. If the City has carried over CBT, and based on adequate weather conditions it has excess water, then the City can rent out its surplus CBT supplies late summer to recover the money spent on the Carryover Program. This is a low or no-cost insurance policy for the City to protect itself from an unforeseen drought.
7. **Complete a financial evaluation.** The shift to 20% CIL will generate some capital to fund a portion of the City's NISP participation. However, it is anticipated that the policy will generate \$9.8 million while the cost of NISP is \$13.1 million. Since a bulk of this \$13.1 million will be financed, the City should develop a plan to not only meet annualized loan payments, but to pay off the debt service as soon as practical.
8. **Negotiate CWCWD contract terms.** The terms of the agreement with CWCWD should be negotiated prior to renewal in November 2007.
9. **Adjust accounting system to record water use for additional customer categories.** As the City grows, it will be important to track water use in more customer categories. It is recommended that the City immediately begin tracking water use associated with Parks and Open Space in two additional categories. As the City begins to develop Multi-Family, this category should be included. The five customer categories that should be tracked are:
  - Residential
  - Commercial
  - Multi-Family
  - Parks

- Open Space

Although the City will not bill itself for the Parks category, tracking water usage associated with this customer class will be important in the management of its water portfolio.

- 10. Complete a non-potable master plan.** As the City acquires irrigation water rights and develops more parks and open space, it will be important to develop a system that can adequately meet the new proposed irrigation. A Non-Potable Master Plan will quantify the amount of irrigation that can be substituted with non-potable supplies and calculate the true benefit to the City's potable supplies and infrastructure.
- 11. Complete a feasibility study for construction of a peaking WTP.** Constructing a WTP is a potentially viable alternative for the City to consider regarding becoming less reliant on CWCWD. For example, a peaking plant could be used to meet increased system demands during the summer. With continual improvements in membrane technologies associated with water treatment, construction of WTP's are becoming more financially and operationally feasible. To reduce the City's debt load, the City could discuss potential partnering opportunities with surrounding municipalities and study the possible construction of a joint peaking plant to assist in addressing the water treatment needs of the region. This study will evaluate location and land costs, cost and timing of construction, permitting regulations, and brine disposal associated with backwashing. Completion of this study, in conjunction with this Water Master Plan, will determine the viability of this option for the City.

## **Water Master Plan Update**

The goal of this Water Master Plan is to provide the City's decision makers with the information and education needed to make sound decisions for the City's future. This Water Master Plan is not designed to be strict and narrow, but flexible with the ability to evolve and adjust as the City grows. This plan was developed to give the City a framework on how to move forward... a starting point. The City is on the cusp of much anticipated growth. As this growth occurs and progress toward a new water portfolio is monitored, this plan will need to be revised. It is recommended that the City update this Water Master Plan in five years.