



# TOWN OF FIRESTONE

## RAW WATER MASTER PLAN

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## EXECUTIVE SUMMARY

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Raw water planning is an important element for any water provider, especially for a Town growing as rapidly as Firestone. The Town of Firestone, at a current population of 8,300 people, is experiencing tremendous growth rates due to its location near the Denver area and the pleasant amenities that are being developed in Town. The Town's Comprehensive Plan shows a final build-out population of 51,451 people. Like other Colorado Front Range municipalities, Firestone is faced with the challenges of meeting water demands associated with its large growth. The Town has taken a positive step with this Raw Water Master Plan and should be commended for its proactiveness and foresight.

Currently, the Town relies on the Colorado Big Thompson (CBT) project for all of its raw water. The Town's water is treated by Central Weld County Water District (CWCWD). CWCWD has a water treatment plant at the base of Carter Lake. Firestone transfers its CBT to CWCWD on an annual basis for CWCWD to treat and deliver. Firestone and CWCWD entered into an agreement in 1974 for CWCWD to be the water provider for the Town. The first term of the agreement was for 20 years with automatic ten-year renewals. The contract was renewed for the second time in 2004. CWCWD treats and delivers water to master meters located at various points surrounding Town 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 Town is responsible for operating and maintaining its distribution system to its customers.

### **Water Master Plan Objective**

Firestone has completed several planning documents in the past. These reports include:

- 2007 Water Conservation Plan
- 2006 Comprehensive Plan
- 2003 Water Master Plan

This Raw Water Master Plan supplements these existing plans and was completed as consistently with these reports as possible.

Being solely reliant on CBT makes Firestone "one-dimensional" with its water portfolio. The goal of this Raw Water Master Plan is to provide the Town's decision makers with the information and education needed to make sound decisions associated with its water portfolio and water policy to best position the Town for its future. This Raw Water Master Plan is not designed to be strict and narrow, but flexible with the ability to evolve and adjust as the Town grows. This plan was developed to give the Town a framework on how to move forward... a

starting point. It is important that the Town begin implementing the recommendations from this plan in 2008. The Town will have opportunity to adapt policies as it grows. However, since a large portion of NISP will be due at the start of construction in 2010 or 2011, we need to start.

### Key Findings and Recommendations

1. The Town should switch from a 100% CBT dedication policy to a 75% CBT-25% Cash-In-Lieu (CIL) policy in 2008. This new policy will help the Town to generate \$3.5 million by 2010 and \$34.9 million by 2030 to assist in the annual loan payments and overall funding of the NISP project.
2. Under the 75% CBT-25% CIL policy, Firestone will have sufficient water supplies past 2050.
3. Firestone should increase its NISP participation from 1,300 ac-ft to 1,600 ac-ft. This coupled with water conservation and non-potable irrigation is projected to meet build-out water demands for the Town.
4. The Town should begin accepting Lower Boulder, Coalridge, Rural, and Godding Ditch through annexation for raw water dedication. The Town should consider budgeting money each year to acquire Lower Boulder and Coalridge rights in the open market. These water supplies can be used for non-potable irrigation and can be treated for potable use in the future should the Town construct a local water treatment facility. Use of these water supplies for irrigation is more efficient and will extend the life of the Town’s potable supplies and system.
5. Firestone should continue to maximize its CBT carryover each year.

### Target Water Portfolio

Table ES.1 – Water Portfolio Shift

Year	CBT (units)	NISP (ac-ft)	Lower Boulder Ditch (shares)	Coalridge Ditch (shares)	Rural Ditch (shares)	Godding Ditch (shares)
2007	4,605	1,300 (participation)				
2015	6,932	1,600	Up to 8	Up to 333	Up to 1.5	Up to 7
2050	9,423	1,600	Up to 39	Up to 1,786	Up to 8	Up to 33

### Water Master Plan Update

The Town is growing at a substantial rate and with this growth comes change. 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 Town update this Raw Water Master Plan in five years, unless the rapid growth calls for an update sooner.

## CHAPTER 1 – PURPOSE

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In 2006, the Town of Firestone contracted with Clear Water Solutions, Inc. to complete this Raw Water Master Plan. The purpose of the plan is to provide the Town with information that will assist Firestone in identifying a preferred direction for water policy as it relates to raw water development and acquisition. More specifically, this plan includes:

- Determination of current and future water demands
- Examination of existing and planned raw water sources and their availability to meet current and future demands
- Evaluation of the range of raw water supply sources available
- Alternatives for water dedication
- Investigation of financial implications of raw water development
- Recommendations for Town decision makers

This Raw Water Master Plan is different from other water plans the Town has completed in the past – it evaluates future water demands and the water supply options available to meet those demands for both potable and non-potable systems. The Water Master Plan completed by TST, Inc. Consulting Engineers in 2003 emphasized infrastructure capacity and needs of the Town’s water transmission and distribution systems. This Raw Water Master Plan is developed to supplement that plan, as well as the Town’s 2007 Water Conservation Plan, to provide overall guidance to the Town’s Board and staff regarding raw water acquisition and policy.

The goal of this Raw Water Master Plan is to develop a strategy for the Town in terms of its water supplies, so it can make sound decisions for its future. The plan is designed to be flexible and will need to be monitored, re-evaluated, and updated as the Town grows.

As we will discuss later in this report, the Town of Firestone is limited on the amount and source of potable water it can obtain. It is in light of these limitations that the Town is interested in further examining and assessing the opportunities that exist to meet its future potable and non-potable water demands.

From Town of Firestone, Comprehensive Master Plan (2006):

**“The Town is developing a Raw Water Master Plan to further assess the benefits of and assess implementation strategies for additional water supplies to serve the Town.”**



## CHAPTER 2 – BACKGROUND

The Town of Firestone is located east of the intersection of I-25 and Hwy 119. Figure 2.1 shows the general location of the Town. The Town is a rapidly growing community with a current population of approximately 8,300 people.

### **Current Sources of Water Supply**

Firestone'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. From there, water is distributed to several Front Range reservoirs. Carter Lake is one reservoir where Firestone's water is collected and then treated and delivered by CWCWD.

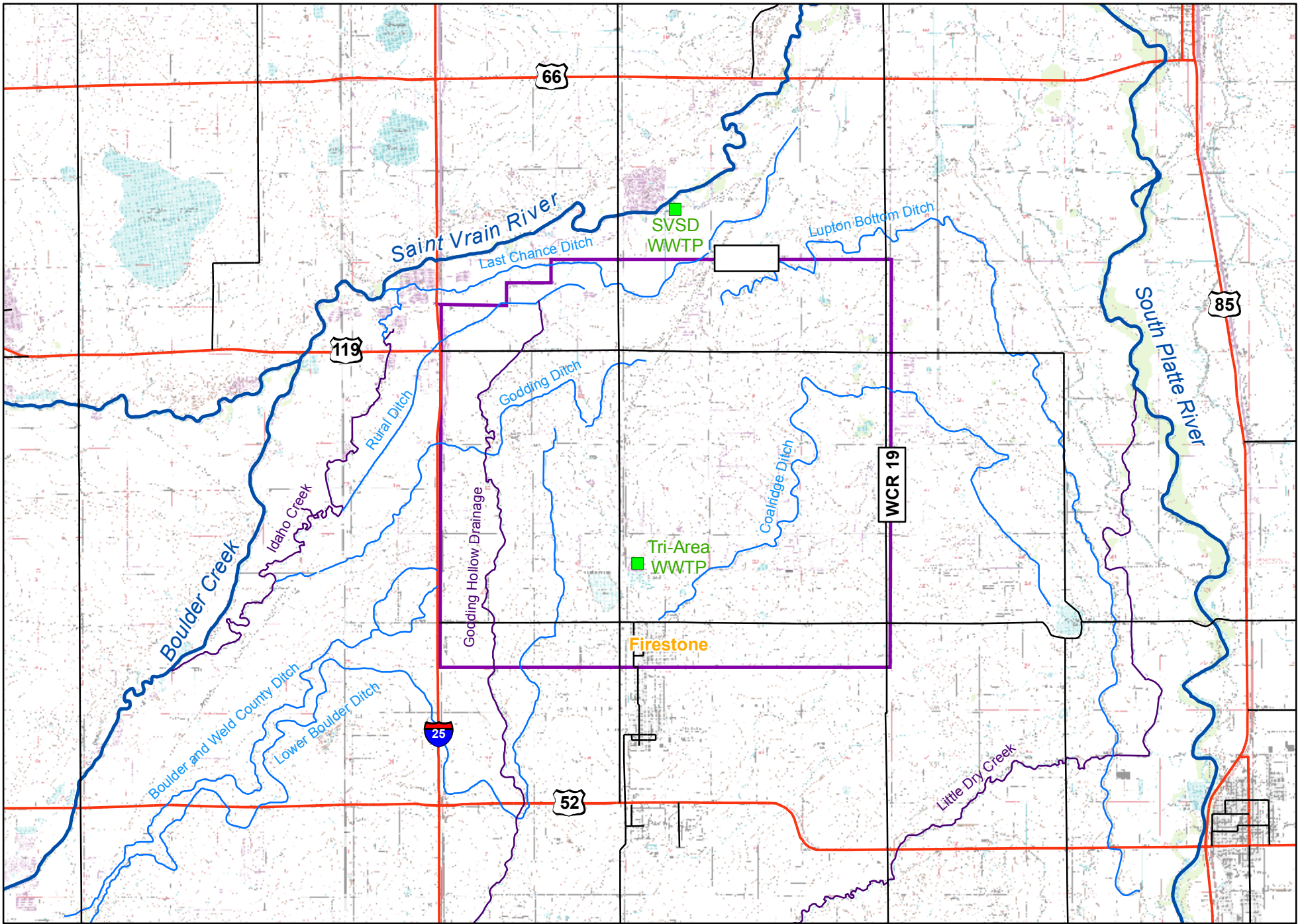
Currently, Firestone receives all its water supply from Central Weld County Water District (CWCWD) to meet residential, commercial and industrial potable uses as well as irrigation uses at residences, commercial areas, and public and private parks and open space.

Firestone and CWCWD entered into an agreement in 1974 for CWCWD to be the water provider for the Town. The agreement was entered for a 20-year term with automatic ten-year renewals. Firestone entered into its second ten-year term in 2004. CWCWD treats water for several water providers including the Town of Firestone and the Towns of La Salle, Milliken, Frederick, Kersey, and Gilcrest. Like these other entities, Firestone owns the CBT water it uses. Firestone transfers its CBT water to CWCWD on an annual basis for CWCWD to treat and deliver to the Town. CWCWD delivers Firestone's water through its infrastructure, which it owns, operates and maintains, to various master meters surrounding the Town limits. After the master meters, the Town is responsible for operating and maintaining its distribution system to its customers.

The agreement between Firestone and CWCWD states that:

1. CWCWD is the exclusive provider of potable water to Firestone
2. Firestone cannot grow more than 10% from the previous year
3. Firestone is required to transfer to CWCWD CBT units equal to 120% of previous year's usage

These three requirements greatly limit the flexibility and alternatives for the Town to grow and develop a diverse potable water portfolio. First, unless Firestone constructs its own water treatment facility, the Town can only evaluate potable water supplies that can be turned over and treated by CWCWD's water system. Currently, CWCWD can only treat CBT or Windy Gap water. The Northern



3



0 3,500 7,000  
 Feet

**Figure 2.1**  
**TOWN OF FIRESTONE**  
 VICINITY MAP



Integrated Supply Project (NISP) will be a new source that can be delivered through the CBT system infrastructure and thus a source that can be treated by CWCWD. A more detailed description of NISP is included later in this report.

Second, Firestone is growing at a higher rate than 10% per year. If CWCWD is to enforce the clause of the agreement, the Town may be up against residential growth limits.

Third, with the requirement to transfer 120% of the Town's water usage in the previous year, a burden is placed on Firestone's water supplies. Although the Town owns the water, this 20% loss factor prevents the Town from committing it to future water demands. In essence, the Town cannot use a portion of its existing water supplies. A system as well operated as CWCWD should have a much lower system loss. The Town and CWCWD are actively negotiating to reduce this loss factor to 10%.

Consideration of these limitations is critical to understanding the range of options the Town has to secure water supplies for its future demands.

### **Potential Sources of New Water Supply**

There are other regional sources of water supply – for both potable and non-potable uses – that may be available and beneficial to meet Firestone's near and long-term water demands. Since the Town relies solely on the water sources delivered through CWCWD, we believe it is prudent for the Town to diversify its water portfolio. CWCWD has consented to Firestone developing other supplies to meet its future potable and non-potable needs.

One of the most obvious sources to consider is the native water supply that has historically been used for irrigated agriculture in the areas surrounding Firestone. Some of these sources of supply are relatively senior and were used on some of the very lands that have or will become part of Firestone proper. In certain situations, it may be possible to irrigate parks, open space areas and possibly even residential and commercial landscapes with this source of water supply. Use of this water for irrigation would reduce the amount of water required from the potable water system; thereby extending the supply-life of the system.

Groundwater is another source to consider for both potable and non-potable uses. Available groundwater may include tributary groundwater as well as non-tributary groundwater.

We explore these potential water sources later in this report.

### **Water Conservation**

Another option for the Town to consider when evaluating raw water policy is to examine the potential for water conservation or water demand reduction. Decreasing water

demand may reduce the rate at which the Town needs to acquire new raw water supplies and potentially delays the need for infrastructure. Clear Water Solutions, Inc. recently completed a 2007 Water Conservation Plan for the Town that identifies options and measures the Town can implement to reduce current and future water demand. More specifically, the plan identifies particular water-savings goals and a timeline for implementation.

## CHAPTER 3 – 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>CBT Carryover:</i>	A program through NCWCD by which the Town can carry over excess CBT supplies into the following water year for use.
<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 Town.
<i>CWRPDA:</i>	Colorado Water Resources and Power Development Authority
<i>Firming Storage:</i>	Storage that provides surety for a water right that is not senior enough to deliver its full yield every year. This storage allows capture during times of excess for use in times of shortage.
<i>Fully Consumable:</i>	<i>Water that can be used and successively used to extinction.</i>
<i>HOA:</i>	Home Owner's Association
<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.
<i>SFE:</i>	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.
<i>Tributary Groundwater:</i>	Water that is hydraulically connected to the river system. Use of this water requires augmentation.
<i>Windy Gap:</i>	Windy Gap water is delivered through the CBT system. It shares in the CBT infrastructure and storage.
<i>WTP:</i>	Water Treatment Plant
<i>Yield:</i>	<i>The delivery amount of a water right</i>

## CHAPTER 4 – WATER DEMAND PROJECTIONS

The Town separates its water customers into the following categories:

- Residential
- Multi-Family
- Commercial
- Industrial
- Parks (a.k.a Government – which are Town-maintained irrigated areas)
- Open Space (HOA-maintained irrigated areas)

This Raw Water Master Plan projects annual water use for each category through 2050.

### Residential Water Demand

To properly assess future water demands, we conducted an analysis of historical and projected population growth. We used data from the Colorado Department of Local Affairs (CDOLA), which uses Census data as well as research performed by the State Demographer’s Office to estimate current population and to project future populations.

The completion of E-470 to I-25 has led to new interchanges that provide additional access from Denver International Airport and the Denver Metro area to the Town of Firestone. This has influenced the growth experienced by the Town and its neighbors in recent years. It is anticipated that this growth will be sustained over the next few years, but eventually the rate will drop to 2%. Specifically, 12 percent growth is used for 2007, 10% growth for 2008 and 2009, and 8% for 2010 through 2012. After 2012, we anticipate the population growth rate will slow and steady to 2% annually over the long-term.

Table 4.1 shows the population and number of residential taps in Firestone between 2001 and 2005. On average during this time period, we estimate there are approximately 2.5 persons per tap.

**Table 4.1 – Average Persons per Tap**

Year	Population	No. of Residential Taps	Persons Per Tap
2001	3047	1398	2.2
2002	4159	1683	2.5
2003	5034	1972	2.6
2004	5748	2221	2.6
2005	6564	2461	2.7
		Average	2.5

Most planners use a persons-per-tap ratio between 2.5 to 2.9. Recent years show a per-tap ratio in Firestone of 2.7 persons per tap, which is very close to the expected range. To project water demands for the Residential customer category, we used a ratio of 2.8 persons per tap.

In addition, the water use per Single Family Equivalent (SFE) is an important planning value. The expected range of annual water use 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. Based on current Town records, the typical SFE in Town uses 0.5 ac-ft annually, which is within the expected range. This is likely attributable to good water tracking and new “standard” homes being built within the Town. This results in a residential per-capita water usage of 159 gallons per capita per day (gpcd).

The total residential water usage is projected to reach 5,805 ac-ft by 2050. This is an increase of approximately 4,340 ac-ft from current use. The projected Residential water demands are shown in Table 4.2.



**Table 4.2 – 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 (gal)	Residential Water Usage (ac-ft)	GPCD
2007	8204	12.0%	2.8	2930	0.50	477,371,715	1,465	159
2008	9024	10.0%	2.8	3223	0.50	525,108,887	1,612	159
2009	9927	10.0%	2.8	3545	0.50	577,619,775	1,773	159
2010	10721	8.0%	2.8	3829	0.50	623,829,357	1,914	159
2011	11579	8.0%	2.8	4135	0.50	673,735,706	2,068	159
2012	12505	8.0%	2.8	4466	0.50	727,634,562	2,233	159
2013	13255	6.0%	2.8	4734	0.50	771,292,636	2,367	159
2014	14051	6.0%	2.8	5018	0.50	817,570,194	2,509	159
2015	14894	6.0%	2.8	5319	0.50	866,624,406	2,660	159
2016	15489	4.0%	2.8	5532	0.50	901,289,382	2,766	159
2017	16109	4.0%	2.8	5753	0.50	937,340,957	2,877	159
2018	16753	4.0%	2.8	5983	0.50	974,834,596	2,992	159
2019	17256	3.0%	2.8	6163	0.50	1,004,079,633	3,081	159
2020	17774	3.0%	2.8	6348	0.50	1,034,202,022	3,174	159
2021	18307	3.0%	2.8	6538	0.50	1,065,228,083	3,269	159
2022	18673	2.0%	2.8	6669	0.50	1,086,532,645	3,334	159
2023	19046	2.0%	2.8	6802	0.50	1,108,263,298	3,401	159
2024	19427	2.0%	2.8	6938	0.50	1,130,428,564	3,469	159
2025	19816	2.0%	2.8	7077	0.50	1,153,037,135	3,539	159
2026	20212	2.0%	2.8	7219	0.50	1,176,097,878	3,609	159
2027	20616	2.0%	2.8	7363	0.50	1,199,619,835	3,681	159
2028	21029	2.0%	2.8	7510	0.50	1,223,612,232	3,755	159
2029	21449	2.0%	2.8	7660	0.50	1,248,084,476	3,830	159
2030	21878	2.0%	2.8	7814	0.50	1,273,046,166	3,907	159
2031	22316	2.0%	2.8	7970	0.50	1,298,507,089	3,985	159
2032	22762	2.0%	2.8	8129	0.50	1,324,477,231	4,065	159
2033	23217	2.0%	2.8	8292	0.50	1,350,966,776	4,146	159
2034	23682	2.0%	2.8	8458	0.50	1,377,986,111	4,229	159
2035	24155	2.0%	2.8	8627	0.50	1,405,545,833	4,313	159
2036	24638	2.0%	2.8	8799	0.50	1,433,656,750	4,400	159
2037	25131	2.0%	2.8	8975	0.50	1,462,329,885	4,488	159
2038	25634	2.0%	2.8	9155	0.50	1,491,576,483	4,577	159
2039	26147	2.0%	2.8	9338	0.50	1,521,408,012	4,669	159
2040	26669	2.0%	2.8	9525	0.50	1,551,836,173	4,762	159
2041	27203	2.0%	2.8	9715	0.50	1,582,872,896	4,858	159
2042	27747	2.0%	2.8	9910	0.50	1,614,530,354	4,955	159
2043	28302	2.0%	2.8	10108	0.50	1,646,820,961	5,054	159
2044	28868	2.0%	2.8	10310	0.50	1,679,757,380	5,155	159
2045	29445	2.0%	2.8	10516	0.50	1,713,352,528	5,258	159
2046	30034	2.0%	2.8	10726	0.50	1,747,619,579	5,363	159
2047	30635	2.0%	2.8	10941	0.50	1,782,571,970	5,471	159
2048	31248	2.0%	2.8	11160	0.50	1,818,223,410	5,580	159
2049	31873	2.0%	2.8	11383	0.50	1,854,587,878	5,692	159
2050	32510	2.0%	2.8	11611	0.50	1,891,679,635	5,805	159

## **Multi-Family Water Demand**

At present, Firestone has 32 units of Multi-Family – five 4-plexes and two 6-plexes. According to development proposals in the queue, the Town anticipates reaching 415 units over the next five years. This rapid increase is due to a large apartment building and several condo units currently under construction. After 2011, the number of multi-family units is projected to grow at 3% per year.

Based on recent water use history, a Multi-Family unit is equivalent to 0.6 SFE. To project this water demand, 0.6 SFE is used through 2011 with the same 0.5 ac-ft of use per SFE as was used for Residential. After 2011, the water demand is projected using 0.8 SFE and 0.5 ac-ft per SFE.

The 2050 water use for Multi-Family is estimated to reach 526 ac-ft.

**Table 4.3 – Projected Multi-Family Water Demand**

Year	No. of Multi-Family Units	SFE Factor Per Unit (SFE)	Per SFE Water Use (ac-ft/SFE)	Multi-Family Water Usage (gal)	Multi-Family Water Usage (ac-ft)
2007	109	0.6	0.50	10,655,328	33
2008	186	0.6	0.50	18,182,486	56
2009	263	0.6	0.50	25,709,644	79
2010	340	0.6	0.50	33,236,802	102
2011	415	0.6	0.50	40,568,450	125
2012	427	0.8	0.50	55,714,004	171
2013	440	0.8	0.50	57,385,424	176
2014	453	0.8	0.50	59,106,987	181
2015	467	0.8	0.50	60,880,196	187
2016	481	0.8	0.50	62,706,602	192
2017	496	0.8	0.50	64,587,800	198
2018	510	0.8	0.50	66,525,434	204
2019	526	0.8	0.50	68,521,197	210
2020	541	0.8	0.50	70,576,833	217
2021	558	0.8	0.50	72,694,138	223
2022	574	0.8	0.50	74,874,963	230
2023	592	0.8	0.50	77,121,211	237
2024	609	0.8	0.50	79,434,848	244
2025	628	0.8	0.50	81,817,893	251
2026	647	0.8	0.50	84,272,430	259
2027	666	0.8	0.50	86,800,603	266
2028	686	0.8	0.50	89,404,621	274
2029	707	0.8	0.50	92,086,760	283
2030	728	0.8	0.50	94,849,362	291
2031	750	0.8	0.50	97,694,843	300
2032	772	0.8	0.50	100,625,689	309
2033	795	0.8	0.50	103,644,459	318
2034	819	0.8	0.50	106,753,793	328
2035	844	0.8	0.50	109,956,407	337
2036	869	0.8	0.50	113,255,099	348
2037	895	0.8	0.50	116,652,752	358
2038	922	0.8	0.50	120,152,334	369
2039	949	0.8	0.50	123,756,904	380
2040	978	0.8	0.50	127,469,612	391
2041	1007	0.8	0.50	131,293,700	403
2042	1038	0.8	0.50	135,232,511	415
2043	1069	0.8	0.50	139,289,486	427
2044	1101	0.8	0.50	143,468,171	440
2045	1134	0.8	0.50	147,772,216	453
2046	1168	0.8	0.50	152,205,383	467
2047	1203	0.8	0.50	156,771,544	481
2048	1239	0.8	0.50	161,474,690	496
2049	1276	0.8	0.50	166,318,931	510
2050	1314	0.8	0.50	171,308,499	526

## **Commercial Water Demand**

Commercial water demand within the Town is anticipated to grow at two new taps per year. Previous commercial water usage shows an average per-tap usage of 950,000 gallons per tap. However, existing commercial within Firestone is lower water use commercial, i.e. warehouse commercial, banks, etc. It is anticipated that the type of commercial to be annexed in the future will be higher water use commercial such as restaurants and car washes.

This customer category is projected using 950,000 gallons through 2008 and 1.1 MG per tap beginning in 2009. The increased average use per tap will sufficiently account for the anticipated new types of commercial customers. The estimated water use for the Commercial category is expected to reach 523 ac-ft by 2050. This is an increase of 386 ac-ft from current use.

The commercial use within Firestone is presently at 149 ac-ft and is projected to reach 523 ac-ft by 2050. This is an increase of 374 ac-ft.

**Table 4.4 – Projected Commercial Water Demand**

Year	No. of Commercial Taps	Commercial Per Tap Usage (gal/tap)	Commercial Water Usage (gal)	Commercial Water Usage (ac-ft)
2007	51	950,000	48,450,000	149
2008	55	950,000	52,250,000	160
2009	59	1,100,000	64,900,000	199
2010	63	1,100,000	69,300,000	213
2011	67	1,100,000	73,700,000	226
2012	71	1,100,000	78,100,000	240
2013	75	1,100,000	82,500,000	253
2014	79	1,100,000	86,900,000	267
2015	83	1,100,000	91,300,000	280
2016	87	1,100,000	95,700,000	294
2017	89	1,100,000	97,900,000	300
2018	91	1,100,000	100,100,000	307
2019	93	1,100,000	102,300,000	314
2020	95	1,100,000	104,500,000	321
2021	97	1,100,000	106,700,000	327
2022	99	1,100,000	108,900,000	334
2023	101	1,100,000	111,100,000	341
2024	103	1,100,000	113,300,000	348
2025	105	1,100,000	115,500,000	354
2026	107	1,100,000	117,700,000	361
2027	109	1,100,000	119,900,000	368
2028	111	1,100,000	122,100,000	375
2029	113	1,100,000	124,300,000	381
2030	115	1,100,000	126,500,000	388
2031	117	1,100,000	128,700,000	395
2032	119	1,100,000	130,900,000	402
2033	121	1,100,000	133,100,000	408
2034	123	1,100,000	135,300,000	415
2035	125	1,100,000	137,500,000	422
2036	127	1,100,000	139,700,000	429
2037	129	1,100,000	141,900,000	435
2038	131	1,100,000	144,100,000	442
2039	133	1,100,000	146,300,000	449
2040	135	1,100,000	148,500,000	456
2041	137	1,100,000	150,700,000	462
2042	139	1,100,000	152,900,000	469
2043	141	1,100,000	155,100,000	476
2044	143	1,100,000	157,300,000	483
2045	145	1,100,000	159,500,000	489
2046	147	1,100,000	161,700,000	496
2047	149	1,100,000	163,900,000	503
2048	151	1,100,000	166,100,000	510
2049	153	1,100,000	168,300,000	516
2050	155	1,100,000	170,500,000	523

## **Industrial Water Demand**

Currently, there are two customers in the Industrial customer category. It is anticipated the Town will add one new industrial customer every ten years. Recent history of recorded water usage shows a per-tap usage of 1.2 MG.

To project Industrial water demand, 1.2 MG of use per tap is used. Industrial usage is projected to reach 22 ac-ft by 2050. This is an increase of 15 ac-ft from current demands.

**Table 4.5 – Projected Industrial Water Demand**

Year	No. of Industrial Taps	Industrial Per Tap Usage (gal/tap)	Industrial Water Usage (gal)	Industrial Water Usage (ac-ft)
2007	2	1,200,000	2,400,000	7
2008	2	1,200,000	2,400,000	7
2009	2	1,200,000	2,400,000	7
2010	2	1,200,000	2,400,000	7
2011	2	1,200,000	2,400,000	7
2012	2	1,200,000	2,400,000	7
2013	2	1,200,000	2,400,000	7
2014	2	1,200,000	2,400,000	7
2015	2	1,200,000	2,400,000	7
2016	3	1,200,000	3,600,000	11
2017	3	1,200,000	3,600,000	11
2018	3	1,200,000	3,600,000	11
2019	3	1,200,000	3,600,000	11
2020	3	1,200,000	3,600,000	11
2021	3	1,200,000	3,600,000	11
2022	3	1,200,000	3,600,000	11
2023	3	1,200,000	3,600,000	11
2024	3	1,200,000	3,600,000	11
2025	3	1,200,000	3,600,000	11
2026	4	1,200,000	4,800,000	15
2027	4	1,200,000	4,800,000	15
2028	4	1,200,000	4,800,000	15
2029	4	1,200,000	4,800,000	15
2030	4	1,200,000	4,800,000	15
2031	4	1,200,000	4,800,000	15
2032	4	1,200,000	4,800,000	15
2033	4	1,200,000	4,800,000	15
2034	4	1,200,000	4,800,000	15
2035	4	1,200,000	4,800,000	15
2036	5	1,200,000	6,000,000	18
2037	5	1,200,000	6,000,000	18
2038	5	1,200,000	6,000,000	18
2039	5	1,200,000	6,000,000	18
2040	5	1,200,000	6,000,000	18
2041	5	1,200,000	6,000,000	18
2042	5	1,200,000	6,000,000	18
2043	5	1,200,000	6,000,000	18
2044	5	1,200,000	6,000,000	18
2045	5	1,200,000	6,000,000	18
2046	6	1,200,000	7,200,000	22
2047	6	1,200,000	7,200,000	22
2048	6	1,200,000	7,200,000	22
2049	6	1,200,000	7,200,000	22
2050	6	1,200,000	7,200,000	22

## **Parks Water Demand**

The Parks customer category is water demand associated with turf areas owned and maintained by the Town. These include parks and irrigated areas around government buildings. Demand projections for parks were calculated based on a per-acre analysis.

To estimate this water demand, 1,600 acres of total park and open space acreage from the Town's Comprehensive Plan was used. We assumed that 80% of this total acreage would be irrigated, 1,280 acres, considering the parks and open space will have non-irrigated areas such as parking lots.

Firestone currently has 154 acres of irrigated parks and open space. A linear approach was used between 2007 and 2050 to increase the total irrigated acres to 1,280. Of this total, 53% was assumed to be within the Park customer category and 47% within the Open Space category. To determine water demand, 2.1 ac-ft per acre is used.

The current estimated park water usage is 172 ac-ft and is projected to reach 1,043 ac-ft by 2050.



**Table 4.6 – Projected Park Water Demand**

Year	Park Irrigated Area (acres)	Park Per Acre Usage (ac-ft/ac)	Park Water Usage (ac-ft)
2007	82	2.1	172
2008	92	2.1	192
2009	101	2.1	212
2010	111	2.1	233
2011	120	2.1	253
2012	130	2.1	273
2013	140	2.1	293
2014	149	2.1	314
2015	159	2.1	334
2016	169	2.1	354
2017	178	2.1	374
2018	188	2.1	395
2019	198	2.1	415
2020	207	2.1	435
2021	217	2.1	455
2022	227	2.1	476
2023	236	2.1	496
2024	246	2.1	516
2025	255	2.1	536
2026	265	2.1	557
2027	275	2.1	577
2028	284	2.1	597
2029	294	2.1	617
2030	304	2.1	638
2031	313	2.1	658
2032	323	2.1	678
2033	333	2.1	698
2034	342	2.1	719
2035	352	2.1	739
2036	362	2.1	759
2037	371	2.1	779
2038	381	2.1	800
2039	390	2.1	820
2040	400	2.1	840
2041	410	2.1	860
2042	419	2.1	881
2043	429	2.1	901
2044	439	2.1	921
2045	448	2.1	941
2046	458	2.1	962
2047	468	2.1	982
2048	477	2.1	1,002
2049	487	2.1	1,022
2050	496	2.1	1,043

## **Open Space Water Demand**

The Open Space customer category is water demand associated with irrigated areas owned and managed by independent entities, such as private home owner associations, and not by the Town. Like Parks, this was calculated using a per-acre analysis. It is assumed that 47% of the total irrigated area increase is within the Open Space category.

Current Open Space irrigation equates to 152 ac-ft and is expected to reach 921 ac-ft by 2050.

**Table 4.7 – Projected Open Space Water Demand**

Year	Open Space Irrigated Area (acres)	Open Space Per Acre Usage (ac-ft/ac)	Open Space Water Usage (ac-ft)
2007	72	2.1	152
2008	81	2.1	170
2009	89	2.1	188
2010	98	2.1	206
2011	106	2.1	223
2012	115	2.1	241
2013	123	2.1	259
2014	132	2.1	277
2015	140	2.1	295
2016	149	2.1	313
2017	157	2.1	331
2018	166	2.1	349
2019	175	2.1	367
2020	183	2.1	384
2021	192	2.1	402
2022	200	2.1	420
2023	209	2.1	438
2024	217	2.1	456
2025	226	2.1	474
2026	234	2.1	492
2027	243	2.1	510
2028	251	2.1	527
2029	260	2.1	545
2030	268	2.1	563
2031	277	2.1	581
2032	285	2.1	599
2033	294	2.1	617
2034	302	2.1	635
2035	311	2.1	653
2036	319	2.1	671
2037	328	2.1	688
2038	336	2.1	706
2039	345	2.1	724
2040	353	2.1	742
2041	362	2.1	760
2042	370	2.1	778
2043	379	2.1	796
2044	387	2.1	814
2045	396	2.1	831
2046	404	2.1	849
2047	413	2.1	867
2048	421	2.1	885
2049	430	2.1	903
2050	439	2.1	921

## Total Water Demand

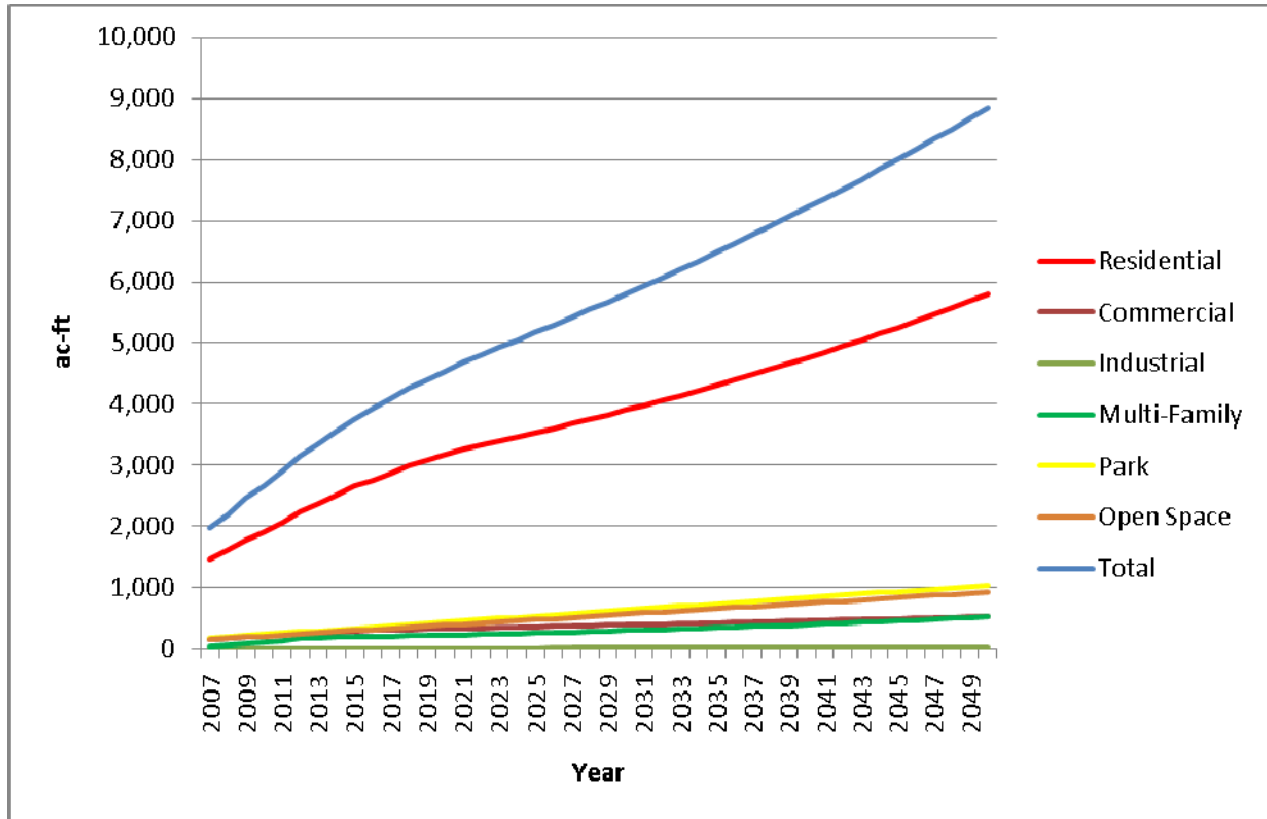
The total projected water demand for Firestone is summarized below.

**Table 4.8 – Total Projected Water Demand**

Year	Residential (ac-ft)	Multi-Family (ac-ft)	Commercial (ac-ft)	Industrial (ac-ft)	Park (ac-ft)	Open Space (ac-ft)	Total (ac-ft)
2007	1,465	33	149	7	172	152	1,978
2008	1,612	56	160	7	192	170	2,197
2009	1,773	79	199	7	212	188	2,458
2010	1,914	102	213	7	233	206	2,675
2011	2,068	125	226	7	253	223	2,902
2012	2,233	171	240	7	273	241	3,166
2013	2,367	176	253	7	293	259	3,356
2014	2,509	181	267	7	314	277	3,555
2015	2,660	187	280	7	334	295	3,763
2016	2,766	192	294	11	354	313	3,930
2017	2,877	198	300	11	374	331	4,092
2018	2,992	204	307	11	395	349	4,257
2019	3,081	210	314	11	415	367	4,398
2020	3,174	217	321	11	435	384	4,542
2021	3,269	223	327	11	455	402	4,688
2022	3,334	230	334	11	476	420	4,805
2023	3,401	237	341	11	496	438	4,924
2024	3,469	244	348	11	516	456	5,044
2025	3,539	251	354	11	536	474	5,165
2026	3,609	259	361	15	557	492	5,292
2027	3,681	266	368	15	577	510	5,417
2028	3,755	274	375	15	597	527	5,544
2029	3,830	283	381	15	617	545	5,672
2030	3,907	291	388	15	638	563	5,802
2031	3,985	300	395	15	658	581	5,934
2032	4,065	309	402	15	678	599	6,067
2033	4,146	318	408	15	698	617	6,203
2034	4,229	328	415	15	719	635	6,340
2035	4,313	337	422	15	739	653	6,479
2036	4,400	348	429	18	759	671	6,624
2037	4,488	358	435	18	779	688	6,767
2038	4,577	369	442	18	800	706	6,913
2039	4,669	380	449	18	820	724	7,060
2040	4,762	391	456	18	840	742	7,210
2041	4,858	403	462	18	860	760	7,362
2042	4,955	415	469	18	881	778	7,516
2043	5,054	427	476	18	901	796	7,672
2044	5,155	440	483	18	921	814	7,831
2045	5,258	453	489	18	941	831	7,992
2046	5,363	467	496	22	962	849	8,160
2047	5,471	481	503	22	982	867	8,326
2048	5,580	496	510	22	1,002	885	8,495
2049	5,692	510	516	22	1,022	903	8,666
2050	5,805	526	523	22	1,043	921	8,840

The total water demand for Firestone is anticipated to increase from 1,978 ac-ft to 8,840 ac-ft by 2050.

Figure 4.1 – Total Projected Water Demand



## CHAPTER 5 – CURRENT WATER SUPPLY

### CBT Water

The Town currently owns 4,605 units of CBT, which is its only source of water. Over the years, Firestone has received more CBT water through dedication than allowed by NCWCD regulations. Resolution D-962-02-95 from NCWCD deals with limitations on 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*

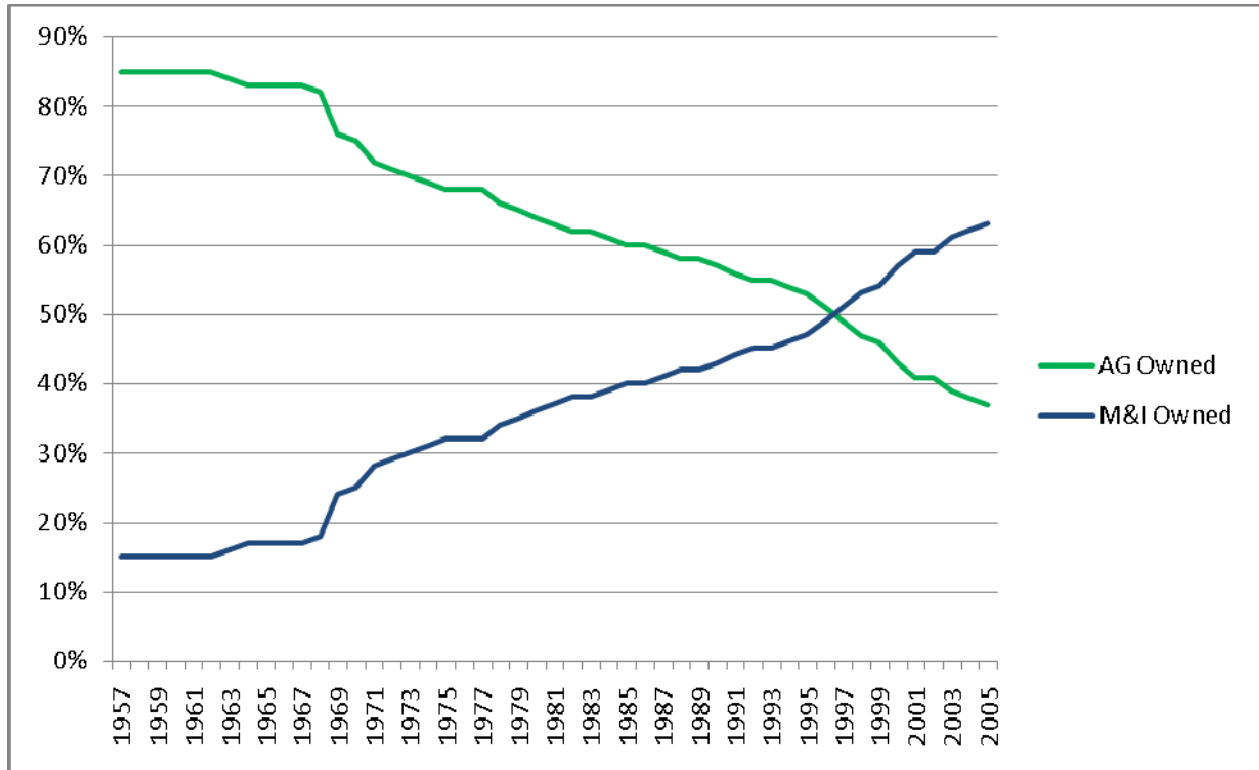
*Demand is based on a 10-year average of per-tap usage times the total number of taps currently supplied and taps committed to supply in the future.*

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 Firestone has exceeded its CBT ownership per the above Resolution, the Town is "capped" and cannot purchase additional CBT supplies through the open market. Therefore, the Town must rely on CBT acquisition through dedication from new development. This NCWCD requirement puts a burden on the Town 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 5.1 – CBT Ownership Transition**



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

### **NISP Participation**

The Town 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, which consisted of both yield and firming storage. The viability of the firming storage component was challenged, and at that stage of the process, the NISP project was converted to solely a yield project versus a yield plus firming storage project. The volume of water originally requested by all participants was 31,000 ac-ft. By this time, NCWCD was deep into the permitting process for 40,000 ac-ft. Accordingly, NCWCD asked participants if they would increase their participation by a prorata amount to keep the project at 40,000 ac-ft. Thus, Firestone's participation in NISP has increased to 1,300 ac-ft.

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 Town's 1,300 ac-ft is \$13.1 million. Construction for NISP is anticipated to begin in 2010 or 2011. A substantial amount of the total project cost will be due at that time.

### Water Dedication Policy

The Town of Firestone accepts 100% CBT dedication for the raw water requirement associated with new development. The Town's current dedication policy requires:

- One CBT unit per single family unit.
- Half of one CBT unit per multi-family unit.
- Two and one half CBT units per acre of irrigated park/open space.
- Commercial and industrial water dedication is determined on a case-by-case basis. The Town can go back and require more dedication if actual water use exceeds initial estimates for the commercial/industrial use.

### Current Water Supply vs. Demand

The Town currently owns 4,605 units of CBT. In an average CBT quota year, which yields 70%, the Town has sufficient water supplies to meet its demand. Receiving 0.7 ac-ft per CBT unit in most years provides Firestone with excess supplies, which it leases to other users on an annual basis.

The following table shows the current water supply (2007) versus demand for the Town with varying levels of CBT quota.

**Table 5.1 – 2007 Water Supply vs. Demand Under Varying CBT Quota Scenarios**

	70% Quota Scenario	60% Quota Scenario	50% Quota Scenario
CBT Ownership =	4,605 units	4,605 units	4,605 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) =	3,224 ac-ft	2,763 ac-ft	2,303 ac-ft
Current Water Demand (2008) =	2,146 ac-ft	2,146 ac-ft	2,146 ac-ft
Current Water Demand + 10% of Previous Year =	2,345 ac-ft	2,345 ac-ft	2,345 ac-ft
Remaining CBT w/o Carryover =	879 ac-ft	418 ac-ft	-43 ac-ft
CBT Carryover =	921 ac-ft	921 ac-ft	921 ac-ft
Remaining CBT w/ Carryover =	1,800 ac-ft	1,339 ac-ft	879 ac-ft

Notes:

1. CBT Water = CBT Ownership\*CBT Quota
2. 2007 Water Demand = 1,988 ac-ft, 2008 Water Demand = 2,146 ac-ft, Current Water Demand (2008) + 10% of 2007 Water Demand = 2,345 ac-ft
3. CBT Carryover equals lesser of (90%\*Oct 31st Account Balance) or (20% of CBT Units Owned). 20%\*CBT units used.



Because the Town maximizes its carryover each year, Firestone 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 Town before their water demands have occurred. As these developments are constructed, this excess will gradually be used. At some point in the future, the Town will need to consider how to safeguard itself from a severe drought situation as in 2002. As shown in Table 5.1, several consecutive 50% quota years would put the Town in a potential water shortage situation. Water conservation and water storage are two effective measures to combat drought.

## CHAPTER 6 – POTENTIAL NEW SOURCES OF SUPPLY

The 1974 Water Supply Agreement between Firestone and CWCWD specifies that CWCWD is the sole water provider for the Town. Due to this clause in the Agreement, the Town is limited to only those sources of potable water that CWCWD is able to treat at its Carter Lake water treatment facility. The raw water sources listed in the 1974 Agreement are CBT and Windy Gap. However, since the NISP project will share a portion of CBT's delivery system, it should also be suitable. Since CWCWD provides water for many rapidly growing municipalities including Firestone, there will be continued pressure on CWCWD to investigate other options to treat and provide water outside of the CBT system.

The sources of water analyzed in this plan may potentially suit Firestone's needs, but some are not currently feasible due to: 1) location of the source and 2) overall cost to acquire and use the water source. Unless the Town 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 Town's existing potable supplies, and thus should be considered as part of Firestone's water portfolio. Only senior water rights should be considered for irrigation. Senior water rights with a firm dry-year yield can be relied upon as a substitute to potable water for irrigation. Diversion records for the evaluated water rights are included in Appendix A. Table A.1 in Appendix A is a summary of all water rights evaluated.

### **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., 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. On average, the preferred shares yield 23.1 ac-ft per share and the common shares yield 7.7 ac-ft per share. 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 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 turns into the Coalridge Ditch, which traverses the southern part of Town near Saddleback Golf Course. Lower Boulder preferred shares are a good water supply option that should be considered to meet the

Town's future non-potable water needs. Lower Boulder can be used for non-potable uses as it is a very senior water right. Furthermore, should the Town ever construct a local WTP, Lower Boulder would provide a reliable potable water supply.

### Advantages

- Lower Boulder preferred shares are very senior, and thus suitable for non-potable irrigation.
- The ditch runs through Town limits, which makes use of the water easier.
- The cost per ac-ft of the preferred shares is more cost effective than the other local ditch systems.

### Disadvantages

- Use for non-potable irrigation on lands not historically irrigated with the water right will require a change of place of use in Water Court.

### Recommendation

Due to the convenient location of the Lower Boulder Ditch, it is recommended that the Town allow preferred shares to be turned over for raw water dedication requirements. This water would be a very reliable water source for non-potable irrigation. The Town should also consider budgeting annually and actively purchasing the preferred shares on the open market. This is the most senior water right in the area and will well suit the Town's irrigation needs.

## **Rural Ditch**

Rural Ditch diverts from Boulder Creek at its headgate located in Section 20, Township 2N, Range 68W in the 6<sup>th</sup> P.M., Weld County. The ditch company has 50 shares under two priority dates, 5-10-1862 and 3-10-1863. Rural Ditch water averages 113.8 ac-ft of delivery per share. According to the Rural Ditch rider, these shares range between \$800,000 and \$1,000,000 per share. This equates to a per ac-ft cost of \$7,030 to \$8,787.

The Rural Ditch runs along the northern edge of Firestone's growth boundary. Most of the lands within Firestone are located above the ditch, and thus not historically irrigated with this water. Potential irrigation of future lands within Firestone with Rural Ditch will require pumping and a change of place of use in Water Court.

### Advantages

- Rural Ditch water is senior, and thus suitable for non-potable irrigation.

### Disadvantages

- Due to ownership transition to gravel mining companies, Rural Ditch shares are difficult to find.
- Use for non-potable irrigation will require a change of place of use in Water Court since most of the lands within Town limits are above the ditch and thus not historically irrigated with Rural Ditch water.
- This water right is “peaky,” i.e. it delivers heavy over two to three months in the summer, so storage will likely be needed to irrigate with this water right.

### Recommendation

The Town can consider Rural Ditch on a case-by-case basis, but should not actively pursue this right. If the water becomes available through lands annexing into Firestone, the Town should accept the Rural Ditch water. Acquiring the water helps to diversify the Town’s water portfolio.

### **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., 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.
- Because the Town has lands historically irrigated under the ditch, some acquisition can occur with annexation.

### Disadvantages

- Use for non-potable irrigation on lands above the ditch will require a change of place of use in Water Court.

### Recommendation

The Coalridge Ditch is the ideal water right for non-potable irrigation for the Town. The ditch runs along the southern portion of Town, so most areas can be gravity fed. Furthermore, this water right can be acquired through annexation because there are existing lands within Town limits that were historically irrigated with this water.

The Town should consider purchase of this water on the open market as well. The price per acre-foot is the least expensive of the water supply options in the area.

### **Last Chance Ditch**

The Last Chance Ditch is located north of Town. Its headgate diverts from the St. Vrain River in Section 3, Township 2N, Range 68W in the 6<sup>th</sup> P.M., Weld County. The ditch has 20 shares and diverts under two priorities, 3-15-1872 and 6-30-1878. Its average yield is 462 ac-ft per share. We contacted water brokers and ditch company representatives, but the cost for Last Chance could not be confirmed. For the purposes of this analysis, this water right is assumed to cost less than Rural Ditch due to its more junior priority, \$5,000 per ac-ft.

#### Advantages

- We do not see any advantage to use this water right.

#### Disadvantages

- Most, if not all, of the lands within Town limits were never irrigated by Last Chance Ditch, so use for non-potable irrigation will require a change of place of use in Water Court.
- The location of the ditch is below Town, so use will require more infrastructure than with other sources.
- This water right is the most junior as compared to other water rights in the area.

#### Recommendation

Last Chance Ditch is the most junior water right of the area ditches evaluated and thus should not be pursued by the Town. Location of the water is somewhat problematic as well. Firestone has better options for new water supplies for non-potable irrigation.

### **Highland Southside Ditch (aka Godding Ditch)**

The Godding Ditch headgate is located on Idaho Creek in Section 21, Township 2N, Range 68W in the 6<sup>th</sup> P.M., Weld County. The ditch company has 162 shares under two priority dates, 6-1-1865 and 6-1-1868. Godding Ditch has an average delivery of 27.2 ac-ft per share. The price of this water could not be confirmed through the ditch company or water brokers, so we estimate \$6,500 per ac-ft or \$177,000 per share.

The Godding Ditch enters the western edge of Firestone near Sable Avenue and flows toward the middle of Town before turning due north. Most of the lands within Firestone are located above the ditch, and thus not historically irrigated with this water. Potential irrigation of future lands within Firestone with Godding Ditch will require pumping and a change of place of use in Water Court.

### Advantages

- Godding Ditch is at a good location to use for non-potable irrigation.

### Disadvantages

- This ditch right is fairly senior, but will require storage for non-potable irrigation.
- Use for non-potable irrigation will require a change of place of use in Water Court since most of the lands within Town limits are above the ditch and thus not historically irrigated with Godding Ditch water.
- This water right is “peaky,” i.e. it delivers heavy over two to three months in the summer, so storage will likely be needed to irrigate with this water right.

### Recommendation

The Town can consider Godding Ditch on a case-by-case basis, but should not actively pursue this right. If the water becomes available through lands annexing into Firestone, the Town should accept the Godding Ditch water. Acquiring the water helps to diversify the Town’s water portfolio.

## **Boulder and Weld County Ditch**

The Boulder and Weld County Ditch is located southwest of Town. Its headgate diverts from Boulder Creek in Section 15, Township 1N, Range 69W in the 6<sup>th</sup> P.M., Boulder County. The ditch has 20 shares and diverts under two priorities, 4-1-1863 and 5-1-1871. Its average yield is 51.8 ac-ft per share and is estimated to cost \$6,500 per ac-ft.

### Advantages

- This is a cost-effective water right compared to other local ditches.

### Disadvantages

- None of the lands within Town limits were historically irrigated by Boulder and Weld County Ditch, so use for non-potable irrigation will require a change of place of use in Water Court.
- The location of the ditch is less than ideal, so use would require much infrastructure.
- This water right is very “peaky” and thus use for non-potable irrigation will require storage.

### Recommendation

Boulder and Weld County Ditch should not be pursued by the Town. Location of the water is problematic as well and Firestone has better options for new water supplies for non-potable irrigation.

## **Lupton Bottom Ditch**

The Lupton Bottom Ditch originates in the South Platte River Basin. Its headgate is located in Section 19, Township 1N, Range 66W in the 6<sup>th</sup> P.M., Weld County. The ditch has 82.5 shares and diverts under three priorities, 5-15-1863, 3-10-1871 and 9-15-1873. Its average delivery is 220.2 ac-ft per share. According to the Ditch Company Secretary, shares of Lupton Bottom Ditch cost \$600,000 or \$2,725 per ac-ft.

### Advantages

- This is an inexpensive, senior water right.

### Disadvantages

- None of the lands within Town limits were historically irrigated by Lupton Bottom Ditch, so use for non-potable irrigation will require a change of place of use in Water Court.
- Because the water right originates in the South Platte Basin, there is much seepage loss associated with the use of this water.
- The end of the ditch is located at the northeastern corner of Town, so use will require more infrastructure than with other sources.

### Recommendation

Lupton Bottom Ditch should not be considered at this time due to its location and distance from Firestone. As shares of Lupton Bottom shift from agriculture to municipal use, either directly or for augmentation, there is uncertainty of receiving full yields at the end of the system. Although the water right is cost-effective, Firestone has better options for new water supplies for non-potable irrigation.

## **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 storage in the CBT system spills, the Windy Gap account spills first. NCWCD is in the permitting process to construct Windy Gap firming storage. Although several alternatives are being evaluated, Chimney Hollow 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 treat and deliver to the Town.

### Disadvantages

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

### Recommendation

Windy Gap is a good future alternative for the Town. The water right utilizes the CBT delivery system and can readily be treated by CWCWD. However, until the Town has a need for the reusable component of Windy Gap, the Town should not pursue this water right.

## **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 seasonal fluctuations of surface water rights. The downside to well use is power costs from pumping and the need for 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 operational 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 Firestone's current size, it is recommended that the Town 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 Town could consider drilling shallow wells strategically around the Town for irrigation and augment with Windy Gap water. A benefit-cost analysis, which is outside the scope of this report, would need to be completed for this alternative to determine long-term viability for Firestone. At this time there are better alternatives for the Town, and thus shallow well use for non-potable irrigation should not be considered further.

## **Deep Groundwater Wells**

The deep groundwater underlying the Town 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.

All groundwater below Firestone originates in the Laramie-Fox Hills aquifer. The central and northern edge of Town limits has NNT water approximately 300 feet below the ground surface. There is no NT water at this location. 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 southern edges of Town limits. The small amount of NT water is borne from the Laramie-Fox Hills aquifer and is located approximately 500 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 surface land ownership and a 100-year aquifer life. Because the aquifer does not recharge naturally, it is a finite resource.

### Advantages

- Irrigation from wells provides operational flexibility.
- NT groundwater can be used to 98% extinction without augmentation.

### 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 is expensive.
- Both sources have limited production capability, yielding 15-20 gpm per well on average and a maximum of 50 gpm per well.
- Pumping these sources of water is expensive for non-potable irrigation.
- NT groundwater is a finite water source, so it should only be used as a supplemental supply.

Recommendation

NNT groundwater will never be a good option for the Town due to the augmentation obligations and should not be considered. NT groundwater is a potential option for non-potable irrigation, although the Town has much better options at this time. NT water is deep and can be expensive to pump for irrigation. NT and NNT wells should not be considered at this time.

## CHAPTER 7 – ALTERNATIVES ANALYSIS

Because the Town has so much invested in the CWCWD system, and since the Town has not constructed a local water treatment facility,, potable supplies for the Town 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 Town target for potable water?
2. How much NISP should the Town participate in?
3. What is the best dedication policy to help the Town pay for its NISP participation?

This alternatives analysis considers the Town’s current NISP participation of 1,300 ac-ft and also provides a plan to ensure that growth pays for itself. Since CBT is currently the only raw water asset the Town owns, the analysis needed to consider how the Town could leverage its CBT to acquire additional rights, i.e. participate and pay for NISP. One option would be to sell some CBT to generate revenue for water acquisition. However, this is not recommended since CBT is in such high demand. This Raw Water Master Plan considers alternatives to pay for NISP while avoiding the sale of Firestone’s CBT and preventing or limiting impacts to its current ratepayers.

### **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 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 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 almost exclusively held by M&I ownership by 2028 to 2030. For purposes of this study, it is assumed that CBT will be available until 2030.

The following table shows the anticipated new CBT units that the Town would acquire through annexation under its current 100% CBT dedication policy.

Table 7.1 – Estimated New CBT Acquisition

Year	Residential				Multi-Family				Commercial				Industrial				Parks				Open Space				Total New CBT Units
	Total Taps	Additional Taps	CBT Units Per Tap	New CBT Units	Total MF Units	Additional MF Units	CBT Units Per MF Unit	New CBT Units	Total ac-ft	Additional ac-ft	CBT Quota	New CBT Units	Total ac-ft	Additional ac-ft	CBT Quota	New CBT Units	Total acs	Additional acs	CBT Units per Acre	New CBT Units	Total Acs	Additional Acs	CBT Units per Acre	New CBT Units	
2007	2,930				109				149				7				82				72				
2008	3,223	293	1.0	293	186	77	0.5	39	160	12	0.7	17	7	0	0.7	0	62	0	2.5	0	81	9	2.5	22	370
2009	3,545	615	1.0	615	263	154	0.5	77	199	50	0.7	72	7	0	0.7	0	72	0	2.5	0	90	17	2.5	43	808
2010	3,829	899	1.0	899	340	231	0.5	116	213	64	0.7	91	7	0	0.7	0	81	0	2.5	0	98	26	2.5	65	1,171
2011	4,135	1,205	1.0	1,205	415	306	0.5	153	226	77	0.7	111	7	0	0.7	0	91	9	2.5	23	107	35	2.5	87	1,579
2012	4,466	1,536	1.0	1,536	427	318	0.5	159	240	91	0.7	130	7	0	0.7	0	101	19	2.5	47	116	43	2.5	108	1,981
2013	4,734	1,804	1.0	1,804	440	331	0.5	166	253	104	0.7	149	7	0	0.7	0	132	50	2.5	126	124	52	2.5	130	2,375
2014	5,018	2,088	1.0	2,088	453	344	0.5	172	267	118	0.7	169	7	0	0.7	0	142	60	2.5	150	133	61	2.5	152	2,730
2015	5,319	2,389	1.0	2,389	467	358	0.5	179	280	132	0.7	188	7	0	0.7	0	151	70	2.5	174	142	69	2.5	173	3,103
2016	5,532	2,602	1.0	2,602	481	372	0.5	186	294	145	0.7	207	11	4	0.7	5	161	79	2.5	198	150	78	2.5	195	3,393
2017	5,753	2,823	1.0	2,823	496	387	0.5	193	300	152	0.7	217	11	4	0.7	5	171	89	2.5	222	159	87	2.5	217	3,677
2018	5,983	3,053	1.0	3,053	510	401	0.5	201	307	159	0.7	226	11	4	0.7	5	179	97	2.5	244	166	94	2.5	234	3,963
2019	6,163	3,233	1.0	3,233	526	417	0.5	208	314	165	0.7	236	11	4	0.7	5	184	102	2.5	256	175	102	2.5	255	4,194
2020	6,348	3,418	1.0	3,418	541	432	0.5	216	321	172	0.7	246	11	4	0.7	5	189	107	2.5	268	183	111	2.5	277	4,429
2021	6,538	3,608	1.0	3,608	558	449	0.5	224	327	179	0.7	255	11	4	0.7	5	194	112	2.5	280	192	119	2.5	298	4,671
2022	6,669	3,739	1.0	3,739	574	465	0.5	233	334	186	0.7	265	11	4	0.7	5	199	117	2.5	292	200	128	2.5	319	4,853
2023	6,802	3,872	1.0	3,872	592	483	0.5	241	341	192	0.7	275	11	4	0.7	5	203	122	2.5	304	209	136	2.5	341	5,038
2024	6,938	4,008	1.0	4,008	609	500	0.5	250	348	199	0.7	284	11	4	0.7	5	208	126	2.5	316	217	145	2.5	362	5,226
2025	7,077	4,147	1.0	4,147	628	519	0.5	259	354	206	0.7	294	11	4	0.7	5	213	131	2.5	328	226	153	2.5	383	5,417
2026	7,219	4,289	1.0	4,289	647	538	0.5	269	361	213	0.7	304	15	7	0.7	11	218	136	2.5	340	234	162	2.5	405	5,616
2027	7,363	4,433	1.0	4,433	666	557	0.5	278	368	219	0.7	313	15	7	0.7	11	223	141	2.5	352	243	170	2.5	426	5,813
2028	7,510	4,580	1.0	4,580	686	577	0.5	288	375	226	0.7	323	15	7	0.7	11	228	146	2.5	364	251	179	2.5	447	6,013
2029	7,660	4,730	1.0	4,730	707	598	0.5	299	381	233	0.7	333	15	7	0.7	11	232	150	2.5	376	260	187	2.5	468	6,217
2030	7,814	4,884	1.0	4,884	728	619	0.5	309	388	240	0.7	342	15	7	0.7	11	237	155	2.5	388	268	196	2.5	490	6,424

Notes:  
 CBT is transitioning about 1% per year from agricultural use to M&I use.  
 Assumes available CBT in M&I ownership by 2030.

Table 7.1 quantifies the total anticipated CBT units to be acquired for each of the Town's customer categories. The increase in residential taps was taken from Table 4.2. Based on these numbers and the Town's policy of one unit of CBT dedication per tap, it is anticipated that the Town will obtain 4,884 new CBT units from residential development by 2030.

Multi-Family units were taken from Table 4.3. It is anticipated that the Town will gain 619 new multi-family units by 2030. Using the Town's policy of 0.5 CBT unit dedication per multi-family unit, it is estimated that the Town will acquire 309 CBT units through multi-family development.

For commercial and industrial use, the acre-foot increase per year was calculated based on data quantified in Tables 4.4 and 4.5. Using 0.7 ac-ft per CBT unit, the total additional CBT units acquired from projected commercial and industrial development is estimated at 342 and 11 new units by 2030, respectively. 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 and industrial development.

New CBT acquisition within Parks and Open Space was determined on a per-acre basis. Additional acreage for this category is quantified in Tables 4.6 and 4.7. The Town's CBT dedication policy for irrigated acreage is 2.5 CBT units per acre. We anticipate 388 new CBT units for Parks and 490 new CBT units for Open Space by 2030.

The total anticipated number of new CBT units to be obtained by the Town through annexation is 6,424 units.

### **Alternatives Analysis**

The Town of Firestone's dedication policy accepts CBT to meet raw water requirements, and thus CBT is the Town'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
- Alternative D – 75% CBT Dedication and 25% CIL

Considering a CBT-CIL blend is a creative way for the Town to generate revenue without having to sell any of its CBT water. It also allows growth to pay its own way. 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 Town 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.

The CIL price used for this plan is \$11,000 in 2007 and escalated at 3% per year. 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. However, this estimate will suffice for the purposes of this Raw Water Master Plan and can be revised in future plan updates.

Each alternative assumes the CIL program will begin in 2008 and the CWCWD system loss will be negotiated and reduced to 10% in 2009.

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

This alternative is the “do nothing” or baseline alternative. At the 60% quota under this scenario, Firestone has sufficient supplies to meet water demands past 2030. Since no money will be generated through CIL, the Town must find other funding under this alternative to finance NISP. Table 7.2 shows the total projected CBT supply versus the anticipated water demand under Alternative A.

**Table 7.2 – Alternative A – 100% CBT Dedication, 0% CIL**

Year	Total Water Usage (ac-ft)	Additional CBT Dedication to CWCWD (ac-ft)	Total CBT Dedication to CWCWD (ac-ft)	Alternative A - 100% CBT Dedication			
				Estimated CBT Ownership (units)	Planning Quota (ac-ft/unit)	CBT Water (ac-ft)	Cash-In Lieu (\$)
2007	1988	359	2347	4,605	0.6	2763	\$0
2008	2146	398	2543	4,975	0.6	2985	\$0
2009	2409	215	2623	5,413	0.6	3248	\$0
2010	2627	241	2868	5,776	0.6	3466	\$0
2011	2856	263	3118	6,184	0.6	3710	\$0
2012	3121	286	3406	6,586	0.6	3951	\$0
2013	3360	312	3672	6,980	0.6	4188	\$0
2014	3561	336	3897	7,335	0.6	4401	\$0
2015	3770	356	4126	7,708	0.6	4625	\$0
2016	3939	377	4316	7,998	0.6	4799	\$0
2017	4102	394	4496	8,282	0.6	4969	\$0
2018	4263	410	4674	8,568	0.6	5141	\$0
2019	4395	426	4821	8,799	0.6	5279	\$0
2020	4529	440	4969	9,034	0.6	5421	\$0
2021	4667	453	5120	9,276	0.6	5566	\$0
2022	4775	467	5241	9,458	0.6	5675	\$0
2023	4884	477	5361	9,643	0.6	5786	\$0
2024	4995	488	5483	9,831	0.6	5899	\$0
2025	5107	499	5607	10,022	0.6	6013	\$0
2026	5225	511	5735	10,221	0.6	6133	\$0
2027	5340	522	5863	10,418	0.6	6251	\$0
2028	5458	534	5992	10,618	0.6	6371	\$0
2029	5577	546	6123	10,822	0.6	6493	\$0
2030	5698	558	6255	11,029	0.6	6617	\$0

Notes:

Assumes available CBT in M&I ownership by 2030.  
 Assumes deliveries from NISP will begin in 2015.

As shown, it is anticipated that the Town will own a total of 11,029 units of CBT by 2030 under a 100% dedication policy. The supply exceeds the demand, which points out the Town is currently collecting sufficient CBT to meet growth.

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 7.3 – Alternative B – 80% CBT Dedication, 20% CIL**

Year	Total CBT Dedication to CWCWD (ac-ft)	Alternative B - 80% CBT / 20% CIL			
		Estimated CBT Ownership (units)	Planning Quota (ac-ft/unit)	CBT Water (ac-ft)	Cash-In Lieu (\$)
2007	2347	4,605	0.6	2763	\$0
2008	2543	4,901	0.6	2941	\$838,029
2009	2623	5,251	0.6	3151	\$1,885,283
2010	2868	5,542	0.6	3325	\$2,814,690
2011	3118	5,868	0.6	3521	\$3,908,937
2012	3406	6,190	0.6	3714	\$5,051,738
2013	3672	6,505	0.6	3903	\$6,237,657
2014	3897	6,789	0.6	4074	\$7,387,232
2015	4126	7,088	0.6	4253	\$8,648,216
2016	4316	7,320	0.6	4392	\$9,740,380
2017	4496	7,547	0.6	4528	\$10,872,004
2018	4674	7,776	0.6	4665	\$12,070,007
2019	4821	7,960	0.6	4776	\$13,153,988
2020	4969	8,148	0.6	4889	\$14,310,285
2021	5120	8,342	0.6	5005	\$15,543,365
2022	5241	8,487	0.6	5092	\$16,633,871
2023	5361	8,635	0.6	5181	\$17,785,937
2024	5483	8,786	0.6	5271	\$19,002,797
2025	5607	8,938	0.6	5363	\$20,287,849
2026	5735	9,098	0.6	5459	\$21,664,961
2027	5863	9,255	0.6	5553	\$23,097,907
2028	5992	9,416	0.6	5649	\$24,610,339
2029	6123	9,578	0.6	5747	\$26,206,408
2030	6255	9,744	0.6	5846	\$27,890,475

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 Town’s water supply is sufficient to cover the Town’s water demand, including the 10% required by CWCWD. This alternative generates approximately \$2.8 million by 2010 and \$27.9 million by 2030 to provide capital for the Town to fund a portion of NISP. Deliveries from NISP are anticipated to begin in 2015. Alternative B provides additional cash while sustaining the Town until NISP comes online.

The following graph depicts the Town’s water situation under Alternative B.

**Figure 7.1 – Water Supply vs. Water Demand Under Alternative B – 80% CBT Dedication, 20% CIL**

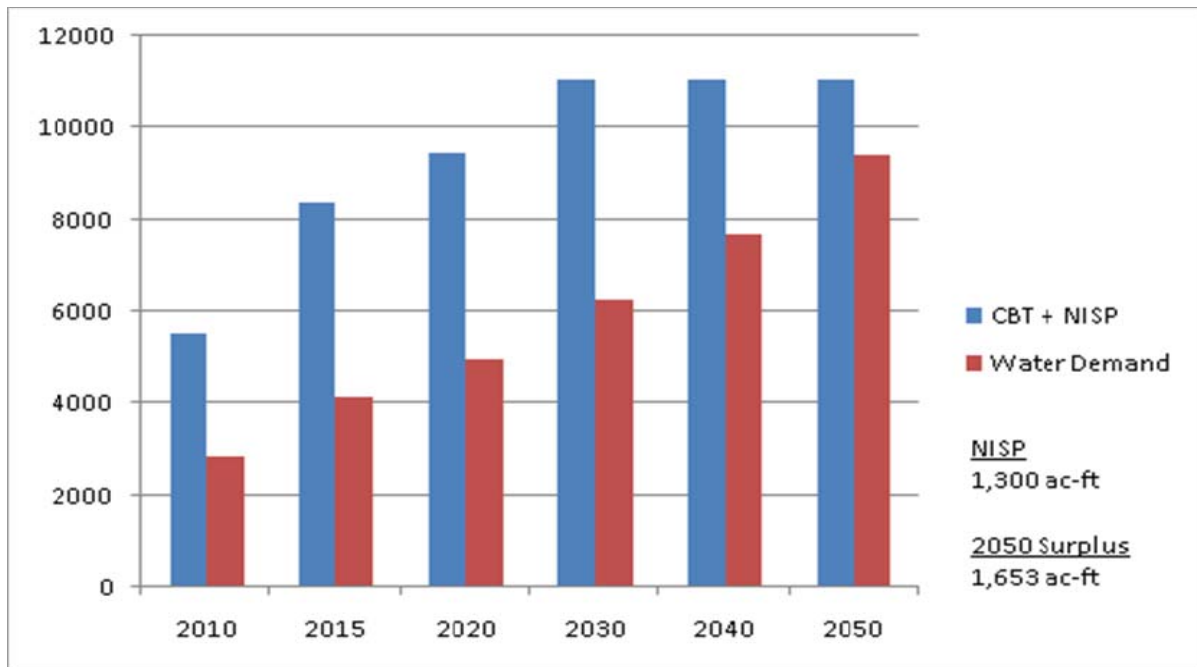


Figure 7.1 illustrates that with 1,300 ac-ft of NISP participation and an 80% CBT-20% CIL dedication policy, the Town will have sufficient water supplies past 2050. In 2050, the water demand is 9,391 ac-ft and the total supply is 11,044 ac-ft.

Since construction of NISP will begin in 2010 or 2011, the \$2.8 million generated under this alternative by 2010 will assist the Town 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 Town’s water dedication policy. Alternative C examines a more aggressive CIL policy, 70% CBT dedication and 30% CIL. Table 7.4 shows this alternative.

**Table 7.4 – Alternative C – 70% CBT Dedication, 30% CIL**

Year	Total CBT Dedication to CWCWD (ac-ft)	Alternative C - 70% CBT / 30% CIL			
		Estimated CBT Ownership (units)	Planning Quota (ac-ft/unit)	CBT Water (ac-ft)	Cash-In Lieu (\$)
2007	2347	4,605	0.6	2763	\$0
2008	2543	4,864	0.6	2918	\$1,257,044
2009	2623	5,170	0.6	3102	\$2,827,925
2010	2868	5,425	0.6	3255	\$4,222,036
2011	3118	5,710	0.6	3426	\$5,863,406
2012	3406	5,992	0.6	3595	\$7,577,607
2013	3672	6,267	0.6	3760	\$9,356,485
2014	3897	6,516	0.6	3910	\$11,080,848
2015	4126	6,777	0.6	4066	\$12,972,323
2016	4316	6,980	0.6	4188	\$14,610,570
2017	4496	7,179	0.6	4307	\$16,308,006
2018	4674	7,379	0.6	4428	\$18,105,011
2019	4821	7,541	0.6	4524	\$19,730,983
2020	4969	7,706	0.6	4623	\$21,465,427
2021	5120	7,875	0.6	4725	\$23,315,048
2022	5241	8,002	0.6	4801	\$24,950,807
2023	5361	8,132	0.6	4879	\$26,678,906
2024	5483	8,263	0.6	4958	\$28,504,195
2025	5607	8,397	0.6	5038	\$30,431,773
2026	5735	8,536	0.6	5122	\$32,497,441
2027	5863	8,674	0.6	5204	\$34,646,860
2028	5992	8,814	0.6	5289	\$36,915,509
2029	6123	8,957	0.6	5374	\$39,309,612
2030	6255	9,102	0.6	5461	\$41,835,713

Notes:

Assumes available CBT in M&I ownership by 2030.

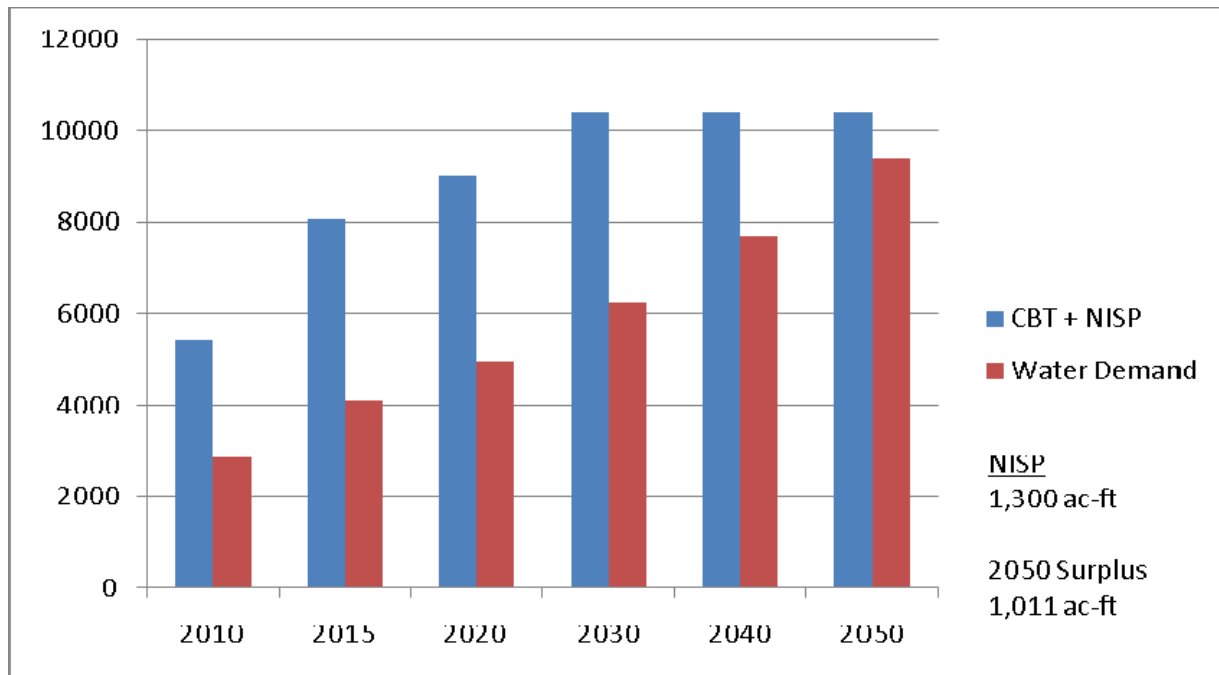
Assumes deliveries from NISP will begin in 2015.

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

As shown in Table 7.4, the water supplies are sufficient to cover water demand through 2014. Since it is estimated that NISP will not come online until 2015, there is a potential one-year “gap” where CBT supplies are insufficient to meet projected water demand. Alternative C generates approximately \$4.2 million by 2010 and \$41.8 million by 2030, which would more than pay for the Town’s NISP participation, but the potential water shortage would need to be addressed.

Figure 7.2 outlines the Town’s water situation under Alternative C.

**Figure 7.2 – Water Supply vs. Water Demand Under Alternative C – 70% CBT Dedication, 30% CIL**



If the Town participates in 1,300 ac-ft of NISP, Alternative C will have sufficient supplies past 2050. The total water demand in 2050 is 9,391 ac-ft and the supply is 10,402 ac-ft.

Although this alternative generates more cash to pay for NISP, the downside is the potential gap between when CBT supplies are short of water demand, 2014, and when NISP water is available for delivery, 2015.

Alternative D – 75% CBT Dedication and 25% CIL

The final alternative evaluated, Alternative D, is a blend of 75% CBT and 25% CIL. Table 7.5 details this alternative.

**Table 7.5 – Alternative D – 75% CBT Dedication, 25% CIL**

Year	Total CBT Dedication to CWCWD (ac-ft)	Alternative D - 75% CBT / 25% CIL			
		Estimated CBT Ownership (units)	Planning Quota (ac-ft/unit)	CBT Water (ac-ft)	Cash-In Lieu (\$)
2007	2347	4,605	0.6	2763	\$0
2008	2543	4,882	0.6	2929	\$1,047,536
2009	2623	5,211	0.6	3126	\$2,356,604
2010	2868	5,483	0.6	3290	\$3,518,363
2011	3118	5,789	0.6	3473	\$4,886,172
2012	3406	6,091	0.6	3654	\$6,314,673
2013	3672	6,386	0.6	3832	\$7,797,071
2014	3897	6,653	0.6	3992	\$9,234,040
2015	4126	6,932	0.6	4159	\$10,810,269
2016	4316	7,150	0.6	4290	\$12,175,475
2017	4496	7,363	0.6	4418	\$13,590,005
2018	4674	7,578	0.6	4547	\$15,087,509
2019	4821	7,750	0.6	4650	\$16,442,485
2020	4969	7,927	0.6	4756	\$17,887,856
2021	5120	8,108	0.6	4865	\$19,429,207
2022	5241	8,245	0.6	4947	\$20,792,339
2023	5361	8,384	0.6	5030	\$22,232,422
2024	5483	8,524	0.6	5115	\$23,753,496
2025	5607	8,668	0.6	5201	\$25,359,811
2026	5735	8,817	0.6	5290	\$27,081,201
2027	5863	8,965	0.6	5379	\$28,872,383
2028	5992	9,115	0.6	5469	\$30,762,924
2029	6123	9,268	0.6	5561	\$32,758,010
2030	6255	9,423	0.6	5654	\$34,863,094

Notes:

Assumes available CBT in M&I ownership by 2030.

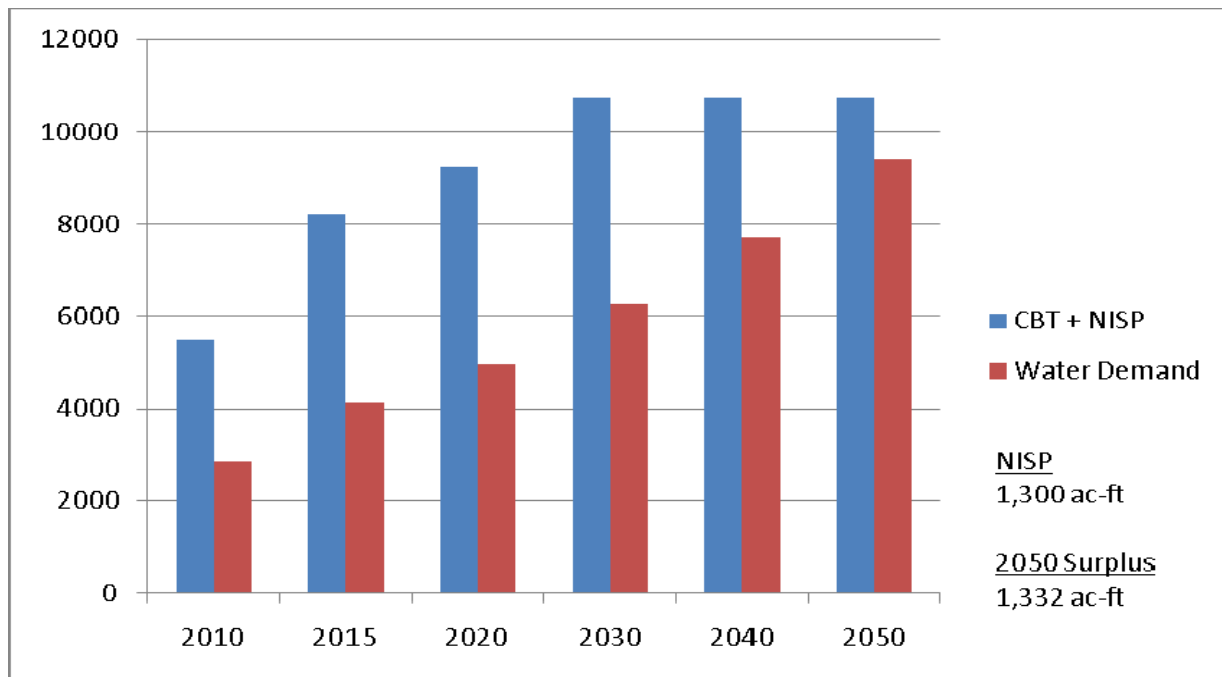
Assumes deliveries from NISP will begin in 2015.

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

As shown in Table 7.5, the water supplies are sufficient to cover water demand through 2015. Since NISP will deliver water in 2015, this dedication policy will allow the Town to maximize its supplies and the opportunity to generate revenue to fund NISP.

Figure 7.3 outlines the Town’s water situation under Alternative D.

**Figure 7.3 – Water Supply vs. Water Demand Under Alternative D – 75% CBT Dedication, 25% CIL**



If the Town participates in 1,300 ac-ft of NISP, Alternative D will have sufficient supplies past 2050. The total water demand in 2050 is 9,391 ac-ft and the supply is 10,723 ac-ft.

## CHAPTER 8 – RECOMMENDED ALTERNATIVE

### Comparison of Alternatives

The three CBT-CIL dedication alternatives are summarized in Table 8.1.

**Table 8.1 – Comparison of Alternatives**

Alternative Scenarios	B	C	D
	80% CBT/ 20% CIL	70% CBT/ 30% CIL	75% CBT/ 25% CIL
Last year CBT meets demand w/o NISP	2017	2014	2015
NISP participation	1,300	1,300	1,300
2050 water surplus	1,653	1,011	1,332
Money generated by 2010	\$2,814,690	\$4,222,036	\$3,518,363
Money generated by 2015	\$8,648,216	\$12,972,323	\$10,810,269
Money generated by 2030	\$27,890,475	\$41,835,713	\$34,863,094

Notes:

10% delivery charge to CWCWD starts in 2009

CIL program starts in 2008

### Recommended Alternative

Alternative D is the recommended alternative. It provides sufficient supplies for the Town until NISP is online. This alternative will generate \$3.5 million by 2010, which covers the currently estimated \$2.2 million NISP payment due in this year. If the Town maintains this blend through 2030, the money generated will more than pay for its entire NISP participation. A more aggressive policy can be evaluated in future updates of this Raw Water Master Plan.

### New Water Dedication Policy

The Town should change its water dedication policy to 75% CBT and 25% 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 Town 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, Town staff will need to closely monitor dedication to ensure that the Town is maintaining a 75% CBT-25% CIL balance as it collects raw water dedication. It will be important that this ratio is maintained, so water supply shortages are not created while the Town is generating cash for water acquisition.

## CHAPTER 9 – WATER PORTFOLIO SHIFT

Under Alternative D with 1,300 ac-ft of NISP, the Town will have 10,723 ac-ft in supplies compared to a water demand of 9,391 ac-ft in 2050. Although the Town has sufficient supplies through 2050, we evaluated Firestone’s estimated water supply versus water demand at build-out. Most entities do not have the opportunity to address build-out water demands this early in its growth. Firestone may have the opportunity to not only address its 2050 demands, but its total build-out water demands as well. This is a unique position and should be considered.

### **Build-Out Water Demand and Supply**

According to the Town’s Comprehensive Plan, the projected build-out population is 51,451 people. Using 2.8 persons per tap and a water usage of 0.5 ac-ft per SFE, this equates to 9,188 ac-ft of water use.

By expanding the water use projections for the other customer categories as shown in Chapter 4, we project a total build-out water demand of 13,900 ac-ft, which includes the 10% requirement to CWCWD.

Although Firestone’s supplies cover demands through 2050, this water portfolio is 3,200 ac-ft short of the Town’s total build-out water needs. This deficit can be met in a variety of ways including water conservation, shifting to irrigation with non-potable supplies, and/or additional water purchase. Each of these strategies is discussed below.

### **Water Conservation**

The most practical funding sources for NISP participation include the Colorado Water Conservation Board (CWCB) and/or the Colorado Water Resources and Power Development Authority (CWRPDA) as these two entities have the most favorable interest rates for water-related projects. The total cost of 1,300 ac-ft of NISP to Firestone is estimated at \$13.1 million. Because Firestone has completed a water conservation plan with the State, it can qualify for funding with these entities.

Firestone’s 2007 Water Conservation Plan predicts the following water savings over a ten-year planning horizon (2015):

- Residential: 4.7%
- Commercial: 13.4%
- Parks: 12.1%
- Open Space: 19.0%

This equates to approximately 1,050 ac-ft in water savings. It is difficult to project water savings past 2015. Assuming there is a diminishing return on water conservation measures with time, the total savings at build-out might be 2,000 ac-ft. This is 15% of the projected build-out water demand (including the 10% requirement to CWCWD), which is a reasonable estimate.

This reduces the total build-out water deficit from 3,200 ac-ft to 1,200 ac-ft.

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

It is recommended that the Town begin accepting Lower Boulder Ditch preferred shares and Coalridge Ditch water through annexation and consider purchase of this water on the open market. Rural Ditch water can be considered on a case-by-case basis through annexation. Use of these supplies for irrigation will extend the life of the Town's treatment and transmission system as well as the life of Firestone's potable water supplies.

It is projected that the Town will irrigate 425 acres of parks and open space areas with non-potable supplies at build-out. Because each water right delivers a different amount per share and the Town will likely acquire a combination of Lower Boulder Ditch, Coalridge Ditch, Rural Ditch, and Godding Ditch, the maximum number of shares for each water right is calculated as if the Town were only to acquire that particular right. Obtaining a combination of these rights would reduce the required number of shares from any one right. For the estimated 893 ac-ft of non-potable irrigation, the Town will need up to 39 preferred shares of Lower Boulder, 1,786 shares of Coalridge, eight shares of Rural, and 33 shares of Godding. There are 2,100 shares of Coalridge Ditch. It is unlikely the Town will be able to acquire 85% of this ditch company, so it is only shown for reference.

### **Additional Water Purchase**

Since CWCWD has exclusive rights to provide water to the Town of Firestone, future water supplies are limited to those CWCWD has the ability to treat. The current contract between CWCWD and the Town lists CBT and/or Windy Gap as the only supplies that can be conveyed on an annual basis to meet Firestone's water needs, although NISP will qualify as an adequate supply source. It will be important to include NISP in future agreements with CWCWD.

The Town's current water portfolio is 4,605 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 Town has a need for the successive uses of Windy Gap water, this water right should not be purchased for the Town's portfolio. Furthermore, the Town 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 Firestone.



The Town has sufficient supplies past 2050 with 1,300 ac-ft of NISP and its anticipated CBT acquisition through annexation under Alternative D. With water conservation and non-potable irrigation, the build-out deficit is estimated to be approximately 300 ac-ft. The Town should strongly consider increasing its participation in NISP by 300 ac-ft to 1,600 ac-ft. By increasing its NISP participation, Firestone can secure additional supplies through build-out while they are still available at a reasonable cost. The current cost of NISP is estimated at \$10,100 per acre-foot. Even if the final costs increase to \$12,000 per ac-ft, this is still the most cost-effective water supply source for the Town considering the cost of water and capital invested in CWCWD's infrastructure.

At this point in the NISP permitting, Firestone 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 Town should be able to acquire additional water if it chooses. Because the Town has sufficient supplies through 2050, additional participation in NISP may be difficult to justify. However, the Town is in an outstanding position to meet anticipated total build-out demands with 300 ac-ft of additional NISP participation. Most water providers are far from this position. Furthermore, this recommended increase in NISP participation will easily be paid off by the anticipated revenue generated from CIL. Unfortunately, a decision to increase NISP participation must occur prior to construction in 2010/2011, although the need for the additional water is several decades in the future.

### Target Water Portfolio

The Town will target the following shift in its water portfolio.

**Table 9.1 – Water Portfolio Shift**

Year	CBT (units)	NISP (ac-ft)	Lower Boulder Ditch (shares)	Coalridge Ditch (shares)	Rural Ditch (shares)	Godding Ditch (shares)
2007	4,605	1,300 (participation)				
2015	6,932	1,600	Up to 8	Up to 333	Up to 1.5	Up to 7
2050	9,423	1,600	Up to 39	Up to 1,786	Up to 8	Up to 33

The ditch-share acquisition shown in 2015 is estimated considering the level of non-potable irrigation we anticipate by that time. Non-potable water acquisition for irrigation should be a priority for the Town.

### Revenue Requirements

Under Alternative D, the Town of Firestone will generate \$3.5 million by 2010 and \$34.9 million by 2030. If the Town increases its NISP participation to 1,600 ac-ft, the expected cost will be \$16.2 million. Based on current estimates and the proposed increased NISP participation, Firestone will owe approximately \$2.5 million per year from 2010 to 2013. The \$3.5 million will sufficiently cover the first year of construction, but the Town may need to finance up to \$7.5 million. Annualized payments for a loan of \$7.5 million are approximately \$380,000 using a 3% interest rate over a 30-year term.

Firestone's will need an additional \$3.5 million when the second phase of NISP, Galeton Reservoir, begins in 2015. Annualized payments for a loan of \$11.0 million (\$7.5 million + \$3.5 million) are approximately \$560,000 using a 3% interest rate over a 30-year term.

Table 10.1 shows the anticipated revenue generated each year and cumulative total under Alternative D.

**Table 10.1 – Annual Revenue Generated from CIL vs. Estimated Loan Payment for NISP**

Year	Cash-in Lieu (\$)	Estimated NISP Loan Payment (\$)
2007	\$0	
2008	\$1,047,536	
2009	\$1,309,067	
2010	\$1,161,759	\$380,000
2011	\$1,367,809	\$380,000
2012	\$1,428,501	\$380,000
2013	\$1,482,399	\$380,000
2014	\$1,436,969	\$380,000
2015	\$1,576,229	\$560,000
2016	\$1,365,206	\$560,000
2017	\$1,414,530	\$560,000
2018	\$1,497,504	\$560,000
2019	\$1,354,976	\$560,000
2020	\$1,445,371	\$560,000
2021	\$1,541,350	\$560,000
2022	\$1,363,132	\$560,000
2023	\$1,440,083	\$560,000
2024	\$1,521,074	\$560,000
2025	\$1,606,315	\$560,000
2026	\$1,721,390	\$560,000
2027	\$1,791,183	\$560,000
2028	\$1,890,541	\$560,000
2029	\$1,995,086	\$560,000
2030	\$2,105,084	\$560,000
<b>Total</b>	<b>\$34,863,094</b>	<b>\$10,860,000</b>

As shown, the annual revenue generated from the blended CBT-CIL policy will be sufficient to cover annual payments for the initial loan in 2010 and the supplemental loan in 2015. The additional revenue generated can be used for debt reduction. If the Town begins this policy in 2008, it will generate approximately \$3.5 million over the next three years to help cover the payment due in 2010. If the Town maintains this dedication policy through 2030, the revenue generated will completely pay for its NISP participation depending on how aggressively the Town retires its debt service through CIL and money generated through water rates.

## CHAPTER 11 – CONCLUSIONS AND RECOMMENDATIONS

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It is important for the Town Board 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 this Raw Water Master Plan. The Town Board and staff can be confident that the recommendations proposed in this plan will adequately cover the Town'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 Town 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 75% CBT dedication and 25% CIL.** This dedication policy will allow the Town to continue to collect sufficient CBT to meet growth while generating revenue to pay for NISP. The policy should remain flexible to allow some developers to dedicate 100% CBT or 100% CIL. However, Town staff must carefully monitor this ratio to ensure water shortages are not created through insufficient CBT dedication as the Town is collecting CIL. This policy should be implemented in 2008.
2. **Evaluate CIL price each year.** The Town should evaluate its CIL price each year. For the Town, the CIL price will be set near the price of CBT. Since allowing CIL typically makes it easier for the developer, the CIL price can be higher than the market value of CBT for this convenience.
3. **Increase participation in NISP from 1,300 ac-ft to 1,600 ac-ft.** The Town should increase its NISP participation to a total of 1,600 ac-ft, 300 ac-ft more than its current participation. Under Alternative D, 1,600 ac-ft will provide sufficient water supplies to meet projected build-out water demands, as long as the Town commits to irrigation with non-potable supplies and implements water conservation.
4. **Acquire Lower Boulder, Coalridge, Rural, and Godding Ditch.** As lands historically irrigated with any of these water rights annex into the Town, this water should be acquired. The Town should also consider budgeting and actively purchasing Lower Boulder and Coalridge water in the open market. Use of these sources will extend the life of the Town's potable water supplies. These water rights are in high demand, so the Town can sell them in the future if needed. Before water rights are taken in by the Town, a historic use analysis should be complete to ensure the

Town is obtaining a good water right. Many times water rights were used inefficiently in the past and buyers do not get what they paid for.

5. **Continue CBT carryover and rent additional supplies in the summer or fall if there is excess.** The Town should continue participating in the CBT carryover program. The Town should carryover its full entitlement each year to safeguard against and extended drought. If the Town has carried over CBT and, based on adequate weather conditions it has excess water, then the Town can rent out its surplus CBT supplies to recover the money spent on the Carryover Program. This is a low or no-cost insurance policy for the Town to protect itself from an unforeseen drought.
6. **Complete a financial evaluation.** The shift to 25% CIL will generate some capital to fund the Town's NISP participation. It is anticipated that the policy will generate \$3.5 million by 2010 and \$34.9 million by 2030 while the cost of NISP is \$16.2 million. The broad-brush analysis contained in this report assists in the decision making process, but the Town will need to further evaluate and monitor its financial situation as we begin the blended CBT-CIL program.
7. **Complete a non-potable master plan.** As the Town acquires the local ditch rights for non-potable irrigation, 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 Town's potable supplies and infrastructure.
8. **Change agreement with CWCWD to 10% loss (reduce from 20%).** The Town is actively negotiating several parts of its agreement with CWCWD. It will be important that the Town reduce the system loss factor to at least 10% by 2009.

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**APPENDIX A**  
*Ditch Information*

**Table A.1**  
**Firestone Raw Water Master Plan**  
**Local Irrigation Ditch Summary**



Averages and ditch yields were determined using 1950-2005 diversion records

Ditch Name	Water District	Appropriation Date	Adjudication Date	No. of Shares	Cost per Share	Ave River Headgate Diversion per Share (ac-ft)	Cost per ac-ft Delivery	Decreed Capacity (cfs)	Total Estimated Capacity (cfs)	Ave. Run Time (days)	Ave. 1st Day of Delivery	Ave. Last Day of Delivery	Source	Headgate Location (T-R-S)
Coalridge	2	NA	NA	2100	\$3,000	0.5	\$6,000	232	125	180	10-Apr	8-Oct	South Platte	2N 68W 25 NE NE
Highland Southside (aka. Godding)	6	6/01/1865	6/02/1882	162	\$177,000	27.2	\$6,507	99.7	50	130	15-May	22-Sep	Boulder Creek	2N 68W 21 SW NW
		6/01/1868	6/02/1882					52.5						
Rural	5	5/10/1862	6/2/1882	50	\$800,000 - \$1,000,000	113.8	\$7,030	22.75	75	138	13-May	28-Sep	Boulder Creek	2N 68W 20 NE SW
		3/10/1863	6/2/1882					60.25						
Lower Boulder	6	10/1/1859	6/2/1882	200 pref	\$190,000	23.1	\$8,211	24.98	230	180	10-Apr	8-Oct	Boulder Creek	1N 69W 16 SW SW
		5/1/1863	6/2/1882					2.6						
		2/1/1865	6/2/1882					3.872						
		5/15/1866	6/2/1882	200 common	\$30,000	7.7	\$3,891	2.66						
		6/1/1866	6/2/1882					1						
		6/1/1870	6/2/1882					96.972						
Lupton Bottom	2	5/15/1863	4/28/1883	82.5	\$600,000	220.2	\$2,725	47.7	155	222	13-Mar	21-Oct	South Platte	1N 66W 19 SW NW
		03/10/1871	4/28/1883					10						
		09/15/1873	4/28/1883					92.87						
Last Chance	5	3/15/1872	6/2/1882	20	\$2,311,500	462.3	\$5,001	96.94	100	169	25-Apr	11-Oct	St. Vrain Creek	2N 68W 3
		6/30/1878	7/13/1903					10						
Boulder & Weld County	6	4/1/1863	6/2/1882	20	\$336,700	51.8	\$6,499	2.5	50	130	8-Mar	24-Sep	Boulder Creek	1N 69W 15 NW NE
		5/1/1871	6/2/1882					59.4						

# Lower Boulder Ditch

Division 1  
 District 6  
 Total Shares = 200 preferred  
 200 common  
 400 Total



All diversions are in acre-feet

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1961	0	0	0	0	467.1	1485.6	2215.6	1690.9	910.4	0	0	0	6769.6
1967	0	0	0	0	1882.3	580.2	1017.5	1537.2	1487.6	549.4	0	0	7054.2
1958	0	0	0	47.6	174.5	3655.6	1797.1	1537.2	1330.9	117	0	0	8659.9
1954	0	0	0	871.7	1797.1	1492.6	1542.2	1525.3	1376.5	299.5	0	0	8904.9
1966	0	0	0	419.5	1730.6	2158	1611.6	1526.3	1487.6	119	0	0	9052.6
1981	0	0	0	0	1854.6	2294.9	1989.5	1537.2	1527.3	148.8	0	0	9352.3
2002	0	0	0	1456.5	1565	1903.5	1174.6	1193.7	1133	1094.1	0	0	9520.4
1972	0	0	0	208.3	2498.4	3814.3	1897.2	1571.9	684.3	0	0	0	10674.4
1957	0	0	0	0	0	2598.4	4359.7	2324.7	1234.7	297.5	0	0	10815
1989	0	0	0	472.5	2976.6	3174.6	1906.1	1462.8	963.7	0	0	0	10956.3
1991	0	0	0	815.2	2923.9	2760.6	2046.4	1357.2	1056.6	0	0	0	10959.9
1963	0	0	0	793.4	2171.9	2615.2	1577.9	1579.9	1673.1	603	0	0	11014.4
1952	0	0	0	0	1204	5329.7	3251	1273.4	0	0	0	0	11058.1
1979	0	0	0	0	293.6	2826.5	4643.4	1755.4	1354.7	218.2	0	0	11091.8
1995	0	0	0	286.9	724	717.7	4185.7	4117.4	1032.1	37.1	0	0	11100.9
1977	0	0	0	0	1910.1	4121.7	1701.8	1803	1487.6	148.8	0	0	11173
1955	0	0	0	767.6	1816.9	4024.5	1626.5	1655.2	1449.9	0	0	0	11340.6
2001	0	0	0	0	1125.2	3712.1	2621.6	1892.5	1306.7	756.4	0	0	11414.5
1969	0	0	0	462.2	1630.4	1802	3942.2	1658.2	1505.5	420.5	0	0	11421
2005	0	0	0	854.1	1931.1	2403.8	2900.1	1517.9	1174.6	728.5	NC		11510.1
1959	0	0	0	0	1237.7	4570	2771.9	1611.6	1332.9	0	0	0	11524.1
1976	0	0	0	204.3	2007.3	3996.8	2025.2	2120.4	1378.5	0	0	0	11732.5
1992	0	0	0	671.1	3538.7	2321.7	2125.9	1655.2	1272.1	266.1	0	0	11850.8
2003	0	0	0	486.2	1498.5	2898.9	3052.6	1297	1657.4	961.4	0	0	11852
1964	0	0	0	119	2590.5	2459.5	1878.4	1537.2	1487.6	1219.9	620.8	0	11912.9
1970	0	0	0	0	2704.5	1910.1	4349.8	1581.8	1428.1	0	0	0	11974.3
1997	0	0	0	0	2349.9	1349.3	5133.3	1969	1124.4	86	0	0	12011.9
1987	0	0	0	0	2011.3	3485	2956.8	2081.7	1426.1	71.4	0	0	12032.3
1988	0	0	0	0	2252	3826.2	3284.7	1448.4	1330.5	0	0	0	12141.8
1960	0	0	0	480	313.4	4407.3	3187.5	1570.9	1487.6	785.5	0	0	12232.2
1994	0	0	0	277.7	3092.5	4928.6	1338.3	1330.4	1174	205.7	0	0	12347.2
1974	0	0	0	0	2354.4	4016.6	3300.5	1658.2	1289.3	0	0	0	12619
1973	0	0	0	0	119	4034.4	5408	1910.1	1150.4	0	0	0	12621.9
1999	0	0	0	183	954.2	2857.8	4705.5	2434.7	1340	163.2	0	0	12638.4
1983	0	0	0	0	0	1338.9	4819.9	4286.3	2037.1	396.7	0	0	12878.9
2004	0	0	0	1021.1	2751.9	2625.6	2242.3	1947.8	1257.7	1060.7	0	0	12907.1
1980	0	0	0	0	0	4633.5	5200.7	1707.8	1517.4	39.7	0	0	13099.1
1950	0	0	0	937.2	1971.6	4085	2159	1537.2	1487.6	1061.2	35.7	0	13274.5
1968	0	0	0	0	1328	5291	2488.3	1930.9	1487.6	773.6	0	0	13299.4
2000	0	0	0	651	3294.9	4322	1892.9	1209.1	1216.5	947.9	0	0	13534.3
1953	0	0	0	39.7	2455.6	4607.7	2456.6	1729.6	1428.1	922.3	0	0	13639.6
1975	0	0	0	0	1678	2598.4	6049.7	1880.4	1457.9	79.3	0	0	13743.7
1971	0	0	0	0	501.8	5028.6	5712.5	1736.6	793.4	0	0	0	13772.9
1965	0	0	0	426.5	2464.5	2163	4354.8	3009	1365.6	0	0	0	13783.4
1993	0	0	0	218.2	2671.4	3619.4	5047.8	1506.5	1055.2	0	0	0	14118.5
1951	0	0	0	0	2842.4	4453	4097.9	1541.2	1408.3	138.8	0	0	14481.6
1962	0	0	0	220.2	3713.1	2703.5	4620.6	1575.9	1465.8	251.9	0	0	14551
1982	0	0	0	543.5	1487.6	2632.1	4962.7	3530.6	1396.4	0	0	0	14552.9
1978	0	0	0	495.9	543.5	3695.3	6289.7	1949.8	1612.6	0	0	0	14586.8
1998	0	0	0	0	2946.7	3964.2	4190	2266.6	1252.9	475.1	0	0	15095.5
1990	0	0	0	0	2814.6	4614.7	4703.9	1445.3	1410.3	158.7	0	0	15147.5
1996	0	0	0	314.9	4748.2	2900.5	5204.7	1561.2	880.5	0	0	0	15610
1985	0	0	0	261.8	1989.5	5666.9	3759.7	1824	1487.6	644.6	0	0	15634.1
1956	0	0	0	454.2	3606	5667.9	1812.9	1900.2	1455.9	1449.9	39.7	0	16386.7
1984	0	0	0	0	993.7	2830.5	7412.3	3459.2	1487.6	446.3	0	0	16629.6
1986	0	0	0	0	3026.8	3249.6	7240.4	1537.2	1547.1	545.5	0	0	17146.6
Avg.	0.00	0.00	0.00	276.09	1884.48	3271.88	3397.24	1853.51	1313.66	333.74	12.66	0.00	12343.02
Prorata preferred	0.00	0.00	0.00	0.52	3.53	6.13	6.37	3.48	2.46	0.63	0.02	0.00	23.14
Prorata common	0.00	0.00	0.00	0.17	1.18	2.04	2.12	1.16	0.82	0.21	0.01	0.00	7.71

Notes: Tabulated values are riverwater to irrigation only pending further information



# Rural Ditch

Division 1  
 District 6  
 Total Shares = 50  
 All diversions in acre-feet



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Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1950	0	0	0	0	634	1188	1146	350	512	152	0	0	3982
1951	0	0	0	0	512	1206	1748	944	840	100	0	0	5350
1952	0	0	0	0	0	1402	1500	1562	570	146	0	0	5180
1953	0	0	0	0	860	1516	1220	768	460	0	0	0	4824
1954	0	0	0	88	1370	1474	1084	164	0	0	0	0	4180
1955	0	0	0	96	1602	1046	1480	690	146	200	0	0	5260
1956	0	0	0	0	1670	1532	1756	1164	102	148	0	0	6372
1957	0	0	0	0	0	988	2596	906	558	768	0	0	5816
1958	0	0	0	0	0	872	1242	1046	552	822	0	0	4534
1959	0	0	0	0	494	1874	1118	1016	756	408	0	0	5666
1960	0	0	0	0	120	1862	1322	1126	882	290	0	0	5602
1961	0	0	0	0	0	906	1272	1416	146	0	0	0	3740
1962	0	0	0	0	996	1348	1540	1050	256	122	0	0	5312
1963	0	0	0	164	1560	520	1056	946	534	72	0	0	4852
1964	0	0	0	0	1670	292	1774	696	154	0	0	0	4586
1965	0	0	0	0	982	0	1158	596	138	0	0	0	2874
1966	0	0	0	0	936	1270	1588	574	96	0	0	0	4464
1967	0	0	0	120	274	258	202	1304	194	176	0	0	2528
1968	0	0	0	0	780	1630	2490	754	84	0	0	0	5738
1969	0	0	0	40	410	60	1436	1176	356	0	0	0	3478
1970	0	0	0	0	1004	590	1986	1422	352	0	0	0	5354
1971	0	0	0	0	350	2438	2740	1508	704	0	0	0	7740
1972	0	0	0	24	1256	1692	1994	1168	870	0	0	0	7004
1973	0	0	0	0	0	1046	2094	1090	142	0	0	0	4372
1974	0	0	0	0	1175	1497	2471	1152	309	0	0	0	6604
1975	0	0	0	0	893	1384	2194	1447	883	0	0	0	6801
1976	0	0	0	93	849	1641	1970	1176	828	20	0	0	6577
1977	0	0	0	0	712.8	1520.6	1019.7	865.3	342.5	91.1	0	0	4552
1978	0	0	0	0	0	948.4	2415.6	1289	545.5	544.5	0	0	5743
1979	0	0	0	0	0	627.7	2702.7	1320.7	974.2	130.7	0	0	5756
1980	0	0	0	0	0	1498.9	2480.9	1296.9	558.4	0	0	0	5835.1
1981	0	0	0	0	524.7	1289	1817.6	687.1	396	0	0	0	4714.4
1982	0	0	0	483.1	643.5	1354.3	2203.7	1718.6	299	0	0	0	6702.2
1983	0	0	0	0	0	431.6	1827.5	1560.2	671.2	128.7	0	0	4619.2
1984	0	0	0	0	914.8	1586	2578	2053.3	1011.8	0	0	0	8143.9
1985	0	0	0	0	316.8	1700.8	1578.1	1190	348.5	0	0	0	5134.2
1986	0	0	0	0	412.57	398.68	2066.8	918.36	414.55	0	0	0	4210.97
1987	0	0	0	0	266.78	893.63	1236.9	692.24	63.47	0	0	0	3153.03
1988	0	0	0	0	298.72	2037.5	1987.5	1468	210.49	0	0	0	6002.16
1989	0	0	0	0	1546.2	938.61	2402.7	1751.9	23.72	0	0	0	6663.17
1990	0	0	0	0	812.24	1114.6	1380.7	1394.8	841.68	0	0	0	5543.96
1991	0	0	0	0	1093.1	1765.3	2782.9	2313.6	364.9	0	0	0	8319.71
1992	0	0	0	0	885.39	1301.8	2259.7	1261	0	0	0	0	5707.93
1993	0	0	0	0	1609	1191	1669.3	972.27	331.15	0	0	0	5772.64
1994	0	0	0	0	665	1502	1967	1736	1052	373	0	0	7295
1995	0	0	0	0	0	0	1603	2446	953	0	0	0	5002
1996	0	0	0	0	1397	1092	1409	1274	301	0	0	0	5473
1997	0	0	0	0	804	630	1812	1053	1028	0	0	0	5327
1998	0	0	0	203	1954	1838	1919	1540	1321	0	0	0	8775
1999	0	0	0	198	599	1144	1995	1239	868	500	0	0	6542.3
2000	0	0	0	97	1542	1816	1629	1807	1540	0	0	0	8429.9
2001	0	0	0	0	434	1572	1650	1267	1162	361	0	0	6445.9
2002	0	0	0	318	952	1007	1115	440	341	869	0	0	5041
2003	0	0	0	79	1060	1228	1961	1603	2139	910	0	0	8979.5
2004	0	0	0	751	1451	1659	2107	1680	1715	124	0	0	9485.6
2005	0	0	0	0	1184	1423	1298	1131	1101	415	NC		6551.6
Avg.	0.00	0.00	0.00	49.17	758.47	1197.15	1768.79	1199.63	577.52	140.54	0.00	0.00	5691.27
Prorata	0.00	0.00	0.00	0.98	15.17	23.94	35.38	23.99	11.55	2.81	0.00	0.00	113.83

# Last Chance Ditch

Division 1  
 District 5  
 Total Shares = 20  
 All diversions in acre-feet



Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1950	0	0	0	0	1051	1974	2003	1845	1359	278	0	0	8510
1951	0	0	0	0	397	1488	1537	664	992	0	0	0	5078
1952	0	0	0	0	555	1646	1845	1617	952	179	0	0	6794
1953	0	0	0	0	833	1726	1984	1230	1121	208	0	0	7102
1954	0	0	0	0	1527	1785	1805	1815	1279	89	0	0	8300
1955	0	0	0	298	1178	1785	1845	1716	1141	179	0	0	8142
1956	0	0	0	417	1845	1785	1845	1845	1200	208	0	0	9145
1957	0	0	0	0	0	1329	2460	2460	1567	238	0	0	8054
1958	0	0	0	0	0	1607	1845	1845	1210	159	0	0	6666
1959	0	0	0	0	0	1666	2916	2559	1765	0	0	0	8906
1960	0	0	0	357	60	2380	2460	2222	1785	357	0	0	9621
1961	0	0	0	0	0	595	1845	1845	912	0	0	0	5197
1962	0	0	0	357	1607	714	1845	1845	1329	79	0	0	7776
1963	0	0	0	635	1857	1279	2380	1845	1349	0	0	0	9345
1964	0	0	0	0	1371	1785	2360	2460	1507	119	0	0	9602
1965	0	0	0	0	1458	516	2003	1587	1051	1845	0	0	8460
1966	0	0	0	0	1745	2083	2162	1845	1349	238	0	0	9422
1967	0	0	0	0	0	555	436	1785	1131	179	0	0	4086
1968	0	0	0	0	0	1131	873	476	595	179	0	0	3254
1969	0	0	0	270	218	405	555	629	387	0	0	0	2464
1970	0	0	0	0	565	599	557	466	345	0	0	0	2532
1971	0	0	0	83	462	526	599	391	303	0	0	0	2364
1972	0	0	0	250	1162	986	450	516	424	0	0	0	3788
1973	0	0	0	0	167	1190	1763	1353	1055	222	0	0	5750
1974	0	0	0	0	518	1000	1507	157	0	0	0	0	3182
1975	0	0	0	0	1476	1486	2920	2339	2124	1615	0	0	11960
1976	0	0	0	891	1866	2731	2519	1944	1603	954	0	0	12508
1977	0	0	0	0	2011	2981	2688	2662	2515	1139	0	0	13996
1978	0	0	0	0	248	2005	2981	2828	2364	1740	12	0	12178
1979	0	0	0	0	317	1111	2549	2220	1091	926	0	0	8214
1980	0	0	0	0	143	1886	2222	2172	1621	678	0	0	8722
1981	0	0	0	1337	2170	2164	2666	2930	2430	1910	0	0	15607
1982	0	0	0	1156	1624	2007	2489	2519	1724	349	0	0	11868
1983	0	0	0	0	0	559	2017	2043	2067	1736	36	0	8458
1984	0	0	0	0	944	1930	2301	1876	720	125	248	0	8144
1985	0	0	0	387	1630	1999	2317	1995	1839	319	0	0	10486
1986	0	0	0	0	1313	1970	2507	2543	1932	1158	0	0	11423
1987	0	0	0	389	1521	1523	2567	2698	2112	1139	0	0	11949
1988	0	0	0	218	1720	2046	2935	2844	2412	1621	0	0	13796
1989	0	0	0	260	2139	1757	3047	2892	1843	0	0	0	11938
1990	0	0	0	0	1732	1596	2963	2833	1922	335	0	0	11381
1991	Water taken but no data available												0
1992	Water taken, no staff gauge on Parshall. Recorder not installed												0
1993	0	0	0	0	2046	2193	3266	2702	906	0	0	0	11113
1994	0	0	0	0	2475	2982	2605	2038	1796	448	0	0	12344
1995	0	0	0	728	2568	2754	2344	2868	2209	101	0	0	13572
1996	0	0	0	0	2065	2351	3142	2826	1826	558	0	0	12768
1997	0	0	0	0	1176	1335	3100	1987	2236	1349	0	0	11183
1998	0	0	0	0	1710	2572	3126	2180	1902	640	0	0	12130
1999	0	0	0	1457	1252	1997	2694	1437	1023	993	0	0	10853
2000	0	0	0	156	1829	1735	2071	1724	1189	873	0	0	9576
2001	0	0	0	0	1202	1589	1783	2170	1509	1316	0	0	9568
2002	0	0	0	375	1555	1841	2309	2147	1382	0	0	0	9610
2003	0	0	0	1527	1666	2049	3459	4663	2995	1726	0	0	18086
2004	0	0	0	77	2398	2281	2354	2340	2013	668	0	0	12132
2005	0	0	0	0	1182	2733	2097	2150	1964	0	NC	NC	10126
Avg.	0.00	0.00	0.00	215.29	1158.40	1679.60	2183.66	1992.37	1469.94	540.22	5.58	0.00	9244.96
Prorata	0.00	0.00	0.00	10.76	57.92	83.98	109.18	99.62	73.50	27.01	0.28	0.00	462.25

# Highland South Side Ditch (aka Godding Ditch)

Division 1  
 District 6  
 Total Shares = 183  
 All diversions in acre-feet



Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1950	0	0	0	0	839	1484	814	140	40.3	246	0	0	3563.3
1951	0	0	0	0	899	901	1359	734	298	0	0	0	4191
1952	0	0	0	0	179	1894	1087	538	109	0	0	0	3807
1953	0	0	238	69.4	607	1470	965	215	98.2	5.95	0	0	3668.55
1954	0	0	47.6	0	663	97.2	29.8	27.3	19.8	0	0	0	884.7
1955	0	0	0	0	1020	1379	487	405	130	59.5	0	0	3480.5
1956	0	0	0	0	1049	1660	734	245	171	9.92	0	0	3868.92
1957	0	0	0	0	0	708	1809	1369	529	363	0	0	4778
1958	0	0	0	0	0	1295	972	376	143	0	0	0	2786
1959	0	0	0	0	579	1841	1654	529	0	0	0	0	4603
1960	0	0	0	188	327	1978	1262	224	202	69.4	0	0	4250.4
1961	0	0	0	0	0	484	1260	595	9.92	0	0	0	2348.92
1962	0	0	0	0	1422	1351	2565	419	49.6	0	0	0	5806.6
1963	0	0	0	0	1232	863	132	571	369	252	0	0	3419
1964	0	0	0	0	988	1621	495	212	66.4	46	0	0	3428.4
1965	0	0	0	0	545	879	2055	1555	593	35.7	0	0	5662.7
1966	0	0	0	0	353	1699	430	292	597	1275	0	0	4646
1967	0	0	0	0	700	438	1466	594	399	286	0	0	3883
1968	0	0	0	59.5	611	2120	1924	509	662	311	0	0	6196.5
1969	0	0	0	121	530	1097	2886	401	335	87.3	0	0	5457.3
1970	0	0	0	0	1105	1164	2729	692	655	0	0	0	6345
1971	0	0	0	0	256	2505	2698	788	378	0	0	0	6625
1972	0	0	0	23.8	1305	1723	1404	797	778	97.2	0	0	6128
1973	0	0	0	0	270	2204	2648	1012	446	0	0	0	6580
1974	0	0	0	0	1055	1611	2337	787	0	0	0	0	5790
1975	0	0	0	0	742	1706	2535	1204	52.6	0	0	0	6239.6
1976	0	0	0	0	1012	2051	1653	657	8.93	0	0	0	5381.93
1977	0	0	0	0	768	1617	576	149	39.7	0	0	0	3149.7
1978	0	0	0	0	0	1277	2462	1058	0	0	0	0	4797
1979	0	0	0	0	0	904	2426	1089	611	157	0	0	5187
1980	0	0	0	0	0	1529	2402	509	0	0	0	0	4440
1981	0	0	0	0	256	944	1812	292	0	0	0	0	3304
1982	0	0	0	0	617	1283	2509	1880	520	0	0	0	6809
1983	0	0	0	0	0	381	1970	1763	978	159	0	0	5251
1984	0	0	0	0	260	1603	2479	1486	869	79.3	0	0	6776.3
1985	0	0	0	0	500	1976	1956	1246	256	0	0	0	5934
1986	0	0	0	0	409	1142	2571	1339	664	165	0	0	6290
1987	0	0	0	0	505	1627	1741	915	199	0	0	0	4987
1988	0	0	0	0	307	1990	1904	992	359	0	0	0	5552
1989	0	0	0	0	725	925	1619	1072	65	0	0	0	4406
1990	0	0	0	0	748	1411	1937	1210	509	0	0	0	5815
1991	0	0	0	0	679	1636	2548	1525	98.6	0	0	0	6486.6
1992	0	0	0	0	1286	1439	2326	738	0	0	0	0	5789
1993	0	0	0	0	760	1640	2866	2135	618	0	0	0	8019
1994	0	0	0	0	875	1736	1207	521	194	12.3	0	0	4545.3
1995	0	0	0	0	0	0	1803	2651	449	0	0	0	4903
1996	0	0	0	0	1009	1138	2381	1804	363	0	0	0	6695
1997	0	0	0	0	422	893	2751	1258	686	0	0	0	6010
1998	0	0	0	0	734	1720	2773	1706	762	0	0	0	7695
1999	0	0	0	366	35.7	1150	2337	1501	474	0	0	0	5863.7
2000	0	0	0	69.4	1079	1707	1621	1050	497	8.57	0	0	6031.97
2001	0	0	0	0	427	1773	2043	661	403	0	0	0	5307
2002	0	0	0	0	501.5	665.1	0	23.8	102	234.2	0	0	1526.6
2003	0	0	0	0	89.3	1429.1	2611.3	473.3	307.5	0	0	0	4910.5
2004	0	0	0	0	538.4	519	296.4	180.7	0	0	0	0	1534.5
2005	0	0	0	0	461.4	799.7	1582.8	513.9	11.1	3369			6737.9
Avg.	0.00	0.00	5.10	16.02	576.43	1340.66	1748.22	850.52	306.69	130.86	0.00	0.00	4974.51
Prorata	0.00	0.00	0.03	0.09	3.15	7.33	9.55	4.65	1.68	0.72	0.00	0.00	27.18

**Notes:** Tabulation includes only river water applied to irrigation pending further information from water commissioner.

# Boulder and Weld County Ditch

Division 1  
 District 6  
 Total Shares = 20  
 All diversions are in acre-feet



Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1950	0	0	0	0	158.7	771.6	121	0	0	0	0	0	1051.3
1951	0	0	0	0	638.7	985.8	1069.1	107.1	0	0	0	0	2800.7
1952	0	0	0	0	607	1684	652.6	0	0	0	0	0	2943.6
1953	0	0	0	0	234.1	1162.3	327.3	0	0	0	0	0	1723.7
1954	0	0	15.9	7.9	0	0	0	0	0	0	0	0	23.8
1955	0	0	0	0	0	573.2	0	0	0	0	0	0	573.2
1956	0	0	0	0	890.6	1265.5	0	43.6	0	0	0	0	2199.7
1957	0	0	0	0	0	603	1061.2	402.7	0	0	0	0	2066.9
1958	0	0	0	0	0	1094.9	0	0	0	0	0	0	1094.9
1959	0	0	0	0	361	1279.4	210.3	0	0	0	0	0	1850.7
1960	0	0	0	79.3	230.1	1055.2	162.6	0	0	0	0	0	1527.2
1961	0	0	0	0	0	761.7	0	79.3	0	0	0	0	841
1962	0	0	0	0	335.2	718	682.3	0	0	0	0	0	1735.5
1963	0	0	0	0	0	164.6	0	0	0	0	0	0	164.6
1964	0	0	0	0	115	1202	0	0	0	0	0	0	1317
1965	0	0	0	0	329.3	363	601	132.9	0	0	0	0	1426.2
1966	0	0	0	0	0	43.6	0	0	0	0	0	0	43.6
1967	0	0	0	0	138.8	73.4	53.6	0	0	0	0	0	265.8
1968	0	0	0	0	73.4	698.2	41.7	0	0	0	0	0	813.3
1969	0	0	0	0	0	126.9	196.4	0	0	0	0	0	323.3
1970	0	0	0	0	376.9	450.3	265.8	0	0	0	0	0	1093
1971	0	0	0	0	73.4	634.7	843	0	0	0	0	0	1551.1
1972	0	0	0	0	99.2	394.7	0	0	0	0	0	0	493.9
1973	0	0	0	0	0	608.9	390.8	0	0	0	0	0	999.7
1974	0	0	0	0	91.2	831.1	168.6	0	0	0	0	0	1090.9
1975	0	0	0	0	17.9	533.6	1011.6	0	0	0	0	0	1563.1
1976	0	0	0	0	29.8	394.7	29.8	0	0	0	0	0	454.3
1977	0	0	0	0	0	247.9	0	0	0	0	0	0	247.9
1978	0	0	0	0	29.8	797.4	878.7	0	0	0	0	0	1705.9
1979	0	0	0	0	0	315.4	325.3	0	0	0	0	0	640.7
1980	0	0	0	0	0	607	410.6	0	0	0	0	0	1017.6
1981	0	0	0	0	0	105.1	0	0	0	0	0	0	105.1
1982	0	0	0	0	0	345.1	355	47.6	0	0	0	0	747.7
1983	0	0	0	0	0	61.5	164.6	119	0	0	0	0	345.1
1984	0	0	0	0	226.1	474.1	893.6	207.3	148.8	9.9	0	0	1959.8
1985	0	0	0	0	106.1	968.9	197.4	185.5	143.8	0	0	0	1601.7
1986	0	0	0	0	105.1	299.5	636.7	0	7.9	0	0	0	1049.2
1987	0	0	0	0	188.4	196.4	0	0	0	0	0	0	384.8
1988	0	0	0	0	104.9	831.5	420.7	163	107	0	0	0	1627.1
1989	0	0	0	0	94.6	138.3	0	0	0	0	0	0	232.9
1990	0	0	0	0	99.8	608.8	281	0	0	0	0	0	989.6
1991	0	0	0	0	328.2	315.3	65.3	0	0	0	0	0	708.8
1992	0	0	0	0	361.6	8	105.5	0	0	0	0	0	475.1
1993	0	0	0	0	221.8	132.6	434.3	0	0	0	0	0	788.7
1994	0	0	0	0	366.6	689.1	0	0	0	0	0	0	1055.7
1995	0	0	0	0	0	79.5	570.3	189.2	0	0	0	0	839
1996	0	0	0	0	673.2	471.9	421.5	8.9	0	0	0	0	1575.5
1997	0	0	0	0	320.2	136.3	355.2	114.5	0	0	0	0	926.2
1998	0	0	0	0	350.7	481.2	623.8	281.8	0	0	0	0	1737.5
1999	0	0	0	0	79.4	557.5	581.2	66.7	245.1	0	0	0	1529.9
2000	0	0	0	0	612.2	291.8	0	0	0	0	0	0	904
2001	0	0	0	0	82.7	608.5	170.2	164.2	0	0	0	0	1025.6
2002	0	0	0	0	8.5	58.3	0	0	0	0	0	0	66.8
2003	0	0	0	0	62.3	291.4	116.2	0	0	0	0	0	469.9
2004	0	0	0	0	345.1	168	204.7	0	0	0	0	0	717.8
2005	0	0	0	46.4	176.9	70.2	190.6	37.1	0	0	0	0	521.2
Avg.	0.00	0.00	0.28	2.39	174.01	514.84	290.91	41.97	11.65	0.18	0.00	0.00	1036.23
Prorata	0.00	0.00	0.01	0.12	8.70	25.74	14.55	2.10	0.58	0.01	0.00	0.00	51.81

Notes: Tabulated values are riverwater to irrigation only pending further information

# Lupton Bottom Ditch

Division 1

District 2

Total Shares = 82.5

All diversions in acre-feet

Includes Slate Ditch Exchange (96-98)



clearWATER solutions  
water rights • planning • engineering

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1950	0	0	0	1087	2454	4584	3850	3019	2856	2763	0	0	20613
1951	0	0	0	0	3416	5215	5673	3231	2707	881	238	0	21361
1952	0	0	0	337	3614	6595	5113	3612	2848	2819	387	0	25325
1953	0	0	0	0	3406	5290	3939	3796	2834	2682	496	0	22443
1954	0	0	0	1141	2926	2838	3019	3005	2852	2573	0	0	18354
1955	0	0	0	536	3261	2926	2924	3205	2473	1682	0	0	17007
1956	0	0	0	1010	3785	4786	3009	2969	2668	2761	0	0	20988
1957	0	0	0	0	426	3316	5324	3941	2469	924	0	0	16400
1958	0	0	0	63	1444	4429	3370	3025	2551	1906	0	0	16788
1959	0	0	0	0	2618	4921	3884	3525	2331	0	0	0	17279
1960	0	0	0	1214	1857	5344	4792	3158	2711	847	0	0	19923
1961	0	0	0	139	2404	2428	3874	4836	1553	278	0	0	15512
1962	0	0	0	496	4729	3554	4350	3310	2795	2277	0	0	21511
1963	0	0	0	916	2906	2541	2965	3306	2553	1817	0	0	17004
1964	0	0	0	426	2975	2979	3291	3600	2779	2567	0	0	18617
1965	0	0	0	1214	2920	1490	4425	4389	1958	319	0	0	16715
1966	0	0	0	1579	3055	2999	3146	3275	2299	583	0	0	16936
1967	0	0	61	2085	2273	583	2180	3457	2811	1101	0	0	14551
1968	0	0	0	1202	2856	4015	3969	4019	3070	764	0	0	19895
1969	0	0	0	1543	2073	1938	5373	4267	2866	353	0	0	18413
1970	0	0	0	0	3465	2497	5262	5074	1938	0	0	0	18236
1971	0	0	0	286	1954	5461	5437	3794	1496	0	0	0	18428
1972	0	0	0	2136	2799	2543	4298	3168	843	817	0	0	16604
1973	0	0	0	0	248	3463	5457	4483	1682	0	0	0	15333
1974	0	0	0	107	3632	3737	4495	3846	1468	339	0	0	17624
1975	0	0	0	522	2795	2450	5177	3995	2077	756	0	0	17772
1976	0	0	0	1742	2662	3854	4203	4663	1791	54	0	0	18969
1977	0	0	357	1545	3644	3400	2801	3076	2684	1704	0	0	19211
1978	0	0	0	1775	1355	3723	4584	3372	2713	1396	0	0	18918
1979	0	0	0	0	1682	2729	5980	2918	2311	1874	0	0	17494
1980	0	0	0	0	526	4255	5113	4445	2398	1345	0	0	18082
1981	0	0	0	805	2031	2104	3334	3344	2565	1097	0	0	15280
1982	0	0	0	1946	2315	2348	4209	4159	1734	323	0	0	17034
1983	0	0	0	0	538	855	3606	4620	2134	1277	0	0	13030
1984	0	0	0	0	1874	3683	5492	3483	1904	93	0	0	16529
1985	0	0	0	1769	1412	4584	4346	4707	2711	0	0	0	19529
1986	0	0	323	589	2751	3832	5889	4727	2854	163	0	0	21128
1987	0	0	0	635	2991	4239	4292	4132	2567	186	0	0	19042
1988	0	0	0	787	3574	4453	4655	4034	2196	1515	0	0	21214
1989	0	0	0	1410	4058	2872	4485	4479	1420	153	0	0	18877
1990	0	0	0	339	3610	3955	4895	4267	2178	200	0	0	19444
1991	0	0	0	1868	3227	3396	5816	5060	2406	413	0	0	22186
1992	0	0	0	708	3790	3736	5202	3488	2053	903	0	0	19880
1993	0	0	0	373	3208	3574	5236	3515	2147	673	0	0	18726
1994	0	0	0	1345	3796	4516	3505	3765	2469	613	0	0	20009
1995	0	0	0	1268	997	1145	4027	5614	2148	80	0	0	15279
1996	0	0	79	1435	3622	3415	4711	3867	1715	142	0	0	18986
1997	0	0	0	794	3149	2442	5640	2650	2216	321	0	0	17212
1998	0	0	113	769	3372	4222	5101	3904	2242	235	0	0	19958
1999	0	0	404	622	760	2415	4971	3215	1846	0	0	0	14233
2000	0	0	332	1701	2700	3615	3604	3651	2467	483	0	0	18552
2001	0	0	169	530	1475	3441	3486	3760	2444	1691	107	0	17103
2002	0	0	20	2139	2369	2228	2617	2491	1941	1573	0	0	15378
2003	0	0	360	751	951	2280	3587	2575	1994	2104	0	0	14601
2004	0	0	391	1089	2336	2777	3372	2954	2344	931	0	0	16193
2005	0	0	300	874	2372	2312	3217	3434	2089	896	NC	NC	15494
Avg.	0.00	0.00	51.94	850.81	2561.39	3380.73	4295.94	3744.19	2288.73	968.69	22.33	0.00	18164.36
Prorata	0.00	0.00	0.63	10.31	31.05	40.98	52.07	45.38	27.74	11.74	0.27	0.00	220.17