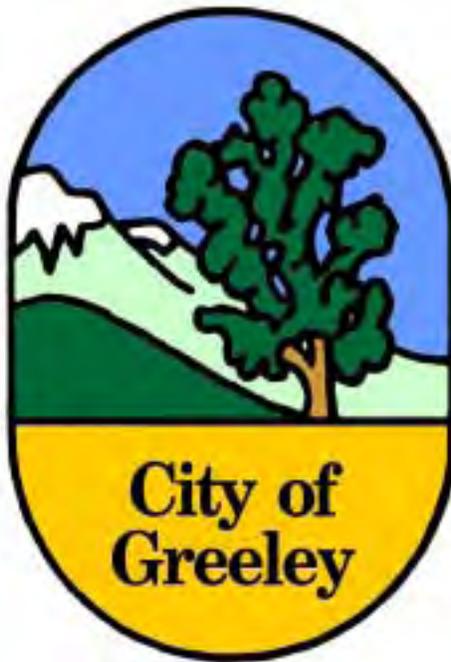


NON-POTABLE WATER MASTER PLAN

Report to the
City of Greeley



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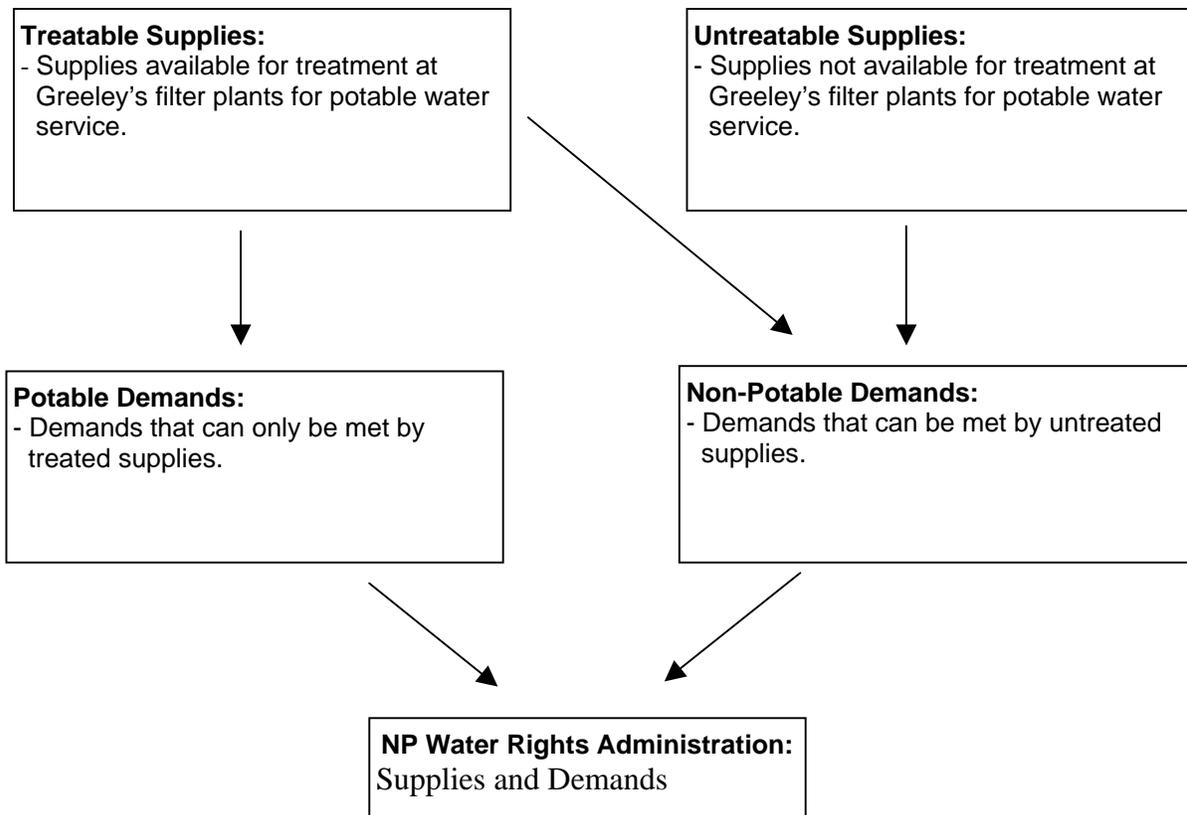
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EXECUTIVE SUMMARY

There are two general categories of water supplies, treatable and untreatable. There are also two kinds of water demands, potable and non-potable. Treatable supplies are those available for treatment at Greeley’s filter plants, Bellvue and Boyd, and untreatable supplies are those not available for treatment for potable water service. Potable water demands are those that can only be met by treated supplies and non-potable demands are those that can be met by untreated supplies.

Most discussions about “non-potable” are in reference to using untreated water for turf irrigation. This master plan addresses non-potable irrigation but is much broader in scope. It also addresses untreated water supplies and demands that are tied to water rights administration by the Water Department. It is impossible to adequately address all planning issues associated with non-potable irrigation without looking closely at supply and demand issues of water rights administration, and vice versa.



Water rights administration of supplies and demands include balancing effluent credit associated with wholly consumable water and lawn irrigation return flow credits with historic irrigation return flow obligations and augmentation obligations. These credits and

obligations are determined from the Water Department's water rights decrees and accounting. Water rights administration also includes management of ditch supplies on the lower Poudre River that are not utilized for non-potable irrigation.

DRIVING FACTORS FOR NON-POTABLE MASTER PLAN

The following drive the need for development and implementation a non-potable master plan:

Maximize the use of untreatable supplies: Utilization of existing water supplies, including untreatable supplies, as efficiently as possible is a key strategic point of the City's 2003 Water Master Plan. The Water Department recognizes the necessity to develop plans to maximize its existing supplies prior to constructing large water storage projects to meet future demands (new regional storage is a key component of the long-term strategy of the City's 2003 Water Master Plan).

Provide the lowest cost of water service to citizens: One of the main responsibilities of the City's Water Department is to provide reliable water service at the lowest reasonable cost. The Water Department is committed to providing non-potable water service to City properties and for private developments if it can be demonstrated it will provide the lowest cost water service. Since the cost of treatable supplies will continue to escalate, providing untreatable water to meet non-potable demands will provide the lowest cost of service for the City's water system as a whole. Providing available low cost untreatable supplies to meet non-potable demands preserves higher cost treatable supplies that will continue to rise in cost and ensures the Water Department is providing the lowest cost of service over time. Low cost supplies and/or low cost infrastructure can make non-potable the lowest cost water service.

Public input shows support of non-potable development: Significant public input was gathered during the City's completion of the 2003 Water Master Plan. Input from the public has been strong in support of non-potable irrigation as a way to maximize water supplies and reduce treatment and transmission costs. Most people share the same "gut reaction" that it does not make sense for the Water Department to put treated water on a park when there is an existing ditch near by. Strong public support is essential in moving forward with a plan that involves substantial commitment to non-potable development.

QUANTIFYING NON-POTABLE WATER SUPPLIES AND DEMANDS

The projected non-potable supplies and demands at year 2020 are shown in the following figure:

Untreatable Supplies

(water supplies not available for treatment at the Bellvue or Boyd Filter Plants)

Non-Potable Demands

(demands that can be met using untreated water supplies)

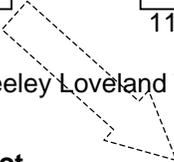
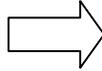
supplies that cannot be treated

- 1. Canal No. 3 supplies (3/8 interest, and Greeley Irrigation Company Shares)
- 2. Wholly Consumable Effluent Credit
- 3. Lawn Irrigation Return Flow Credit
- 4. Firm Yield from Gravel Pit Storage

18,000 ac-ft

- 1. Non-Potable Irrigation Under Canal No. 3
- 2. Historic Irrigation Return Flow Obligations
- 3. Augmentation Obligations

11,500 ac-ft



Poudre – Greeley Loveland Transfer Alternative

supplies that can be treated but are not

- 5. GLIC Non-Potable Supplies

3,400 ac-ft (GLIC: 13,200 ac-ft total supplies)

- 4. Non-Potable Irrigation under the GLIC Canal.
- 5. Historic Irrigation Return Flow Obligations

3,400 ac-ft



Greeley’s supplies for non-potable demands come from three general sources, 1) Canal No. 3 (untreatable); 2) second use of wholly consumable supplies (effluent credit delivered back to the river from wastewater treatment plant and lawn return flow credits which is untreatable); and 3) GLIC (Greeley Loveland Irrigation Company) supplies delivered through the Greeley Loveland Canal or to the Big Thompson River (treatable). In addition, the Water Department will be using the 25th Avenue Gravel Lakes storage in the future to expand the firm yield of the non-potable supplies by utilizing it to carryover water from wet years into drought years.

Non-potable demands include 1) non-potable irrigation; 2) historic irrigation return flows; and 3) augmentation requirements.

The GLIC supplies are listed separately above because they directly impact the available potable supplies for the City. By the year 2020 the Water Department expects to have 13,200 acre-feet of total GLIC supplies, 3,400 acre-feet of which will be needed to meet non-potable demands. This leaves 9,800 acre-feet for treatment at the Boyd Filter Plant.

One of the driving factors in this master plan is to maximize the use of all existing water supplies, specifically those supplies that cannot be treated. As illustrated in the above figure, the projected surplus of untreatable supplies, at year 2020 is 6,500 acre-feet (18,000 acre-feet minus 11,500 acre-feet). Currently, these surplus supplies cannot be physically delivered to meet the GLIC non-potable demands.

UTILIZING SURPLUS UNTREATABLE WATER SUPPLIES

Two alternatives were evaluated for the utilization of the Water Department's projected surplus of 6,500 acre-feet of untreatable supplies by 2020. One alternative, the Poudre – Greeley Loveland Transfer (Poudre – G-L) Alternative is illustrated in the above figure. The Water Department can construct a pump station and storage system to deliver water from the lower Cache La Poudre River (the location of the surplus untreatable supplies), deliver these supplies into the Greeley Loveland Canal and by 2020 free up 3,400 acre-feet of supplies currently delivered out of the Greeley Loveland System. The 3,400 acre-feet would then be available for treatment at the City's Boyd Filter Plant. The Poudre – G-L transfer, as preliminarily designed, could be implemented in phases to serve up to 6,000 acre-feet of demands under the Greeley-Loveland Canal at some point beyond 2020 as non-potable demands grow.

The other alternative considered for the use of the surplus untreatable supplies is called the "Sell/Buy" Alternative. Very simply, this plan would entail the City selling (or leasing) its surplus untreatable supplies to downstream users and using the funds to purchase new supplies that are higher on the Poudre River that can easily be delivered to the City's Bellvue Water Treatment Plant. The City will be able to increase its firm yield potable supply by selling its surplus untreatable supplies. Under this alternative the Water Department will continue to develop and serve non-potable demands through the Greeley Loveland system, Canal No. 3, and wells.

The two alternatives for utilization of the City's surplus untreatable supplies were compared using the common objective of increasing the City's potable (treatable) supplies by 6,000 acre-feet of firm yield. The Sell/Buy alternative would involve selling (or leasing) surplus untreatable supplies (6,000 acre-feet of the total projected surplus of 6,500 acre-feet) and using the funds to buy new potable supplies, which would produce about half of the new firm yield, 3,000 acre-feet. The remaining potable supplies, 3,000 acre-feet, would be directly purchased. The Poudre – G-L transfer project would involve the delivery of 6,000 acre-feet of water to non-potable demands through the Poudre – G-L transfer system and retaining 6,000 acre-feet of new firm yield available for treatment at the Boyd Water Treatment Plant.

For the purpose of alternatives comparison it was assumed the market value of the untreatable supplies is \$2,000 per acre-foot. It is believed this is a conservatively low estimate that would enable the City to easily sell or lease its surplus supplies. It is also assumed the Water Department could purchase new potable supplies that are treatable at the Bellvue Water Treatment Plant at \$6,000 per acre-foot. The total cost to the Water Department for implementation of the Sell/Buy Alternative is \$24 Million to develop 6,000 acre-feet of new potable firm yield.

It is estimated new reservoir storage (Raindance Ridge and/or Larimer Draw), including all storage, delivery systems, and land, can be obtained for \$4,000 per acre-foot. Therefore, the total cost of developing 6,000 acre-feet of storage would result in a total cost to the Water Department of \$24 Million. The resulting increase in firm yield to the Water Department would be 6,000 additional acre-feet now available for treatment at the Boyd Treatment Plant.

Based on the assumed market values for untreatable and treatable water and the assumed cost of new storage, the cost analysis indicates the two alternatives are essentially equal in cost. The estimated gap in the market value of untreatable supplies (\$2,000 per acre-foot) versus treatable supplies (\$6,000 per acre-foot) is \$4,000 per acre-foot. If the true gap in these market values is less than \$4,000 per acre-foot the Sell/Buy Alternative would have the cost advantage. If the gap is greater than \$4,000 per acre-foot the cost advantage would be with the Poudre – G-L transfer Alternative. Likewise, if the true cost of building the complete Poudre – G-L transfer system is greater or less than the projected \$4,000 per acre-foot, the cost advantage swings between the two alternatives.

Recent cost estimates for the construction of the “Poudre – G-L transfer” indicate costs may be higher than the \$4,000 per acre-foot used in the preliminary analysis. If this holds true the cost advantage would lean toward the “Sell/Buy” alternative.

The Water Department Staff and the Water and Sewer Board are in the process of completing some final steps in the alternatives analysis prior to selecting an alternative. Of particular importance, the Water Department will be doing some further study on the market demand and market values for untreatable water supplies at the Poudre River/South Platte Confluence (Sell/Buy Alternative). Additional follow-up steps have been laid out in this plan to complete the study of the two alternatives prior to selecting the final alternative.

NON-POTABLE IRRIGATION

A primary conclusion of the non-potable master plan is a decision by the Water Department to make a more substantial commitment to utilize non-potable irrigation of large turf areas where it is cost effective. This increased commitment to the development of non-potable is based on three primary factors.

First, the City’s Water Master Plan directs the Water Department to maximize use of treatable water supplies. To maximize use of treatable water supplies, the City must develop non-potable systems to use as much untreatable water as possible to supply non-potable demands.

Second, the Water Department is dedicated to providing the lowest cost water service while at the same time maintaining a high level of service to each of its customers. Whether it is water service to City lands such as parks or ball fields or water service to private developments, the Water Department is committed to offer service at the lowest reasonable cost. In most cases the lowest cost of service for large turf irrigation will be a non-potable irrigation system rather than through the Water Department’s potable system.

Third, the Water Department has developed a significant number of non-potable systems that are served by either the Greeley Loveland Canal or Canal No. 3 (see Chapter 4). The effectiveness of using these canal systems for on-going future non-potable irrigation is dependent on maintaining sufficient flows in the canals to avoid excessive seepage losses. The Water Department must commit to the future development of additional non-potable

systems to ensure sufficient flows in the canals are maintained as agriculture diversions continue to decrease with the dry-up of irrigated farm lands.

This master plan establishes several major policy positions related to non-potable irrigation within the City. One of the primary new policies for non-potable irrigation is making non-potable irrigation systems a requirement when the combined total open space/common space turf area for new development proposals is 20 acres or more. The two primary driving factors for the Non-Potable Master Plan are for the Water Department to maximize use of untreatable supplies and offer non-potable water service when it will be the lowest cost of long-term water service. When the combined turf area is 20 acres or more, the lowest cost of service is non-potable service. This policy will reinforce the Water Department's increased commitment to non-potable water service. Using the 20-acre limit will provide the Water Department and the developers a clear policy for planning and will ensure both the Water Department and private development will utilize the lowest cost of water service.

Another major change in policy for non-potable irrigation is a change in the Plant Investment Fees for non-potable irrigation. Previously, developers paid a flat fee per irrigated acre. Under the new policy developers will pay the true cost for the construction of a non-potable system that serves their site. If the system has both on-site (on the lands being developed) and off-site system components, the developer will construct the on-site portion of the system and the Water Department will construct the off-site portion of the system and the developer will reimburse the Water Department for the off-site costs. Using the 20-acre limit will ensure the lowest cost of service is being implemented.

This master plan also details the steps the Water Department will take to evaluate the potential for serving multiple developments with regional non-potable irrigation systems to reduce the overall cost per acre-foot.

Below is a list of the 12 key policies established in this master plan related to non-potable irrigation.

- 1) When cost effective, non-potable systems are required for 20 acres or more of open space irrigation in developments with Greeley-Loveland irrigation supplies. Those developments with untreatable irrigation supplies (e.g., Greeley Irrigation Company and New Cache Irrigation Company) will be required to construct non-potable systems for open space irrigation of greater than 20 acres
- 2) In general, the Water Department will not develop non-potable systems to serve single family residential. However, there may be unique circumstances where the Water Department will consider a non-potable system if implementation of the system would be cost effective and safe.
- 3) Water Department will own and maintain all new non-potable systems.
- 4) Developer will pay for and construct the on-site non-potable system components and dedicate the system over to the City along with necessary easements and/or rights-of-ways.

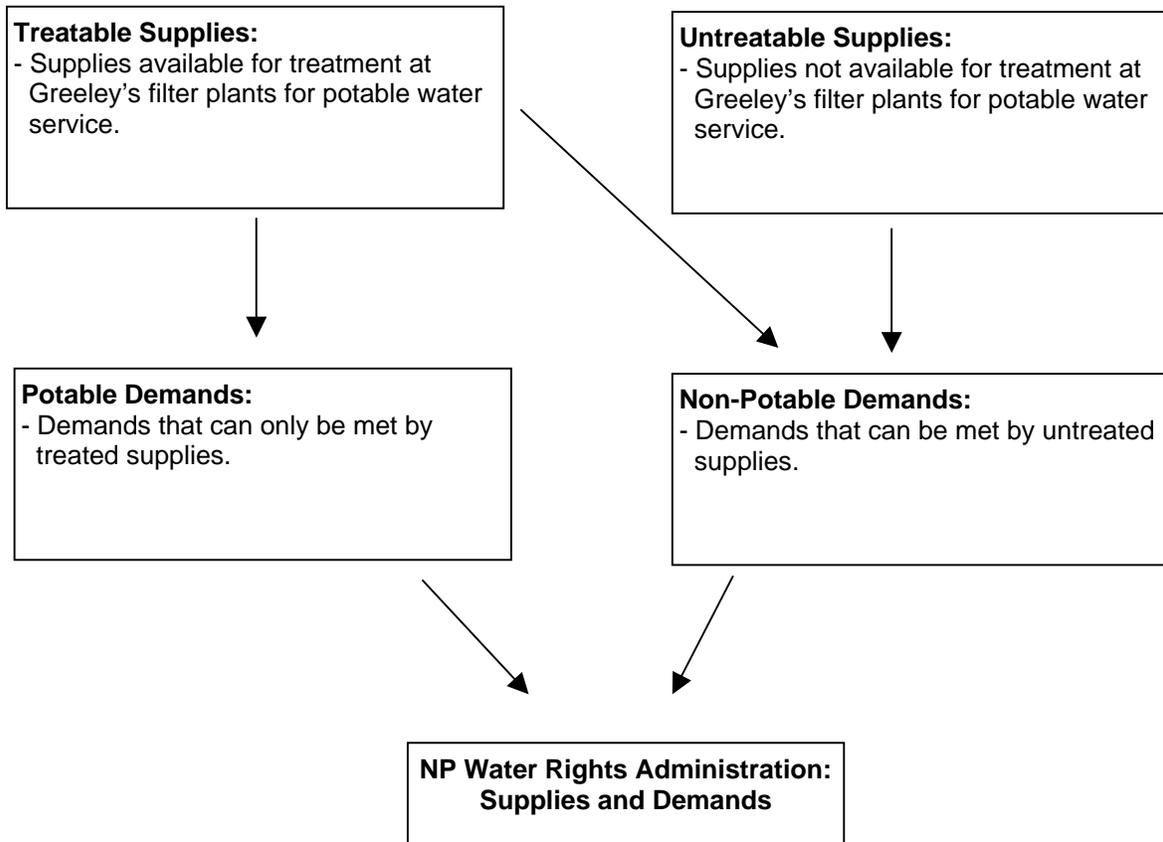
- 5) Water Department will construct the off-site non-potable system components and charge the developer a Plant Investment Fee based on the actual cost of the off-site improvements.
- 6) Water Department will strongly seek opportunities to develop regional non-potable systems that will serve multiple developments and reduce the overall cost of service.
- 7) Water Department will investigate opportunities to develop regional non-potable systems that can also serve as regional (community) parks.
- 8) Non-potable rates will be established each year in the same manner as potable rates by use of a standard rate model.
- 9) Plant Investment Fees for open space/common irrigation for potable service will be calculated on an acre-foot demand basis using the true cost of providing new potable capacity.
- 10) City will accept historic water for dedication regardless of whether the development is using a non-potable system or not (full credit with non-potable system and reduced credit without). This policy will be subject to the City's need for a given water supply. Staff will annually determine those water supplies that are needed and will be accepted.
- 11) Water Department will maintain a list of acceptable and non-acceptable water rights for dedication including the firm yield credit of each.
- 12) The Water Department will offer non-potable cash-in-lieu if it is determined the City has surplus supplies available for sale (price set at market value) and the proposed development is planning a non-potable system.

CHAPTER 1: INTRODUCTION

There are two general categories of water supplies, treatable and untreatable. There are also two kinds of water demands, potable and non-potable. Treatable supplies are those available for treatment at Greeley’s filter plants, Bellvue and Boyd, and untreatable supplies are those not available for treatment for potable water service. Potable water demands are those that can only be met by treated supplies and non-potable demands are those that can be met by untreated supplies.

Most discussions about “non-potable” are in reference to using untreated water for turf irrigation. This master plan addresses non-potable irrigation but is much broader in scope. It also addresses untreated water supplies and demands that are tied to water rights administration by the Water Department. It is impossible to adequately address all planning issues associated with non-potable irrigation without looking closely at supply and demand issues of water rights administration, and vice versa.

Figure 1: Description of Greeley’s Water Supplies & Demands



Water rights administration of supplies and demands include balancing effluent credit associated with wholly consumable water and lawn irrigation return flow credits with historic

irrigation return flow obligations and augmentation obligations. These credits and obligations are determined from the City's water rights decrees and accounting. Water rights administration also includes management of ditch supplies on the lower Poudre River that are not utilized for non-potable irrigation. Chapter 2 provides a further discussion on Greeley's definition of untreatable supplies and non-potable demands.

Chapter 2 also quantifies the total amount of untreatable supplies above and beyond the total non-potable demands for Greeley. Chapter 3 covers the alternatives analysis for the future use of the City's surplus untreatable supplies. Planning related specifically to non-potable irrigation is covered in Chapters 4 through 7.

The backbone of Greeley's distribution system for non-potable irrigation is the Greeley Loveland Canal and Canal No. 3 (See Map 1). A small number of shallow alluvial wells also provide water for non-potable irrigation. Map 1 also shows the location of the City's 25th Avenue Gravel Pits storage site. This new storage facility is a key component of the overall non-potable system, designed to maximize the use of untreatable water supplies available on the lower end of the Poudre River.

HISTORY OF NON-POTABLE IN GREELEY

Throughout its history Greeley has utilized untreatable water supplies for irrigation. Even before the City of Greeley was formed, water was being used through Canal No. 3 to irrigate lawns and gardens. In 1875 the Union Colony deeded 3/8ths interest in Canal No. 3 to Greeley. This early acquisition of Canal No. 3 continued to spur development of non-potable systems for the irrigation of lawns and gardens in the first expansion on the north and east side of the City. In addition, private entities with large open space turf irrigation such as the Greeley County Club and University of Northern Colorado put non-potable irrigation systems in place to utilize the Greeley Loveland system shares they obtained with their land acquisitions.

In the 1990's the Water Department began more actively looking at applications of non-potable systems as a way to implement water conservation. The Water Department completed a study to determine what existing parks, sports fields, schools could be served economically by non-potable systems. The finding of the study was that serving these existing sites with new non-potable systems was cost effective. Following the study, the Water Department began a multi-year effort constructing non-potable systems for many of the City's existing parks, schools and sporting complexes and a few privately owned sites.

In the past eight years the Water Department has been actively encouraging non-potable systems for new developments. Some large regional systems have been installed by the Water Department such as the Promontory System, the Monfort Park System, the Northridge System, and the Youth Sports System, all of which serve multiple City and private development open space irrigation.

Up until 20 years ago Greeley's "non-potable" operations were fairly straightforward and simple. Ditch water was used, when convenient, to irrigate lawns and gardens in the City.

Map 1: Non-Potable Distribution Map

Now as “water law” has become more and more sophisticated in Colorado and the demand for water has grown significantly, non-potable supply and demand issues have become more multifaceted. Over the last 15 years, the Water Department has gone through several water court cases changing the legal use of Greeley-Loveland shares and Greeley Irrigation Company (Canal No. 3) shares from irrigation to other uses, including municipal and augmentation uses. These “change of use cases” have brought about new non-potable supplies (wholly consumable effluent and lawn irrigation return flows) and new non-potable demands (historic irrigation return flow obligations).

Also adding to the complexities of quantifying and utilizing untreatable supplies has been the increased focus in recent years to develop multiple uses of the City’s Windy Gap water, a transbasin supply that can be used to extinction. Across all of the Front Range in Colorado, there has been a tremendous stepping up of efforts by municipalities in the last 5-10 years to find efficient ways to get the “second use” on water supplies that are wholly consumable.

Another area of non-potable development, which has only arisen in the past 10 years for Greeley, is well pumping to irrigation and the corresponding augmentation responsibilities. Wells can be a valid source of non-potable water for irrigation, but augmentation water must be replaced back to the river to compensate for the water pumped from alluvial groundwater.

If recent history is any sign of the next 10-20 years, it is expected the issues and complexities of non-potable applications will continue to grow at a fast rate. With these rapid changes, there becomes an even greater need to develop a non-potable master plan that will provide policy and direction for all aspects of non-potable supplies and uses.

WATER PROVIDER SURVEY

At the start of this planning effort neighboring cities and other large water providers were interviewed to get input to avoid “re-inventing the wheel” on non-potable water service. It was discovered the other area water providers, like Greeley, had many of the same questions, limited policy, lack of future planning for non-potable development, and insufficient documentation on the economics of non-potable service. In fact, Greeley is further down the road on non-potable development than many water providers primarily because of the experience gained in recent years with the construction of several major regional non-potable irrigation systems.

Each water provider is struggling with the issues of how to make use of their untreatable supplies efficiently and under what circumstances should they allow or promote non-potable systems. All providers agree there are opportunities for better utilization of untreatable supplies but at the same time, it adds to their workload and the complexity of operations (dual systems, separate tap fees, rates and water dedication, etc.). All parties agreed it is an important area of development but there is still much disagreement on the practicality and economics of providing both potable and non-potable service. None of the water providers who were contacted and interviewed had non-potable master plans or a full written list of policies that could be used for reference in Greeley’s planning.

In general, most entities over the past several decades have had to focus their effort on keeping pace with potable water supplies because of the tremendous growth that has occurred on the Front Range. For this reason, non-potable development has received limited consideration by water providers.

Only in recent years, has there been such attention to the development of non-potable systems in the northern Front Range of Colorado. This increased interest on non-potable development has been spurred on in most cases by the lack of options for affordable new water supplies available to some communities. In particular this has been true for the communities who rely solely on Colorado-Big Thompson Project (CBT) supplies for their potable water (a supply that has increased in value by several hundred percent over the last 10-15 years).

On the other hand, Greeley and several other northern Colorado cities that do not rely solely on CBT supplies, have affordable options for new potable supplies. Without the prospect of obtaining considerable savings by using untreatable supplies over treatable (potable) supplies, the economic incentive alone is not enough to drive non-potable water service. All of these factors have led to a lack of attention on non-potable development by most water providers.

In the survey, it was also apparent there was a lack of clarity on the reasons why a water provider is promoting non-potable water service. Any two entities may have different factors at work and have different core motivations for promoting non-potable. Even the definition of “non-potable” differs from water provider to water provider. Therefore early in the master plan process, after the water provider survey was completed, time was spent to adequately address the question, “What are the key driving factors for non-potable development for Greeley?”

DRIVING FACTORS FOR NON-POTABLE MASTER PLAN

It was not a given at the beginning of this study that the Water Department should continue to promote non-potable water service. In recent years, the Water Department had been giving emphasis to non-potable development but the complexity of non-potable issues sometimes led to uncertainty over what were in fact the driving factors. Three primary drivers were identified in this master planning study:

Maximize the use of untreatable supplies: Utilization of existing water supplies, including untreatable supplies, as efficiently as possible is a key strategic point of the City’s overall Water Master Plan. The Water Department recognizes the necessity to develop plans to maximize its existing supplies prior to constructing large water storage projects to meet future demands (new regional storage is a key component of the long term strategy of the City’s 2003 Water Master Plan).

Provide the lowest cost of water service to citizens: One of the main responsibilities of the City’s Water Department is to provide reliable water service at the lowest reasonable cost.

The Water Department is committed to providing non-potable water service to City properties and for private developments if it can be demonstrated it will be the lowest reasonable cost of water service. Low cost supplies and/or low cost infrastructure can make non-potable the lowest cost water service.

Public input shows support of non-potable development: Significant public input was gathered during the Water Department’s completion of the 2003 Water Master Plan. Input from the public has been strong in support of non-potable irrigation as a way to maximize water supplies and reduce treatment and transmission costs. Most people share the same “gut reaction” that it does not make sense for the Water Department to put treated water on a park when there is an existing ditch near by. Strong public support is a very essential factor in moving forward with a substantial development plan for non-potable.

CRITICAL SUCCESS FACTORS FOR THE NON-POTABLE MASTER PLAN

As stated above, the issues surrounding non-potable water service can quickly become very complex. Therefore, considerable time and effort was spent defining what issues need to be addressed and what should be the primary outcomes of this study. Non-potable issues are much broader for the City of Greeley than just the application of supplies to non-potable irrigation. A list of critical success factors for the project was established as follows:

1. Quantify the total amount of non-potable supplies available today and at year 2020.
2. Quantify the demands that can be met with non-potable supplies and determine any surplus non-potable supplies after meeting demands today and at year 2020 (It was assumed the City had a surplus of non-potable supplies).
3. Assuming there is a surplus of non-potable supplies out to year 2020; determine how the City will use these supplies.
4. Define how the Water Department will utilize the Greeley Loveland Canal system for non-potable purposes (both infrastructure and supplies).
5. Establish policy on what non-potable supplies will be accepted for water dedication to the City and whether the supplies will only be accepted for dedication if a non-potable system is proposed by the developer.
6. Review and establish new policy as needed on plant investment fees and water rates for non-potable water service.
7. Define policy on what types of land uses and developments will be served with non-potable water service (e.g. will the city provide non-potable to single family residential lots?).
8. Design a go/no-go decision model for non-potable systems to assist Water Department staff as they review proposed development plans.
9. Determine if the Water Department can meet its goal of 15 percent non-potable water service for future development. Per the City’s 2003 Water Master Plan, it was assumed the City would meet 15 percent of new demands with non-potable water service between now and 2020.

10. Determine if there are some general planning approaches to non-potable that can be used by the Water Department to simplify future planning (regional non-potable sites, over sizing pipelines, etc.).

INTEGRATION WITH THE 2003 WATER MASTER PLAN

The City's 2003 Water Master Plan was recently completed. Several key findings and policy points have been taken and applied to the development of the Non-Potable Water Master Plan. In addition, projections of various future water supplies were used to determine projection of non-potable supplies available to Greeley in the future. Some of the key points of the Water Master Plan that impact non-potable are as follows:

Planning and policy must support “growth paying its own way”: Both the Water and Sewer Board and the City Council took a strong position in the Water Master Plan, that to the degree possible, growth should pay its own way. This position influences the Non-Potable Master Plan in two ways. First, the credit given for non-potable dedication must reflect the firm yield the Water Department can obtain with the water supply (firm yield in the worst year of a 50 year drought – the same drought protection the City is providing for potable water service). Second, the existing citizens must not subsidize plant investment fees and water rates for non-potable water service.

New raw water supplies: It was determined in the Water Master Plan that the Water Department will develop wholly consumable water supplies to meet future demands. This will include firming a portion of the Windy Gap units the City owns and acquisition of new wholly consumable supplies in the Poudre River basin. These supplies will add new yield to the City's future non-potable supplies in the form of wholly consumable effluent credit. These wholly consumable effluent credits were included in the alternatives analysis for utilization of the City's surplus non-potable supplies.

Future capacity and supply projections - non-potable demands will make up 15 percent of future water demands: A level of non-potable development had to be established in the Water Master Plan in order to develop projections needed for calculation of treatment plant and transmission line capacities. As well, the Water Department had to calculate the amount of future raw water supplies that must be obtained. If the 15 percent cannot be substantiated with the Non-Potable Water Master Plan then the Water Master Plan would need to be revised accordingly.

CHAPTER 2: NON-POTABLE SUPPLIES AND DEMANDS

DEFINING “NON-POTABLE”

As discussed in Chapter 1, not all water providers have the same thing in mind when they use the term “non-potable”, which can add to the confusion of non-potable planning. When discussing non-potable it is important to understand the meaning that is being intended. Many water providers use the term strictly in reference to non-potable irrigation. For Greeley the meaning of non-potable is applied much more broadly to include all supplies and demands for water that is not treated.

There are two types of supplies used for non-potable demands, 1) those that cannot cost effectively be treated at a filter plant, and 2) those that can be treated for potable use but instead are used to meet non-potable demands. Greeley only has one supply in the later category, Greeley Loveland Irrigation Company water (GLIC); a supply that is treated at the Boyd Filter Plant, and a supply used without treatment to meet certain non-potable demands.

The GLIC supplies are the only water supplies that can be used for non-potable irrigation under the Greeley Loveland Canal. In addition, GLIC supplies must be used to make deliveries to the Big Thompson River to make up for historic irrigation return flows required upstream of Greeley. These demands, which can only be met by GLIC supplies, in effect reduce the City’s GLIC supplies available for potable service.

The following definitions are used throughout this study:

GLIC supplies:	Greeley Loveland System supplies available for use at Boyd Lake. The term “GLIC supplies” does not include GLIC reusable (wholly consumable) effluent credits at the wastewater treatment plants and lawn irrigation return flow credits (supplies that cannot be treated at the Boyd Filter Plant).
GLIC non-potable supplies:	GLIC supplies that are used without treatment at the Boyd Filter Plant.
GLIC non-potable demands:	Non-potable demands that can only be met by GLIC supplies.
Untreatable supplies:	Supplies not available for treatment at the Bellvue and Boyd Filter Plants. This includes 1) supplies that cannot be cost effectively treated because of either cost of delivery to the plant and/or poor water
Treatable Sources	Supplies that are available for treatment at the Bellvue and Boyd Filter Plants. These supplies are used without treatment at the Boyd Filter Plant.

Non-potable demands:

Demands that can be met using untreated water supplies.

SUMMARY OF NON-POTABLE SUPPLIES/DEMANDS

The City currently has the following supplies and demands:

Figure 2: Non-Potable Supplies/Demands - Current

Available Supplies

(water supplies not available for treatment at the Bellvue or Boyd Filter Plants)

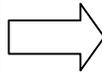
Non-Potable Demands

(demands that can be met using untreated water supplies)

supplies that cannot be treated (untreatable)

- 1. Canal No. 3 supplies (3/8 interest, and Greeley Irrigation Company Shares)
- 2. Wholly Consumable Effluent Credit
- 3. Lawn Irrigation Return Flow Credit

10,000 ac-ft



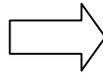
- 1. Non-Potable Irrigation Under Canal No. 3
- 2. Historic Irrigation Return Flow Obligations
- 3. Augmentation Obligations

8,300 ac-ft

supplies that can be treated but are not

- 4. GLIC Non-Potable Supplies

2,100 ac-ft (GLIC: 11,000 ac-ft total supplies)



- 4. Non-Potable Irrigation under the GLIC Canal.
- 5. Historic Irrigation Return Flow Obligations

2,100 ac-ft

Figure 3 shows Greeley’s current non-potables operations. Greeley’s non-potable supplies comes from three general sources, 1) Canal No. 3, 2) second use of wholly consumable supplies (effluent credit delivered back to the river from wastewater treatment plant and lawn return flow credits), and 3) GLIC supplies delivered through the Greeley Loveland Canal or to the Big Thompson River. In addition, the Water Department will be using the 25th Avenue Gravel Lakes storage in the future to expand the firm yield of the non-potable supplies by utilizing it to carryover water from wet years into drought years.

Non-potable demands include 1) non-potable irrigation, 2) historic irrigation return flows, and 3) augmentation requirements.

The GLIC non-potable supplies are listed separately above because they directly impact the available potable supplies for the City. Out of the 11,000 acre-feet of total GLIC supplies, 2,100 acre-feet are needed to meet non-potable demands. This leaves 8,900 acre-feet for treatment at the Boyd Filter Plant. The majority of GLIC non-potable demands (1,300 acre-feet) are irrigation demands under the Greeley Loveland Canal. In addition, there are 800 acre-feet of historic irrigation return flows that can only be met with GLIC supplies.

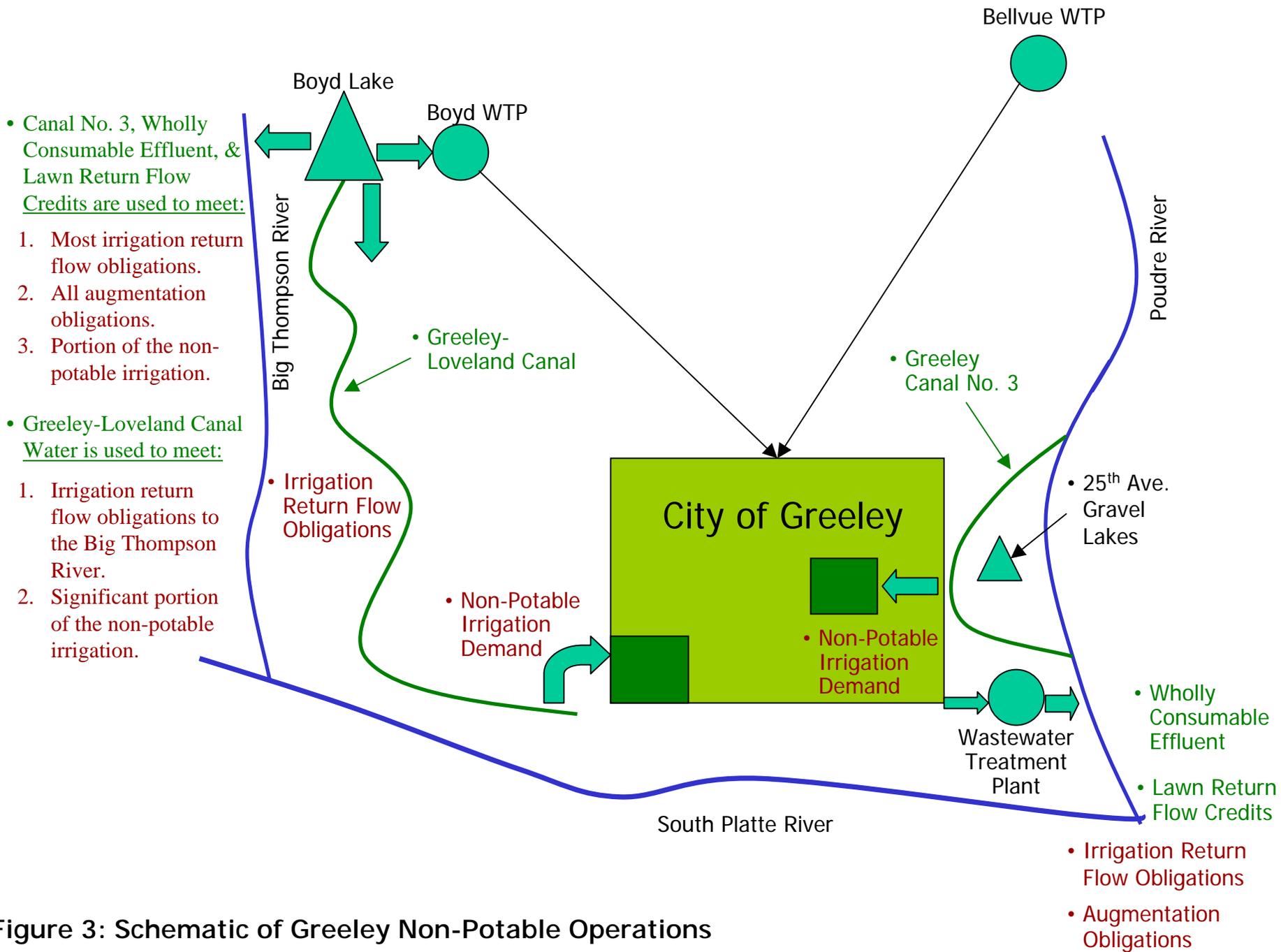
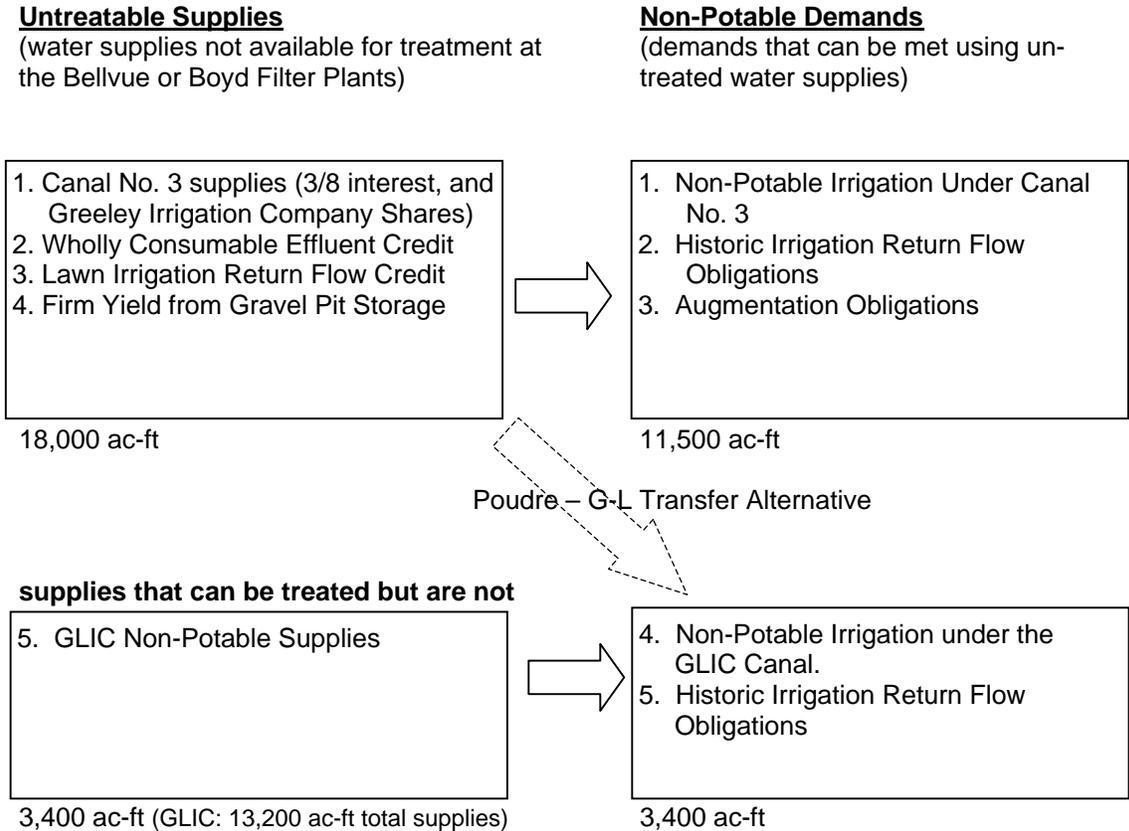


Figure 3: Schematic of Greeley Non-Potable Operations

One of the driving factors in this master plan is to maximize the use of all existing water supplies, including non-potable supplies (specifically supplies that cannot be treated). As illustrated in Figure 2, the current surplus of untreatable supplies is 1,700 acre-feet (10,000 acre-feet minus 8,300 acre-feet). Currently, these surplus supplies cannot be physically delivered to meet the GLIC non-potable demands.

The following untreatable supplies and demands are projected for the year 2020:

Figure 4: Non-Potable Supplies/Demands - 2020



By 2020 several of the existing supplies and demands will have increased. Also, new categories of non-potable supplies will be added. There will be an increase in the amount of surplus non-potable supplies by 2020, bringing the total up to approximately 6,500 acre-feet. Included in this calculation of surplus non-potable supplies is wholly consumable effluent associated with new water rights obtained by the Water Department between now and 2020. If the new water rights acquired by the Water Department are not transbasin wholly consumable supplies, the total surplus could be reduced by as much as 2,700 acre-feet, reducing the total projected surplus to 4,300 acre-feet.

It is projected there will still be more than enough GLIC supplies to meet the GLIC non-potable demands at 2020. With the exception of 100 acre-feet of historic irrigation return flow obligations, all future GLIC non-potable demands will be for non-potable irrigation under the Greeley Loveland Canal (3,300 acre-feet).

One option for the use of the surplus untreatable supplies is to construct the necessary infrastructure to pump water from the Poudre River to the Greeley Loveland Canal. Under this scenario, the untreatable supplies would be used to meet all 14,900 acre-feet of non-potable demands. This is referred to as the Poudre – Greeley-Loveland transfer alternative, one of the alternatives discussed in detail in Chapter 3. Under the Poudre – G-L transfer alternative, the full 13,200 acre-feet of GLIC supplies would be available for treatment at the Boyd Filter Plant for potable service.

NON-POTABLE SUPPLIES/DEMANDS (DETAILED)

The non-potable supplies and demands that are being stated in this report are the supplies and demands that would occur in **the worst year of the 50-year drought**. The 50-year drought is the drought scenario the Water Department uses for all water supply planning. Using the 50-year drought planning for non-potable as well as potable supplies ensures the same level of service is offered to Greeley customers regardless of the type of water supply.

Each of the general non-potable supplies and demands listed above can be broken down into more detailed supplies and demands. They include:

Supplies:

- 3/8th City Interest of the Canal No. 3
- Greeley Irrigation Company (Canal No. 3) Shares
- Greeley Loveland System Shares used directly without treatment
- Effluent credit from Greeley Loveland System Shares
- Lawn return flow credit from Greeley Loveland System Shares
- Effluent credit from Windy Gap Units
- Boyd and Freeman Ditch Company Shares (only available for use under the ditch)

Demands:

- Irrigation with 3/8th City Interest in Canal No. 3
- Irrigation with Greeley Irrigation Company (Canal No. 3) Shares
- Irrigation with Greeley Loveland System Shares
- Return Flow Obligations for Canal No. 3 Shares
- Return Flow Obligations for Greeley Loveland System Shares
- Augmentation Responsibilities (i.e. depletions associated with pumping of wells for non-potable irrigation of Greeley parks)
- Irrigation with Boyd and Freeman Ditch Company Shares

By 2020 there will be an increase in several of the supplies and demands listed above. In addition, there will be several new categories of supplies and demands added by 2020, which will include:

Supplies:

- Increased firm yield from the use of the 25th Avenue Gravel Lakes for drought carryover storage
- Transbasin re-use effluent credit from supplies such as Water Supply and Storage Company (WSSC) Shares or the Divide Canal and Reservoir Company Shares
- New Cache la Poudre (Canal No. 2) System Shares

Demands:

- Return Flow Obligations for new supplies such as Water Supply and Storage Company (WSSC) Shares or the Divide Canal and Reservoir Company Shares
- Return Flow Obligations for New Cache la Poudre (Canal No. 2) System Shares

CURRENT NON-POTABLE SUPPLIES/DEMANDS

City 3/8th Interest in Canal No. 3 (Current):

The City's 3/8th ownership of Canal No. 3 is limited to "irrigation of parks and gardens" within Greeley and is close to being fully developed. The supply available for use from the City's 3/8th interest ownership is 900 acre-feet. The current use of the water is 600 acre-feet (see Table 1). This current surplus supply is not available for other uses by the City but will be used for future non-potable irrigation. By 2020 the full supply of the City's 3/8th interest will be utilized by the Water Department on City properties.

Greeley Irrigation Company (Canal No. 3) Shares (Current):

The City owns 82 shares in the Greeley Irrigation Company. Seven of those shares are used directly for irrigation at East Memorial Park. The seven shares of the Greeley Irrigation Company used directly for irrigation equates to about 100 acre-feet of non-potable supplies and 100 acre-feet of non-potable obligations (irrigation demands). Because these shares are used on historic lands for decreed uses it is assumed a change of use in water court and maintenance of return flows will not be required.

The other 75 shares are available for other uses when the Water Department takes them through water court. The drought yield for the 75 shares is 1,500 acre-feet and the historic return flow obligations for the 75 shares are 700 acre-feet. Return flow obligations can be met directly with returns back to the river with Canal No. 3 replacements during the irrigation season and winter month return flows can be met with wastewater effluent credit.

Greeley Loveland System Shares (Current):

The 50-year drought yield for the City's current ownership is roughly 11,000 acre-feet. Of the 11,000 acre-feet of GLIC supplies, 2,100 acre-feet are used to meet non-potable demands. A total of 1,300 acre-feet are used to meet non-potable irrigation demands under the Greeley Loveland Canal and 800 acre-feet used to meet historic irrigation return flows.

Table 1: Current Non-Potable Supplies/Demands

Current Supplies	Annual Volume (ac-ft)	Current Demands	Annual Volume (ac-ft)
City 3/8th interest in Canal No. 3	900	City 3/8th (Canal No. 3) non-potable irrigation	600
Greeley Irrigation Company (75 unassigned shares)	1500	GIC Historic return flow obligations	700
Greeley Irrigation Company (7 assigned shares)	100	GIC Water demand for non-potable irrigation	100
Greeley Loveland Effluent/Lawn Return Flow Credit	4300	Greeley Loveland Return Flow Obligations	5300
Greeley Loveland Direct Release	2100	Greeley Loveland Direct Demands	2100
	-	City augmentation plans	1600
Windy Gap Effluent Credit	3200		-
TOTALS	12100		10400
SURPLUS NON-POTABLE	1700		

Notes:

City 3/8th interest in Canal No. 3

1. There are a few additional non-potable systems that are not yet installed on City lands that will utilize the City's interest in Canal No. 3.

Greeley Irrigation Company:

1. The City has 82 existing shares but 7 of those shares are assigned for irrigation use at East Memorial Park. Because the 7 shares are used for irrigation on historic lands no change of use in water court is required.
2. 75 shares will require a change in water court before they can be used for other City non-potable uses.

Greeley Loveland

1. Effluent credit is based on current seasonal usage at Boyd Filter Plant (approx. 30% WWTP effluent credit)
2. Waste water plant effluent credit (3300 ac-ft), Lawn return flow credit (1000 ac-ft)
3. The 5300 ac-ft of return flows are those that can be met by non-potable supplies. Approx. 800 ac-ft of return flow obligations are met by direct diversions from the Greeley Loveland System (6100 ac-ft total return flow obligations)
4. 2,100 ac-ft of demand must be met by direct releases from the Greeley Loveland System (1300 ac-ft to irrigation, 800 ac-ft to historic irrigation return flows)

Augmentation Responsibilities

1. Includes ConAgra, Flatiron, Poudre River Ranch, and Saddle Club (Saddle Club at full development)

Windy Gap

1. The City can expect an annual firm yield from its 64 Windy Gap units in the amount of 2500 acre-feet.
2. Windy Gap can be used in drought by collateralizing w/CBT water as long as CBT is not supply limited, such as occurred in 2003.
3. Because Greeley cannot take water from the CBT/Windy Gap system during the winter only a portion of the water can be stored and used in the winter (Barnes & Seaman). The City can obtain an 80% effluent credit in the winter months and a 30% effluent credit in the summer months.

Table 2: City Ownership of Greeley Loveland System Shares – Current

	Share Ownership As of 2002	Firm Yield Per Share (ac-ft)	Firm Yield 50 Year Drought (ac-ft)
Greeley Loveland Irrigation Company	734	9	6,606
Lake Loveland	93	30	2,790
Seven Lakes	161	10	1,610
TOTAL			11,006

The Water Department uses supplies from the Greeley Loveland system during the non-winter months when the Boyd water treatment plant is operating. The average wastewater treatment plant effluent during the April through October months when the Boyd plant is being operated is approximately 30 percent. Greeley has the right to reuse all effluent associated with Greeley Loveland system water supplies. Therefore the City obtains approximately 3,300 acre-feet of effluent credit due to the use of the Greeley Loveland supplies in drought.

The other source of non-potable supplies from the City’s use of Greeley Loveland water is lawn return flows. Based on Water Department staff estimates, the return flow credit from lawn return flows is 1,000 acre-feet. The total effluent/return flow credit for the current Greeley Loveland shares is 4,300 acre-feet (see Table 1).

The City has historic return flow obligations associated with the use of Greeley Loveland system shares. Map 2 shows the points and amounts of replacement for the return flow obligations. The return flow obligations shown on Map 2 for the lower ditches on the Big Thompson and Poudre Rivers are only for irrigation months. During the winter months all return flows can be satisfied by replacements to the Poudre-South Platte Confluence. The quantities of return flow obligations are those assumed in a 50-year drought (assumed continuous 365 days/year river call). This is a conservative assumption but valid for an analysis of a drought year obligation.

Most return flow obligations can be met with effluent credit. The only obligations that must be met with potable supplies (releases of water directly from Greeley Loveland system) include the return flow obligations to the Thompson and Platte Ditch and the Lower Latham Ditch. These return flows will require about 800 acre-feet of deliveries from the Greeley Loveland system. Once the proposed Ashcroft Wastewater Treatment Plant is constructed and in operation the effluent credit will be available to meet the return flow obligations to the Lower Latham Ditch.

Irrigation season return flow obligations to the Jones Ditch and Canal No. 3 can be met with effluent credit from Kodak and Windsor wastewater treatment plants. Greeley has rights to approximately 1,100 acre-feet of effluent credit from Kodak and 200 acre-feet of effluent credit from Windsor on an annual basis if wholly consumable supplies are utilized.

The total historic return flow obligations for the City’s Greeley Loveland system are approximately 6,100 acre-feet, but 800 acre-feet will have to be met with releases of water

Map 2: Greeley Loveland Return Flow Obligations

from the Greeley Loveland system. A total of 5,300 acre-feet of return flow obligations can be met with wastewater effluent credit.

City Augmentation Responsibilities (Current):

The City has obligations for making augmentation replacements for various augmentation plans. The specific plans and responsibilities are as follows:

Table 3: City Augmentation Obligations

Plan	Annual Volume (ac-ft)
ConAgra	1,000
Flatiron	234
Poudre River Ranch	24
Saddle Club	240
Misc. Plans	123
TOTAL	1,621

Current augmentation responsibilities amount to approximately 1,600 acre-feet. City non-potable supplies at the lower end of the Poudre River can meet each of these augmentation replacements.

Windy Gap Units (Current):

Windy Gap units provide the City with significant untreatable supplies in the form of wastewater effluent credit. There are no historic irrigation return flow obligations associated with the Windy Gap Units.

The City owns 64 units of Windy Gap. The Windy Gap project was designed to provide 100 acre-feet of delivery for each unit, a total of 6,400 acre-feet. Windy Gap water is transbasin water that can be used fully to extinction. Currently, the Windy Gap project does not yield in extreme drought years. The City does have the option to collateralize Windy Gap water with Colorado-Big Thompson (CBT) units. The collateralizing of Windy Gap with CBT essentially allows Greeley to transfer the wholly consumable characteristic of Windy Gap water over to the use of CBT water under certain circumstances.

As long as CBT is not supply limited the Water Department can collateralize with CBT units and develop 6,400 acre-feet of wholly consumable water. It is assumed in this report that CBT is not supply limited in the 50-year drought. However, in a severe drought (greater than the 50-year drought), such as occurred in 2002, CBT was supply limited and the Water Department was not able to benefit from the second use of the Windy Gap supplies. The Water Department intends to participate in a firming project for their Windy Gap units, first to provide a firm yield in drought, and second to provide a firm yield on the second use (effluent credit) of the Windy Gap supplies. The firming of Windy Gap units is discussed in more detail below.

The City can maximize the second use of Windy Gap water by using as much as possible in the winter months. Currently the only Windy Gap water that can be used in the winter months is water stored in reservoirs on the Poudre River that can be delivered to the Bellvue Treatment Plant. The Water Department has the ability to exchange Windy Gap water into storage in Barnes Meadow Reservoir (2,100 acre-feet) and into Milton Seaman Reservoir (500 acre-feet) for winter delivery. The water can then be delivered to the Bellvue Treatment Plant during the winter months when the average wastewater plant effluent credit percentage is approximately 80 percent (an effluent credit of 2,080 acre-feet). The remaining 3,800 acre-feet of Windy Gap water would be used in the summer months at an effluent credit percentage of 30 percent (an effluent credit of 1,140 acre-feet). In total the Water Department can obtain a second use on the 64 units of Windy Gap of about 3,200 acre-feet. The Water Department is in the process of exploring the potential sale of a portion of the Windy Gap shares as a method of funding the Windy Gap firming project. The increased reliability from the firming project should maintain or increase the yield of the City's Windy Gap shares, even with the sale of a portion of the units. As Greeley's demands grow the use of Windy Gap can be shifted to winter months and the second use of this supply can be maximized (see discussion below on 2020 supplies and demands).

Boyd and Freeman Ditch Shares (Current):

The City owns 203 shares in the Boyd and Freeman Ditch Company, but the Water Department will only be using these shares for historic uses (irrigation) on historic lands. No water will be made available for additional non-potable uses from these shares. Because Greeley does not plan to use this water other than for irrigation on lands under the ditch, and will not provide surplus non-potable supplies, it has not been included non-potable surplus calculations as shown on Table 1 and 5.

Summary of Non-Potable Supplies/Demands (Current):

As shown on Table 1, the current total supply of non-potable water is 12,100 acre-feet and the total obligation of the City for non-potable supplies is 10,400 acre-feet. An excess of 1,700 acre-feet of non-potable supplies is currently available for utilization by the Water Department.

2020 NON-POTABLE SUPPLIES/DEMANDS

Shifting Season of Use for Wholly Consumable Supplies:

The Water Department expects to see a significant increase in non-potable supplies by the year 2020. This increase is due to the anticipated addition of new transbasin water such as Water Supply and Storage Company shares, the addition of gravel pit storage on the north side of the City, and shifting the seasons of water use, for the wholly consumable supplies, to maximize wastewater effluent credit.

The shifting of water use to maximize effluent credit at the wastewater treatment plants can significantly add to the City’s non-potable supplies. In general, the effluent credit is highest in the winter months when the water use is primarily indoor use and lowest in the summer months when the outdoor irrigation is highest. The monthly effluent at the wastewater treatment plant divided by the monthly water demand for the year 2000 (a typical year) was as follows:

Table 4: Greeley Year 2000 Effluent Percentages:

Jan	86%	Jul	22%
Feb	81%	Aug	26%
Mar	73%	Sep	32%
Apr	41%	Oct	61%
May	29%	Nov	82%
Jun	25%	Dec	80%

Water Department staff tracks water use by water type to determine what supplies are used by month. Any water used that is wholly consumable can be credited back to the City as effluent credit. For example, if the Water Department uses Windy Gap water (a wholly consumable supply) to meet half of the demand in October 2000 then half of the October effluent would be available by the Water Department for reuse. Thus, the Water Department can maximize its non-potable supplies by utilizing its wholly consumable supplies in the winter months when the effluent credit is highest and focus the utilization of single-use water in the peak summer months. The raw water operational plan that will maximize the use of Greeley’s water would be as follows:

Winter Months: Windy Gap, New Transbasin Supplies
 Shoulder Months: Additional New Transbasin Supplies, Greeley Loveland System (G-L) shares
 Peak Months: CBT units, 12.5 cfs Poudre direct right, Poudre Storage

With this future scheduled use of water supplies, the Water Department can obtain 80% effluent credit for all Windy Gap supplies and for a portion of the new transbasin supplies. The City’s single-use water (CBT units, 12.5 cfs direct right from the Poudre River and storage in High Mountain Reservoirs on the Poudre River) can be used in the peak summer months when the effluent credit is the lowest. The use of the single-use water in the peak months pushes the use of wholly consumable supplies (G-L shares and new transbasin supplies) out into the shoulder months where the effluent credit is higher. This will provide a slightly higher effluent credit (approximately 40 percent) on the G-L shares as compared to today’s use of G-L shares (30 percent effluent credit).

City 3/8th Interest in Canal No. 3 (2020):

Prior to 2020, the Water Department will have completed the last non-potable irrigation systems on Canal No. 3 utilizing the City’s 3/8th interest in the canal. The current use is about 600 acre-feet and the build out use of the 3/8th interest water will be about 900 acre-feet (see Table 5). There will not be any surplus supplies available in the future from the City’s 3/8th interest in Canal No. 3.

Table 5: 2020 Non-Potable Supplies/Demands

2020 Supplies	Annual Volume (ac-ft)	2020 Demands	Annual Volume (ac-ft)
City 3/8th interest in Canal No. 3	900	City 3/8th (Canal No. 3) non-potable irrigation	900
Greeley Irrigation Company (155 shares)	3100	GIC Historic return flow obligations	1600
Greeley Irrigation Company (32 assigned shares)	600	GIC Water demand for non-potable irrigation	600
Greeley Loveland Effluent/Lawn Return Flow Credit	7000	Greeley Loveland Return Flow Obligations	6500
Greeley Loveland Direct Release (irrigation & river)	3400	Greeley Loveland Direct Demands	3400
	-	City augmentation plans	1600
Windy Gap Effluent Credit	2700		-
Gravel Pit Storage (firm yield added by storage)	1000		-
WSSC Shares Effluent/Lawn Return Flow Credit	2700	WSSC return flow obligations met w/effluent	300
TOTALS	21400		14900

SURPLUS NON-POTABLE

6500

Notes:

City 3/8th interest in Canal No. 3

1. All supplies available under the City's 3/8th interest in Canal No. 3 will be utilized for non-potable irrigation demands by 2020.

Greeley Irrigation Company:

1. The City currently owns 82 shares but 7 of those shares are used directly on East Memorial Park
2. It is estimated that approximately 80 additional shares (currently 75) will be dedicated to the City by 2020 without a non-potable irrigation demand under Canal No. 3
3. It is assumed that an additional 25 shares (currently 7) will be dedicated by 2020 and used for irrigation under ditch for decreed uses on historic lands and therefore will not require a change of use in water court and return flow maintenance.

Greeley Loveland

1. Effluent credit is based on an assumed 40% effluent credit
2. Waste water plant effluent credit (5300 ac-ft), Lawn return flow credit (1700 ac-ft)
3. The 6500 ac-ft of return flows are those that can be met by non-potable supplies. Approx. 100 ac-ft of return flow obligations are met by direct diversions from the Greeley Loveland System (6600 ac-ft total return flow obligations).
4. 3,400 ac-ft of demand must be met by direct releases from the Greeley Loveland System (3300 ac-ft to irrigation, 100 ac-ft to historic irrigation return flows)

Augmentation Responsibilities

1. Includes ConAgra, Flatiron, Poudre River Ranch, and Saddle Club (Saddle Club at full development)

Windy Gap

1. Based on selling 30 units to provide funding for the firming of the remaining 34 units.
2. Based on the assumption that the Windy Gap water can be used in the winter months (estimated 80% effluent credit at the waste water plant)
3. Although the City expects a slightly lower amount of reusable effluent from Windy Gap at 2020 (2700 ac-ft compared to the current 3200 ac-ft), the City will be adding 900 ac-ft of firm yield by participating in firming projects.

Gravel Pit Storage

1. Greeley West Site initially will be 1000 ac-ft of storage. It will be 2000 ac-ft of storage once excavated deeper - half of the storage will be used for shifting seasonal water.
2. The other half of the storage will be used for non-potable uses in the worst year of drought. The 1000 ac-ft of storage will provide a firm yield of 1000 ac-ft of non-potable supplies.

WSSC

1. Assume that the City will obtain 71 shares of WSSC at 56 ac-ft per share (4000 ac-ft)
2. Assume 2500 ac-ft can be used in winter months at 80% eff. And the rest at 40%
3. Assume 400 ac-ft of WSSC will be used for irrigation, assume 18% lawn return flow credit (approx 100 ac-ft credit)
4. Return flow obligations are met with lower storage in the WSSC system (carryover storage and/or WSSC deliveries bypassed to the LCC headgate). The assumption is that effluent credit will only be needed to met the winter return flow obligations (300 ac-ft, or 3.9 ac-ft/share)

Greeley Irrigation Company (Canal No. 3) Shares (2020):

Per this master plan, the Water Department will only give full dedication credit for Greeley Irrigation Company (GIC) shares for development on lands that have historically been irrigated by Canal No. 3 shares and the proposed development is utilizing a non-potable system. This change in policy will ensure growth is not being subsidized, but it also could have some impacts on development on the east side of Greeley (see Chapter 7 and “Implementation Steps” in Chapter 8 for more discussion on the pending status of this change in policy). It is expected that some of the shares that are dedicated to the City, will be used with a non-potable irrigation system. There will however, be some dedication of shares without any irrigation demand.

Based on growth projections, it is assumed approximately 105 additional GIC shares will be dedicated to the City by 2020. It is assumed approximately 25% of these shares (25 shares) will be dedicated and used with a non-potable system. The remaining shares (80 shares) will be dedicated to the City without a non-potable irrigation demand and will be a surplus supply for the City. Therefore, it is anticipated by 2020, there will be 155 Canal No. 3 shares available for non-potable uses other than irrigation under Canal No. 3. A total of 32 shares will be assigned to direct irrigation under the ditch and will not need a change in water court or the maintaining historic return flows.

Greeley Loveland System Shares (2020):

It is projected the City will obtain an additional 2,200 acre-feet firm yield from shares in the Greeley Loveland system by 2020. These new supplies will come to the City through water dedication for new annexations into the City. Of the 13,200 acre-feet of GLIC supplies, 3,400 acre-feet will be used to meet non-potable demands. A total of 3,300 acre-feet will be used to meet non-potable irrigation demands under the Greeley Loveland Canal and 100 acre-feet will be used to meet historic irrigation return flows.

Table 6: City Ownership of Greeley Loveland System Shares by 2020

	Share Ownership by 2020	Firm Yield Per Share (ac-ft)	Firm Yield 50 Year Drought (ac-ft)
Greeley Loveland Irrigation Company	859	9	7,731
Lake Loveland	117	30	3,510
Seven Lakes	191	10	1,910
TOTAL			13,151

An estimated 40% wastewater effluent credit for the GLIC supplies will provide the City with a future non-potable supply of about 5,300 acre-feet. In addition to the wastewater effluent credit, the City also can get second use on lawn irrigation return flows, which will add another 1,700 acre-feet of non-potable firm yield. Combined, the future use of Greeley Loveland shares will result in a firm non-potable supply of about 7,000 acre-feet (beyond the 3,000 acre-feet of supplies delivered used directly from the Greeley Loveland System).

As discussed previously, the City also has historic return flow obligations associated with the use of Greeley Loveland system shares. Map 2 shows the points and amounts of replacement for the return flow obligations. The return flow obligations shown on Map 2 for the lower ditches on the Big Thompson and Poudre Rivers are only for irrigation months. During the winter months the return flows can be satisfied by replacements to the Poudre-South Platte Confluence. The quantities of return flow obligations are those assumed in a 50-year drought (assumed continuous 365 days/year river call). This is a conservative assumption but valid for an analysis of a drought year obligation.

Most return flow obligations can be met with effluent credit. The only supplies that must be met with treatable supplies (releases of water directly from Greeley Loveland system) are the return flow obligations to the Thompson and Platte Ditch, approximately 100 acre-feet. Return flow obligations to the Lower Latham Ditch will be replaced from effluent credit available from the proposed Ashcroft Wastewater Treatment Plant. The return flow obligations to the Lower Latham Ditch are not predicted to increase between now and 2020.

Irrigation season return flow obligations to the Jones Ditch and Canal No. 3 can be met with effluent credit from Kodak and Windsor wastewater treatment plants (Greeley has rights to approximately 1,100 acre-feet of effluent credit from Kodak and 200 acre-feet of effluent credit from Windsor if wholly consumable supplies are utilized).

The total historic return flow obligations for the City's Greeley Loveland system is projected to be 6,600 acre-feet by 2020, but 100 acre-feet will have to be met with releases of water from the Greeley Loveland system (treatable water). A total of approximately 6,500 acre-feet of return flow obligations can be met with wastewater effluent credit.

City Augmentation Responsibilities (2020):

There are not any known additional augmentation responsibilities that will come on line between now and 2020. The City's large augmentation responsibilities such as ConAgra, Flatiron, and Saddle Club have already been included in current augmentation obligations.

Windy Gap Units (2020):

Greeley owns 64 units of Windy Gap, which equates to 6,400 acre-feet of delivery as originally designed. The 100 acre-feet delivery per unit is not a firm yield and as a result Greeley, along with other owners of Windy Gap, are evaluating projects to provide a firm supply of 100 acre-feet per unit. Greeley intends to sell some units of Windy Gap to help provide funding for the units that are retained. It is assumed for this analysis the City will end up selling 30 units out of the 64 currently owned to help fund the firming storage for the remaining 34 units. The City will increase its firm yield potable supply by about 900 acre-feet in the future by firming the 34 units. However, the amount of Windy Gap effluent credit is expected to decrease from 3200 acre-feet (today's credit) to 2,700 acre-feet by 2020.

Windy Gap can be fully used to extinction. The use of Windy Gap in the winter months will maximize the effluent credit the City receives for second use. In early 2004, the City

was able to take deliveries from the Pleasant Valley Pipeline which allowed winter deliveries of all Windy Gap water to the Bellvue Plant. As a result the Water Department expects to get an effluent credit from Windy Gap water of 2,700 acre-feet (80% of 3,400 acre-feet of delivery).

Gravel Pit Storage (2020):

Greeley has successfully lined two existing gravel pits located on the north side of the City near the Poudre River. The storage will be used for two purposes. First, will be to shift water seasonally so water can be captured during months when non-potable supply is greater than non-potable demand (i.e. winter months). The other plan for the use of this storage is to provide drought carryover storage for non-potable supplies.

The original construction of the project would have provided the City approximately 1,500 acre-feet of storage. Greeley has entered into a sand and gravel mining lease for the site to excavate the existing pits deeper and to obtain a total of 2,000 acre-feet of storage (storage could be as high as 2,500 acre-feet). It is estimated about 1,000 acre-feet of the storage will be required to shift water seasonally during the year to match supplies with demands. The other 1,000 acre-feet of storage will be used for providing a firm yield of non-potable supplies during the worst year of the 50-year drought.

The new non-potable firm yield added (1,000 acre-feet), is the result of adding 1,000 acre-feet of storage. This assumption of one acre-foot of firm yield for each acre-foot of storage is based on the higher yields of Greeley's non-potable supplies in the years preceding the worst year of the 50-year drought. The full 1,000 acre-feet of storage will be kept full until the worst year of the 50-year drought.

New Transbasin Water Supplies (2020):

As established in the *Greeley Water Master Plan*, the Water Department will be developing 6,000 acre-feet of water (Future Water Account) that will be offered for new development through a cash-in-lieu program. As the 6,000 acre-feet of water is sold to new development, the cash-in-lieu payments will be used to purchase additional water to replenish the Future Water Account. It is anticipated that a significant portion of the water purchased with the cash-in-lieu payments will be transbasin water such as shares in the Water Supply and Storage Company (WSSC) and Divide Canal and Reservoir Company. For the purpose of projecting the surplus non-potable supplies by 2020, it is assumed that two thirds of the City's cash-in-lieu water acquisitions, 4,000 acre-feet, will be transbasin water. For the purpose of evaluating future surplus non-potable supplies, it is assumed the full 4,000 acre-feet will be from the acquisition of WSSC shares.

As discussed in detail earlier in this chapter, the Water Department can maximize non-potable supplies by utilizing wholly consumable supplies such as WSSC as much as possible during the winter months when the effluent credit is highest. For each 1.0 acre-foot of WSSC used in the winter months, roughly 0.8 acre-feet of effluent from the wastewater

treatment plant can be captured and reused for non-potable uses (non-potable irrigation, augmentation, maintaining historic return flows, etc.).

There are approximately 9,700 acre-feet of projected winter (November – March) demand for the year 2020. Of this demand, about 3,800 acre-feet will be met with the City’s Poudre River 12.5 cfs direct right. Windy Gap water will make up another 3,400 acre-feet. The remaining winter demand, 2,500 acre-feet, can be met with deliveries from the WSSC system at 80% efficiency at the wastewater treatment plant (2,000 acre-feet of non-potable supplies). The remaining 1,500 acre-feet of firm yield from the new WSSC shares will be used in the irrigation season (shoulder months) at a 40% efficiency at the wastewater treatment plant (600 acre-feet of non-potable supplies). In total the City will obtain a second use of about 2,600 acre-feet of non-potable water from use of WSSC shares

There is expected to be some lawn return flow credits available to the City due to the irrigation use of WSSC shares. It is assumed about 25% of the WSSC water used in the shoulder months (400 acre-feet of the 1,500 acre-feet) will be used for outdoor irrigation. Assuming a lawn return flow credit of 18% on water used for irrigation, the City will obtain an additional 100 acre-feet of lawn return flow credits.

Greeley has completed a study of WSSC shares to determine the level of historic return flow obligations required with a change of use proceedings through water court. It has been determined water stored in the WSSC lower storage facilities (storage below the Larimer County Canal headgate) will be available to meet irrigation season return flow replacements. It is assumed winter month return flow replacements will be met with WSSC effluent credit at the wastewater treatment plant. This assumption is due to the fact the calling rights during the winter months will be lower South Platte diversions. The total return flow obligation met by wholly consumable effluent credit will be approximately 3.9 acre-feet per share (estimated 71 shares of WSSC will come into the City by 2020) or a total of about 300 acre-feet.

It is estimated, in total, the use of WSSC shares will provide the City with 2,700 acre-feet of new non-potable supplies. The non-potable obligations for the WSSC shares will be about 300 acre-feet, which in turn will provide the City a net surplus of 2,400 acre-feet of non-potable supplies by 2020.

As stated above, the projected addition of 2,700 acre-feet of new non-potable supplies is based on the assumption that the Water Department will acquire two thirds of its new supplies from transbasin supplies. The timing and amount of new transbasin supplies acquired by the Water Department between today and 2020 will directly impact both the timing and the amount of surplus non-potable supplies.

New Cache la Poudre System Shares (2020):

The projected growth boundaries for the City of Greeley indicate there will be growth north of the Cache la Poudre River including growth over lands historically irrigated by the New Cache System (Canal No. 2). However, most of the growth on lands irrigated under Canal

No. 2 will occur between the years 2020 and 2050. The Water Department has included New Cache System shares on its acceptable non-potable water rights list because of the projected future ownership the Water Department will have by 2050. However, the projected number of New Cache la Poudre Irrigating Company and New Cache la Poudre Reservoir Company shares dedicated to the City by 2020 will be very minimal. As a result, the New Cache System shares obtained by 2020 will have an insignificant impact on the surplus non-potable supplies available for the Water Department for other uses, and are not included in this surplus determination.

Summary of Non-Potable Supplies/Demands (2020):

As shown on Table 5, the current total supply of non-potable is 21,400 acre-feet and the total obligation of the City for non-potable supplies is 14,900 acre-feet. A projected surplus supply of 6,500 acre-feet of non-potable supplies will be available by 2020 for utilization by the City.

CHAPTER 3: ALTERNATIVES FOR UTILIZING SURPLUS NON-POTABLE SUPPLIES

In Chapter 2 it was determined the City currently has a surplus of 1,700 acre-feet of untreatable supplies (supplies not available for treatment at Greeley's Bellvue or Boyd Water Treatment Plants). This surplus supply is projected to grow to about 6,500 acre-feet by the year 2020.

Two alternatives, and variations of these alternatives, are being considered for the ultimate use of these surplus supplies. One option (Sell/Buy Alternative) involves selling (or leasing) the surplus untreatable supplies and using the funds to obtain new supplies that are treatable at Greeley's water treatment plants. The second option (Poudre – G-L transfer alternative) is to use the water directly for non-potable irrigation in the City. Implementing this alternative will require a pump station on the Poudre River and storage west of Greeley in order to get water into the Greeley Loveland Canal where it can be delivered to non-potable irrigation projects.

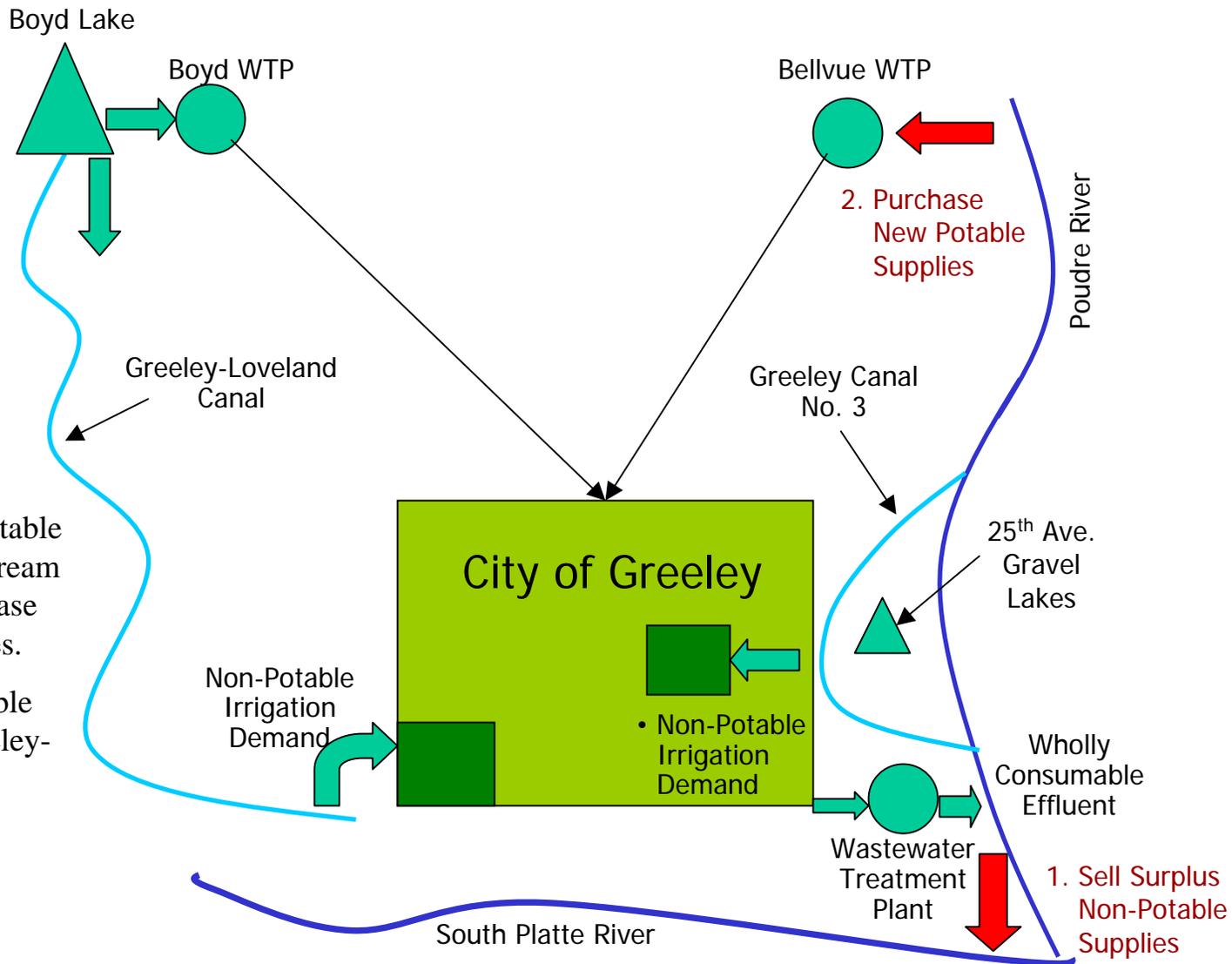
SURPLUS NON-POTABLE ALTERNATIVE A: SELL/BUY

The first, Alternative A, is called the Sell/Buy Alternative. Very simply, this plan would entail the Water Department selling (or leasing) its surplus untreatable supplies to downstream users and using the funds to purchase new supplies that are higher on the Poudre River that can be delivered to the City's Bellvue Water Treatment Plant. The City would be able to increase its firm yield potable supply by selling (or leasing) its surplus untreatable supplies. Figure 5 illustrates this option for utilization of the City's surplus supplies. Under Alternative A the City will continue to develop and serve non-potable demands through the Greeley Loveland system, Canal No. 3, and wells. The major points of this alternative are:

- Sell (or lease) surplus untreatable supplies to downstream users.
- Purchase new potable supplies that can be treated at Bellvue Filter Plant (i.e. Water Supply and Storage Company shares).
- Continue to deliver water down the Greeley Loveland Canal, Canal No. 3, and wells for non-potable irrigation as it is currently practiced.
- Continue to promote non-potable irrigation for new development and strive for serving at least 15% of new demands with non-potable water supplies.

SURPLUS NON-POTABLE ALTERNATIVE B: POUDBRE – GREELEY – LOVELAND TRANSFER SYSTEM

There are numerous diversions from the Poudre River throughout the summer and winter that prohibit exchanges up the Poudre River from Greeley to the Bellvue Treatment Plant. However, during the non-irrigation months there are options to exchange water from the



SELL/BUY

- Sell Excess Non-Potable Supplies to Downstream Water Users/ Purchase new potable supplies.
- Continue Non-Potable Irrigation with Greeley-Loveland Canal.

Figure 5: Sell/Buy (Alternative A) Schematic

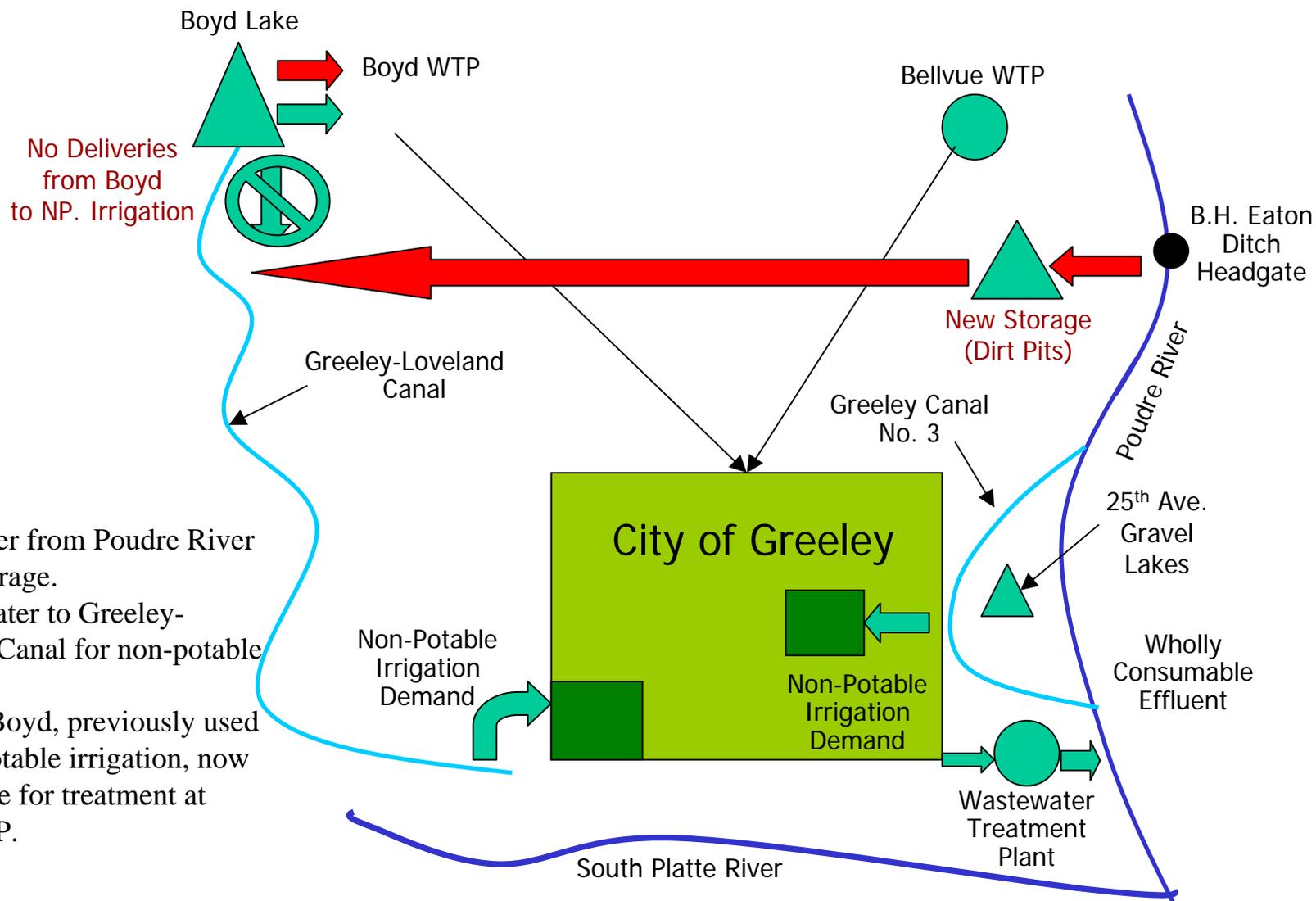
City's wastewater treatment plant to the City's 25th Avenue Gravel Lakes and also to the B.H. Eaton Ditch headgate in the vicinity of Windsor.

Alternative B would involve exchanging untreatable water supplies up the Poudre River to the B.H. Eaton Ditch headgate. From this point the supplies would be pumped to a new water storage facility west of Greeley and then delivered into the Greeley Loveland Canal so that it is available for non-potable irrigation (See Poudre – Greeley-Loveland Transfer schematic – (Figure 6). Map 3 shows a conceptual layout of potential reservoir sites and an approximate pipeline route for this alternative.

It is possible a combination of storage sites may be the best option for the City. The basic concept of both reservoir options is the same; pump water from the Poudre River to new storage, which then can be delivered into the Greeley Loveland Canal for non-potable irrigation.

The major points of the Poudre – G-L transfer alternative are:

- Exchange WWTP effluent and releases from gravel pit storage in Greeley up the Poudre River to the B.H. Eaton headgate in the winter months.
- Pump water, primarily in the winter, from the Poudre River into new storage (Raindance Ridge and/or Larimer Draw).
- Storage will initially accommodate up to 1,700 acre-feet of surplus non-potable supplies and up to 6,000 acre-feet of surplus non-potable supplies by the year 2020. Storage will be phased to meet these needs.
- Deliver water from storage into the Greeley Loveland Canal for non-potable irrigation in the summer months.
- Retain Greeley Loveland System supplies in storage, previously delivered down the canal for non-potable irrigation, and now use these supplies for delivery to the Boyd Water Treatment Plant.
- There is between 4,000 and 5,000 acre-feet of deliveries down the Greeley Loveland Canal currently going to non-potable irrigation. This includes City lands (parks, etc) and private users (UNC, Greeley Country Club, etc).
- With the construction of new storage, the 4,000-5,000 acre-feet of existing non-potable demands can be met with supplies from the Poudre River. In addition, a future demand beyond 2020 of 1,000-2,000 acre-feet of new non-potable demands under the Greeley Loveland Canal could be met from the Poudre – G-L transfer system.
- Continue to promote non-potable irrigation for new development, when cost effective, and strive for serving at least 15% of new demands with non-potable water supplies.



DIRT PITS

- Pump water from Poudre River to new storage.
- Deliver water to Greeley-Loveland Canal for non-potable irrigation.
- Water in Boyd, previously used for non-potable irrigation, now is available for treatment at Boyd WTP.

Figure 6: Dirt Pits (Alternative B) Schematic

Map 3: Dirt Pits Vicinity Map

POUDRE – G-L TRANSFER: POUDRE RIVER EXCHANGE POTENTIAL

The new storage for this alternative would allow the City to capture water from the Poudre River during the non-irrigation months when there is exchange potential (live flows between the B.H. Eaton headgate and the lower end of the Poudre River). An analysis completed by Greeley staff indicated there is sufficient exchange potential in the non-irrigation months (mid October thru mid April), even in a severe drought year as experienced in the water year of 2002, to exchange 6,000 acre-feet of water from the City to the B.H. Eaton headgate.

As discussed in Chapter 2, in the future, the majority of Greeley's wholly consumable supplies will be used in the winter months when the wastewater effluent return flows are at their highest, which will maximize the quantity of water available for second use. This future water supply operation matches well with the Poudre – G-L Transfer Alternative, which requires winter month exchanges up the Poudre River. In addition, the Water Department will have the option of using the 25th Avenue Gravel Lakes to shift effluent supplies to match the timing of exchange potential on the Poudre River.

The Poudre – G-L Transfer storage will be used as annual storage versus carryover storage. During average and dry years water will be pumped to storage and in the summer months all water pumped to storage will be delivered to irrigation.

Dirt Pits: Wet Year and Dry Year Operation

The Greeley Loveland System has significant junior water rights that result in large variations in delivery amounts from wet years to dry years. If the Poudre – G-L Transfer Alternative is implemented it would allow for flexibility to use either the Greeley Loveland System or the Transfer System to deliver water to non-potable irrigation. In average and dry years the Water Department would pump water to the Transfer System storage during the winter months. Water would then be delivered from storage to non-potable irrigation under the canal during summer months. In wet years the City can hold water in the Transfer System storage, avoid the pumping costs, and use excess flows in the Greeley Loveland System to serve non-potable irrigation under the canal.

Dirt Pits: Demand and Supplies

The current estimate of non-potable irrigation demands under the Greeley Loveland Canal (4,000-5,000 acre-feet) includes demands from private Greeley Loveland System shareholders such as University of Northern Colorado, Greeley Country Club and Aims Community College. See Chapter 4 for more discussion on privately owned non-potable systems in Greeley.

The Water Department will have the opportunity under the Poudre – G-L Transfer Alternative to complete agreements with these private shareholders to give their shares to the City in exchange for City water supplies delivered down the Greeley Loveland Canal System. The advantage of such an agreement to the private shareholder would be the shoulder month delivery of water. Currently, the Greeley Loveland System does not deliver

water in the early and late portions of the irrigation season and a supplemental potable tap is required. The Poudre – G-L Transfer Alternative would eliminate the need for using a potable tap and allow delivery throughout the full non-potable irrigation season.

Replacing the Greeley Loveland System supplies with Poudre River supplies will be on-going over the next 20 years as the City’s surplus non-potable supplies expand. The projected surplus will grow to about 6,500 acre-feet by the year 2020. Consequently, there is the potential of implementing the Poudre – G-L Transfer Alternative in phases in an effort to match the increase in surplus non-potable supplies.

ADVANTAGES OF ALTERNATIVE A: SELL/BUY

1. Will not reduce the flows in the Poudre River between Windsor and Greeley (Poudre River exchange required with the Poudre – G-L Transfer Alternative would reduce flows)
2. A significant advantage to this alternative is that it can be implemented incrementally as the City’s surplus non-potable supplies increase. The timing and amount of the projected surplus untreatable supplies between now and 2020 is dependent on the City’s ability to acquire transbasin supplies available on the Poudre River (see *Chapter 2, New Transbasin Water Supplies 2020*). The Sell/Buy alternative can be implemented effectively regardless of what future water supplies the Water Department obtains.
3. This alternative maintains the use of the Greeley Loveland System for non-potable deliveries. The water quality in the Greeley Loveland System is better than the water quality of the Poudre River near Windsor.
4. Lower operating costs because this alternative does not require pumping.
5. Does not require a new court change of use proceeding that would be necessary for approval for the Poudre – G-L Transfer Alternative.

ADVANTAGES OF ALTERNATIVE B: POUFRE – GREELEY-LOVELAND TRANSFER SYSTEM

1. Eliminates using treatable water (Greeley Loveland System shares) for non-potable uses.
2. Increases the efficiency of Greeley’s water system.
3. Expands the entire region’s potable (treatable) water supply.
4. Greeley has more control over the implementation of this alternative versus relying on the uncertain markets for treatable and untreatable supplies under the Sell/Buy alternative.
5. Can make Fall/Spring month deliveries of non-potable water as opposed to using potable supplies to supply water in the shoulder months.
6. Greeley can claim seepage from the Greeley Loveland Canal as augmentation water.

COST COMPARISON OF ALTERNATIVES

The two alternatives for utilization of the City's surplus non-potable supplies were compared using the common objective of increasing the City's potable (treatable) supplies by 6,000 acre-feet of firm yield. The Sell/Buy alternative would involve selling (or leasing) surplus untreatable supplies (6,000 acre-feet of the total projected surplus of 6,500 acre-feet) and using the funds to buy new potable supplies, which would produce about half of the new firm yield, 3,000 acre-feet. The remaining potable supplies, 3,000 acre-feet, would be directly purchased. The Poudre – G-L Transfer project would involve the delivery of 6,000 acre-feet of water to non-potable demands through the Transfer System and retaining 6,000 acre-feet of new firm yield available for treatment at the Boyd Water Treatment Plant.

Alternative A, Sell/Buy, is reliant on a market for non-potable water on the Lower Poudre. There are increasing demands for water downstream of the City's wastewater plant where most of the City's surplus untreatable is available today and in the future. Demands for augmentation water has been steadily increasing over the past several years. This past year it increased at an even a higher rate due to the recent change in state laws requiring well owners to assemble their own individual augmentation plans to allow continued well pumping. Greeley's surplus supplies on the lower end of the Poudre River, accordingly, are increasing in value as the demand for this water is growing.

The market value of supplies on the lower end of the Poudre River is not well established like many of the other City owned supplies. Values however are impacted by the increasing demands and by the fact the City has supplies throughout the year, not just during the irrigation season. It is possible for entities to purchase wholly consumable effluent credit from the City and use this supply on a monthly basis throughout every month of the year and only need minimal or no storage to implement an augmentation plan. For these reasons it is expected the market value of effluent credit will be higher than transactions in the recent years would indicate for ditch shares on the lower end of the Poudre River.

For the purpose of alternatives comparison it was assumed the market value of the untreatable supplies is \$2,000 per acre-foot. It is believed this is a conservatively low estimate that would enable the City to easily sell (or lease) its surplus supplies. It is also assumed the Water Department could purchase new potable supplies that are treatable at the Bellvue Water Treatment Plant at \$6,000 per acre-foot. The total cost to the Water Department for implementation of the Sell/Buy Alternative is \$24 Million to develop 6,000 acre-feet of new potable firm yield (see Table 7).

It is estimated new reservoir storage for the Poudre – G-L Transfer Alternative, including all storage, delivery systems, and land, can be obtained for \$4,000 per acre-foot. Therefore, the total cost of developing 6000 acre-feet of storage would result in a total cost to the Water Department of \$24 Million. The resulting increase in firm yield to the City would be 6,000 additional acre-feet now available for treatment at the Boyd Treatment Plant.

Table 7: Cost Analysis of Surplus Non-Potable Alternatives

Alternatives

- A Sell/Buy (portfolio shift)**
- B Dirt Pits**

Assumptions:	Cost per ac-ft
assume market value of non-potable (lower Poudre rights) is equal to :	\$2,000
assume cost of potable supplies (treatable at Bellvue WTP) is equal to:	\$6,000
construction cost for the Dirt Pits or similar project (storage, delivery system, land, etc):	\$4,000

Asset #	Current Assets	Assets after Implementation of Alts.	
		Alt A: Sell/Buy	Alt B: Dirt Pits
1	6000 ac-ft in Boyd Lake (delivered to NP Irrigation)	6000 ac-ft in Boyd Lake (delivered to NP Irrigation)	6000 ac-ft in Boyd Lake (available to treatment plants)
2	6000 ac-ft NP surplus supplies (unused)	2000 ac-ft new supplies (available to treatment plants)	6000 ac-ft NP surplus supplies (delivered to NP Irrigation)
3	\$24 Million	4000 ac-ft new supplies (available to treatment plants)	Construction of the Dirt Pits

Notes:

Asset 2 Under Alternative A (Sell/Buy) the assumption is that the 6000 ac-ft of surplus NP supplies can be sold for \$2000 per ac-ft for a price of \$12 Million and then the \$12 Million in turn would be used to purchase 2000 ac-ft of new water supplies available to the Bellvue Plant

Asset 3 Under Alternative A (Sell/Buy) \$24 Million would be spent to purchase 4000 ac-ft of new supplies available to the Bellvue Plant. These funds are in addition to the \$12 Million generated from the sell of the City's surplus NP supplies.

General Note If the gap between the market value of potable and non-potable supplies is smaller than the estimated gap of \$4000/ac-ft, Alternative A has the cost advantage. If the gap is greater than estimated gap of \$4000/ac-ft, the cost advantage is with the Dirt Pits Alternative

Based on the assumed market values for non-potable and potable water and the assumed cost of new storage, the cost analysis indicates the two alternatives are essentially equal in cost. The estimated gap in the market value of untreatable supplies (\$2,000 per acre-foot) versus potable supplies (\$6,000 per acre-foot) is \$4,000 per acre-foot. If the true gap in these market values is less than \$4,000 per acre-foot, the Sell/Buy Alternative would have the cost advantage. If the gap is greater than \$4,000 per acre-foot, the cost advantage would be with the Poudre – G-L Transfer Alternative.

Likewise, if the true cost of building the complete Poudre – G-L Transfer system is greater or less than the projected \$4,000 per acre-foot, the cost advantage swings between the two alternatives.

Recent cost estimates for the construction of the Transfer System indicate the cost may be higher than the \$4,000 per acre-foot used in the preliminary analysis. If this holds true, the cost advantage would lean toward the “Sell/Buy” alternative.

SELECTING AN ALTERNATIVE

The Water Department has been taking significant steps in the determination of the feasibility of the Poudre – G-L Transfer Alternative. However, additional study and evaluation must be completed by the Water Department prior to finalizing an alternative for the utilization of the City’s surplus non-potable supplies. The steps remaining include:

- a) Evaluate, with a greater level of detail, the demand for non-potable supplies at the Poudre River/South Platte River confluence and the potential market value for those supplies.
- b) Evaluate the sizing and timing of Poudre – G-L Transfer Alternative phasing in relation to the availability of the City’s excess non-potable supplies.
- c) If any additional information is provided to the Water Department that supports the preliminary estimate of the Transfer System construction costs at \$4,000 per acre-foot, reconsider the cost comparison of the two alternatives.
- d) If the Transfer System option is determined to be the preferred option for Greeley’s surplus non-potable supplies, perform the following additional studies:
 1. Study in more detail the costs on pumping for the Transfer System alternative.
 2. Begin talks with the entities in Greeley who own private non-potable irrigation systems under the Greeley Loveland System regarding Greeley providing supplies from the Poudre – G-L Transfer Project in exchange for their potable supplies.

CHAPTER 4: NON-POTABLE IRRIGATION DEMANDS

One of the important on-going responsibilities for the Water Department spelled out in this master plan is to perform an annual accounting of non-potable irrigation activities. The City's future water supply and infrastructure planning is based on 15 percent of new demands being met by non-potable irrigation. Annual non-potable accounting will be necessary to track progress toward the 15 percent projection. This chapter summarizes the current and projected acreage of non-potable irrigation and tabulates how much irrigation is provided by each source of water (Canal No. 3, Greeley Loveland Canal, wells, effluent reuse water). In addition, this chapter quantifies how much non-potable water is served to irrigation through privately owned non-potable systems.

SOURCES OF WATER FOR NON-POTABLE IRRIGATION

Water is delivered to non-potable irrigation from several different sources including the Greeley Loveland Canal, Canal No. 3, shallow alluvial wells, and wastewater effluent re-use. Map 4 shows the location of the parcels within the City that are irrigated with non-potable water and identifies the sources of water used to irrigate the various sites.

Historically, most of the non-potable irrigation has been from Canal No. 3. Over the past decade the expansion of non-potable irrigation in the City has been primarily on lands served by supplies delivered through the Greeley Loveland Canal and its many laterals. A total of 922 acres are now served by non-potable irrigation through the Greeley Loveland system. Canal No. 3 serves 259 acres and wells serve 158 acres. Wells used for non-potable irrigation are permitted and operated under pending plans of augmentation. Wells used for non-potable irrigation, which are decreed alternate points of diversion for Canal No. 3, are included in the Canal No. 3 irrigation totals.

Table 8 lists the sites served by non-potable water and the source of water used to irrigate the site. Many of the non-potable systems serve multiple sites such as the Youth Sports System and the Monfort Park System. The development of one system to serve multiple sites has made the overall cost per acre-foot of delivery much more affordable. Private systems are those developed by private entities and use privately owned water supplies.

The acreages shown on Table 8 list both the current acreage irrigated and the acreage after the existing systems have been fully expanded. For example, the Promontory non-potable irrigation system has been constructed to ultimately serve 240 acres. The total acreage, at full development, also include proposed sites that, by contract or agreement with the City, will utilize non-potable water service.

Map 4: Parcels with Non-Potable Irrigation – by Water Source

Table 8: Irrigated Acreage by Water Source

Greeley Loveland System

Non-Potable System	Current Irrigated Acreage (acres)	Acreage at Full Development (acres)
Youth Sports System	83	83
Monfort Park System	58	58
Mosier Hill System	18	18
McCloskey System	0	153
Promontory System	29	240
Boomerang GC (South 9)	50	50
Josephine Jones Park	21	21
Highland Hills GC	115	115
Bittersweet Park	30	30
Cottonwood Park	5	5
Sanborn Park	16	16
Glenmere Park	8	8
Private Systems	490	490
Total	922	1286

Greeley Canal No. 3

Non-Potable System	Current Irrigated Acreage (acres)	Acreage at Full Development (acres)
Northridge System	51	81
Boomerang GC (north 9) *	59	59
Luther Park System*	10	16
East Memorial System	12	17
Houston Gardens *	6	6
Boys & Girls Club *	1	1
Balsam Sports Complex	15	15
Island Grove Park*#	10	10
Delta Park*#	4	4
Linn Grove Cemetery*#	59	59
Private Systems	32	32
Total	259	300

*sites utilizing 3/8th Interest, all others use GIC shares

sites irrigated with shallow wells (decreed alternate points of diversion to Canal No. 3)

Shallow Wells - Augmented

Non-Potable System	Current Irrigated Acreage (acres)	Acreage at Full Development (acres)
Centennial Village System	6	16
Bella Romero Elementary	5	10
Saddle Club	11	11
Villa West (private)	22	22
County Offices (private)	100	100
Friendly Village (private)	14	14
Total	158	173

Wastewater Effluent Reuse

Non-Potable System	Current Irrigated Acreage (acres)	Acreage at Full Development (acres)
Greeley WWTP	12	12
Total	12	12

note:

Acreage at Full Development includes sites that have non-potable service but demand has not come on line yet and includes sites that are under agreement with the City for non-potable service.

In summary, the non-potable water demands by water source are as follows:

Table 9: Summary of Irrigated Acreage by Water Source

Source of Supply for Non-Potable	Existing Irrigated Acreage of Non-Potable Systems	Irrigated Acreage at Full Development of Existing Non-Potable Systems
Greeley Loveland Canal	922	1,286
Canal No. 3	259	300
Wells	158	173
Wastewater Effluent	12	12
TOTAL	1,351	1,771

CITY AND PRIVATE NON-POTABLE IRRIGATION SYSTEMS

Map 5 shows the location of parcels using non-potable irrigation served by City non-potable service and those served by privately owned non-potable systems. Table 10 lists the acreage by water source and non-potable system classification. The classifications are as follows:

Private System: Non-potable systems owned, operated, and maintained by private entities (i.e. Greeley Country Club). Water supplies used with the systems are privately owned. Private entities do not provide any payments to the Water Department for non-potable water service.

City System-City Property: Non-potable systems owned, operated, and maintained by the Water Department and used on City lands. The Water Department owns water supplies used with the system.

City System – Private Prop: Non-potable systems owned, operated, and maintained by the Water Department and used on private lands. Private entities pay non-potable water rates to the City for the non-potable water service (school sites are included in this category because they pay water rates). The Water Department owns water supplies used with the system.

Most of the lands currently served with non-potable service by the Water Department are City properties (538 acres of City owned lands as compared to 155 acres of privately owned lands). As the existing non-potable systems are fully developed, most of the major increases in non-potable irrigation will be for serving privately owned parcels. The two most significant developments include the Promontory and McCloskey non-potable systems. These two non-potable systems will be fully expanded over a period of years as the developments are completed.

Map 5: Parcels with Non-Potable Irrigation – by System Ownership

Table 10: Irrigated Acreage by System Classification

Greeley Loveland System

System Classification	Current Irrigated Acreage (acres)	Acreage at Full Development (acres)
Private Systems	490	490
City Systems - City Property	332	332
City Systems - Private Property	99	464
Total	922	1286

Greeley Canal No. 3 (including alt pt wells)

System Classification	Current Irrigated Acreage (acres)	Acreage at Full Development (acres)
Private Systems	32	32
City Systems - City Property	172	197
City Systems - Private Property	55	70
Total	259	300

Shallow Wells - Augmented

System Classification	Current Irrigated Acreage (acres)	Acreage at Full Development (acres)
Private Systems	136	136
City Systems - City Property	22	37
City Systems - Private Property	0	0
Total	158	173

Wastewater Effluent Reuse

System Classification	Current Irrigated Acreage (acres)	Acreage at Full Development (acres)
Private Systems	0	0
City Systems - City Property	12	12
City Systems - Private Property	0	0
Total	12	12

note:

Acreage at Full Development includes sites that have non-potable service but demand has not come on line yet and includes sites that are under agreement with the City for non-potable service.

Table 11: Summary of Irrigated Acreage by System Classification

Non-Potable System Classification	Existing Irrigated Acreage of Non-Potable Systems	Irrigated Acreage at Full Development of Existing Non-Potable Systems
Private System	658	658
City System – City Property	538	578
City System – Private Property	155	534
TOTAL	1,351	1,771

POTENTIAL FOR CITY SERVING PRIVATE SYSTEM NON-POTABLE DEMANDS

As discussed in detail in Chapter 3, one of the alternative uses for the City’s surplus untreatable supplies is to pump water from the Poudre River to sites located under the Greeley Loveland system (the Poudre – G-L Transfer alternative). By using Poudre River water for irrigation uses, the City can hold water in storage in the Greeley Loveland system and then utilize the water for potable service in Greeley. This same strategy can be used with private entities that use Greeley Loveland system shares. The 490 acres (see Table 10) of private lands irrigated by privately owned shares in the Greeley Loveland system could be served with the City’s surplus untreatable supplies on the lower Poudre River, an annual demand of approximately 1,500 acre-feet.

The current irrigated acreage under the Greeley Loveland Canal served by the City is 431 acres (a demand of about 1,300 acre-feet). By 2020 it is projected this demand will increase to 3,300 acre-feet. In total, the Poudre – G-L Transfer alternative could serve a total of about 4,800 acre-feet of demands by 2020 under the Greeley Loveland Canal (3,300 acre-feet from City non-potable systems and 1,500 acre-feet served to private systems).

The storage volume required with the Poudre – G-L Transfer alternative, if implemented, would need to take into consideration both the timing and quantity of non-potable demands (4,800 acre-feet of new non-potable irrigation demands by 2020 under the Greeley Loveland Canal) and supplies (6,500 acre-feet of surplus supplies by 2020). If the Water Department is not able to obtain agreements to serve the 1,500 acre-feet of existing demands served by private non-potable systems, the storage needed for implementation of the Poudre – G-L Transfer project should be reduced accordingly.

MEETING THE 15 PERCENT NON-POTABLE GOAL

Greeley’s current non-potable irrigation demand is approximately 2,000 acre-feet. Records are not available for private non-potable irrigation demands but the total demand is estimated to be about 1,500 acre-feet. Combined, a total of 3,500 acre-feet of demand is estimated to be met by non-potable irrigation. Per the City’s 2003 Water Master Plan, the total metered potable demand for Greeley is approximately 25,000 acre-feet of potable water. This brings the overall total, for both potable and non-potable, to 28,500 acre-feet. The percent of total water demand met by non-potable water service is approximately 12.3%.

Per Greeley’s 2003 Water Master Plan, the Water Department plans to serve 15 percent of new demands by non-potable irrigation. It is expected, with the increased commitment to non-potable irrigation, the Water Department will be able to see an increase from 12 percent non-potable to 15 percent non-potable for future demands. Projected increases in total water demand from today to 2020 are 16,200 acre-feet. Assuming the Water Department is able to serve 15 percent of these demands with non-potable, about 2,400 acre-feet of demand will be met by new non-potable irrigation systems and the remaining 13,800 acre-feet will be met with potable supplies.

The 2,400 acre-feet of new demand met by non-potable irrigation represents metered demand. Assuming a metered demand of 2.5 acre-feet per acre and a delivery demand of 3.0 acre-feet per acre, raw water delivery demand is projected to be approximately 2,800 acre-feet. Additional future irrigation under Canal No. 3 is projected to be about 800 acre-feet (300 acre-feet irrigated by the City’s 3/8th interest in Canal No. 3 and 500 acre-feet irrigated with new Greeley Irrigation Company shares).

To meet the 15 percent future non-potable goal, 2,000 acre-feet of new non-potable demand under the Greeley Loveland Canal must be developed by 2020. This equates to adding approximately 670 acres of new non-potable irrigation under the Greeley Loveland Canal. It is projected 365 acres will be added under the Greeley Loveland Canal when the full development of the existing non-potable systems is complete. It is very conservative to assume an additional 305 acres of non-potable irrigation will be developed under the Greeley Loveland Canal between now and 2020.

Also, in an effort to support the 15 percent goal for non-potable, the City’s projected new land uses added by 2020 were reviewed. In the Water Master Plan it was determined 16,161 acres of new land will be developed by 2020 with estimated land uses as shown in Table 12 below. Estimated turf area percentages have been applied to these total acreages to calculate the total turf area that will be developed between now and 2020.

Table 12: Land Use and Irrigated Turf Estimates (today through 2020)

Land Use	Acres	Percentage of Total	Estimated Percent Turf	Irrigated Acres	Irrigation Demand (ac-ft)*
Agricultural/Large Lot Residential	386	2.4%			0
Low Density Residential	1,230	7.6%	15.0%	185	469
Medium Density Residential	2,423	15.0%	50.0%	1211	3077
Commercial	968	6.0%	25.0%	242	615
Employment District	2,076	12.8%	25.0%	519	1318
Public/Institutional	336	2.1%	60.0%	202	512
Industrial	306	1.9%	15.0%	46	117
Parks	310	1.9%	85.0%	264	670
Open Space	7,798	48.3%			0
Mining	326	2.0%			0
Parks					0
Total	16,161	100.0%		2,668	6,777

* Annual irrigation demand estimated at 2.54 acre-feet per acre.

New irrigation demand is estimated at 6,800 acre-feet. Meeting 2,400 acre-feet (15% of new demand) demands with non-potable systems appears to be a conservative assumption. The Water Department should be able to reach the 15 percent goal without much effort.

CHAPTER 5: GO/NO-GO DETERMINATION FOR FUTURE NON-POTABLE

In the past several years, the Water Department has moved forward on several non-potable irrigation systems based on the confidence they were cost effective solutions for providing water service to open space irrigation. The non-potable evaluations performed in this master plan have further substantiated that non-potable service to large turf area irrigation can be cost effective. Although the Water Department has taken a position of encouraging non-potable development in recent years, the final decision was always left to the developer.

A primary outcome of the non-potable master plan is a decision by the Water Department to make a more substantial commitment to utilize non-potable irrigation of large turf areas where it will preserve the City's treatable water supplies. This increased commitment to the development of non-potable is based on two primary factors:

First, as directed in the Water Master Plan, the Water Department needs to use all possible means to maximize use of untreatable water supplies. Using untreatable supplies to meet non-potable demands is an efficient and logical means of increasing the City's available treatable water supplies.

Second, the Water Department is dedicated to developing a system that provides a reasonable cost water service while at the same time maintaining a high level of service to each of its customers. Whether it is water service to City lands such as parks or ball fields or water service to private developments, the Water Department is committed to offering long-term service at the lowest reasonable cost. In many cases for large turf irrigation the lowest reasonable cost of service is through a non-potable irrigation system rather than through the City's potable system.

Third, the Water Department has developed a significant number of non-potable systems within the City served by either the Greeley Loveland Canal or Canal No. 3 (see Chapter 4). The effectiveness of using these canal systems for on-going future non-potable irrigation is dependent on the amount of flows that must be maintained in the canals to avoid excessive seepage losses. The City must commit to the future development of additional non-potable systems under the G-L System to ensure sufficient flows in the canals are maintained as agriculture diversions continue to decrease. The steady decrease in canal flows are due to the conversion of irrigated farm lands to urban uses and, in turn, water is diverted from the reservoirs within the G-L System to Boyd Lake for municipal use instead of being delivered down the G-L Canal. The City must also commit to a plan to reduce losses in the Greeley Loveland canal to permit delivery of reduced flows in the canal in future years. This plan should include a means for generating revenue, standards for lining/tiling the ditch and a schedule for improvements.

TURF AREAS TO BE SERVED BY NON-POTABLE SYSTEMS

Non-potable use for turf irrigation requires installation of dual systems. Regionally, many cities have explored the use of dual systems to provide water service. It has generally been found the use of dual systems has only proved to be reasonably cost effective with large turf areas and not for individual residential, lot-to-lot, turf irrigation.

The exception to this can be found in cases where a city or town has availability to untreatable water supplies that are significantly less than the cost of potable water supplies. If the savings on water acquisition are large enough, it can cover the cost of adding complete dual water systems within a community. Currently, Greeley is not reliant on high cost treatable supplies such as Colorado Big Thompson Units as a water source for new development.

The Water Department will provide an opportunity for a variance that a developer can obtain for large lot residential applications. If the turf area of a large lot subdivision is significant enough it may be feasible to use a non-potable system.

Turf areas that will be included in the determination of combined large turf areas will be:

- Large landscape areas - commercial/industrial sites
- Large landscape areas - multi-family developments
- Large landscape areas - residential common space/public space/buffer yards
- Parks/sports complexes/golf courses
- Schools

If the combined turf area of each of these is 20 acres or more for a proposed development, then construction of a non-potable system will be required when an untreatable source is available.

GO / NO-GO DETERMINATION: 20 ACRE REQUIREMENT

Three proposed developments were evaluated to determine the feasibility of using non-potable systems to provide water service for large turf areas within the developments. Some of the key data collected included the acreage of the large turf areas (parks, buffer yards, etc.), the peak day irrigation demand, cost estimate of constructing a non-potable system and the cost estimate of adding system capacity assuming potable water is used for irrigation. In each example the cost of non-potable was less than the cost of adding new potable system capacity.

Table 13: Potable vs. Non-Potable Infrastructure Costs

Development	Open Space Irrigation Area (acres)	Irrigation Peak Day Demand (MGD)	Non-Potable Infrastructure Cost Estimate	Cost of Adding Potable Infrastructure for Potable Irrigation ²
Talon (with parks)	44	0.345 ¹	\$560,000	\$ 835,000
Talon (private only)	33	0.259 ¹	\$420,000	\$ 626,000
Meyer Farm (St. Michaels)	56	0.427 ¹	\$716,000	\$1,063,000
West Greeley Tech Center	18	0.142 ¹	\$326,000 ³	\$ 342,000

notes:

¹ Based on a maximum daily demand of 0.22 inches per day (0.29 inches/day assuming 75% irrigation efficiency)

² Based on the City 20 yr CIP: cost of adding potable infrastructure is \$2.41 Million per MGD of capacity

³ Cost does not include any oversizing by the City, does not include off-site land cost (assumption that land will be donated to the City for a permanent conservation easement)

As demonstrated in each of these evaluations, non-potable systems are reasonably cost effective when the combined turf areas are large enough to support the necessary infrastructure (ditch diversion structure, pond, pumping station, delivery pipeline, and distribution system).

One of the major policy positions the City has approved, as a result of this master planning effort, is to require non-potable water service for developments with a total combined acreage of 20 acres or more of large turf areas (large turf areas are defined in more detail below). This policy will reinforce the City’s increased commitment to non-potable water service. Using the 20-acre limit will provide the Water Department and the developers a clear policy for planning and will ensure both the Water Department and private development will implement the lowest reasonable cost of water service.

The irrigation peak day demand for turf is 0.22 inches per day according to a feasibility study done for the proposed Talon Development done by Aqua Engineering, Inc dated October 14, 2002. Assuming an irrigation efficiency of 75 percent the irrigation system peak day demand is 0.29 inches per day. A 20-acre turf irrigation peak day demand in the City of Greeley is approximately 160,000 gallons per day.

Data from Greeley’s 20 year Capital Improvements Plan indicates the cost of adding potable system capacity (treatment, transmission, etc.) will cost the Water Department \$2.41 Million for each MGD of added capacity. Consequently, the addition of 20 acres of new turf area (0.160 MGD peak day capacity requirement) will cost the Water Department \$380,000 if those lands are served through the City’s potable water system.

Each development will have its own distinctiveness that will influence the cost of constructing a non-potable system (distance from the supply ditch or pond, distribution of large turf areas throughout the development, etc.). However, it is expected that in almost all cases a non-potable irrigation system can be constructed for \$380,000 or less to serve 20 acres of common space/open space turf irrigation.

It is possible there will be some instances when the construction of a non-potable system (for 20 acres or more) will be a higher cost to the developer as compared to irrigation with potable water. For developments within the Greeley-Loveland Irrigation Company service area, developers will construct non-potable irrigation systems so long as the system is reasonable cost effective. Those developments with adequate untreatable water for dedication will construct non-potable systems for open space irrigation of 20 acres or more regardless of cost.

GO / NO-GO DETERMINATION: LESS THAN 20 ACRES

There will likely be instances where construction of a non-potable system is the low cost of water service even when the acreage is less than 20 acres. In these cases the Water Department and/or the developer may decide to evaluate the feasibility of non-potable water service. The Water Department will continue to encourage the construction of a non-potable system when the combined turf area is less than 20 acres if it appears it can be reasonably cost effective.

For the evaluation of sites with a combined turf area of less than 20 acres, the cost of potable capacity to meet the peak day irrigation demands will be determined first:

$$\text{Peak Day Demand (gal/day)} = 0.29 \text{ inches/day} / 12 \text{ (in/ft)} * 43560 \text{ (sq ft/acre)}$$

$$* 7.48 \text{ (gal/cubic ft)} * \text{irrigated acreage}$$

$$\text{Cost of Potable System Capacity} = \$2,410,000 / \text{MGD} * (1/1,000,000) \text{ (gal/MG)}$$

Cost of Potable

$$\text{Water Service} = \text{Peak Day Demand (gal/day)} * \text{Cost of Potable System Capacity/gal}$$

Cost of Potable

$$\text{Water Service} = (7874 * \text{irrigated acreage for proposed development}) * \$2.41$$

For example, the estimate for adding potable infrastructure capacity to serve 15 acres of irrigated turf is \$285,000. This value will be used to determine an upper limit for the infrastructure costs for non-potable service. Continuing with this example, if a non-potable system could be constructed for less than \$285,000, then the Water Department would encourage the use of non-potable water service. Each year the 2.41 value will need to be reconsidered by the Water Department using the most current figures from the City's long-term CIP cost projections.

CHAPTER 6: NON-POTABLE PLANNING APPROACH

DEVELOPING REGIONAL NON-POTABLE SYSTEMS

Each year there are a few developments proposed within Greeley that fall in the approximate range of 160 to 640 acres. These large development areas can have significant “common space/open space turf area” (over 20 acres) that warrants consideration of a non-potable system to provide non-potable irrigation (see Chapter 5). In many of these cases the Water Department may find the development of a larger regional non-potable system may be a much more cost effective solution for non-potable water service than developing separate non-potable systems for each individual development within the same geographic area.

When the Water Department considers the possibility of a regional non-potable system there are several challenging questions that must be addressed including 1) how much additional non-potable irrigation should be planned for in the service area of the future regional site, 2) what will be the timing of the development of the land that is in the service area of the future regional site, 3) how much money does the Water Department need to expend to reserve the capability to develop a regional non-potable system, and 4) what degree of oversizing of system components should the Water Department construct today in anticipation of future non-potable irrigation demand and what can be delayed until additional development occurs.

These questions are complicated because the City does currently not take a strict approach to land planning and it is generally not known where, when and how much “common space/open space turf area” will be developed in any particular growth area of the City. Even if land uses can be better defined, the non-potable demands can vary significantly from one development to the next and, therefore, non-potable systems cannot be effectively developed using standard sized mains to serve each square mile such as done with potable service.

Three possible approaches could be taken in regards to non-potable regional planning:

1. **Do not include any future development projections in the non-potable system design.** Develop systems to serve only developments that have complete certainty. This approach has the lowest financial risk to the City. It does not involve any oversizing for future development.
2. **Develop regional non-potable systems using standard service grids, service capacity and sizing.** This approach simplifies the implementation of non-potable service but does not take into account the variability of land use from one site to the next and the impacts due to location of canals, existing ponds/lakes, plans for future parks, etc. This approach would require a large up front capital investment from the Water Department without any guarantee of when or how much use any particular grid system would be utilized by future development.
3. **Consider regional systems as individual developments are proposed.** Consider regional systems taking into account all of the major factors that will influence the decision on the timing and capacity of development. This approach to planning should provide a lower overall cost of non-potable water service to Greeley customers as well as

limit the amount of financial risk to the Water Department. It will require Water Department staff to evaluate regional systems each time a large development proposal is brought to the City.

The selected approach by the City (#3) is a “middle ground” between the first two approaches. It would involve giving considerable effort to determining the potential for regional non-potable systems each time new developments are being proposed. It also includes oversizing certain components of the non-potable system that can be completed at low cost to the City. The Water Department has been operating primarily under this approach for the past several years. Prior to 1995, most non-potable systems within Greeley were constructed on an individual development or site basis.

Since geography is the primary factor in determining cost effective locations for regional non-potable systems, the optimum locations for future systems can be determined prior to development. Those prime locations that would allow development of cost-effective regional systems will be identified. Water Department staff will coordinate with Parks and Planning Department staff to implement code revisions that require regional non-potable systems be installed in these optimum areas.

REGIONAL STORAGE: COORDINATE WITH COMMUNITY PARK PLANNING

The Parks Department has future plans for two regional (community) parks for approximately every six square miles of new development in the city and neighborhood parks for about every one square mile. Future community parks are planned to be around 40 acres in size and the neighborhood parks are planned to be 5-15 acres in size. In an effort to maximize the combined efforts of both the Water and Parks Departments, the Water Department will evaluate potential storage sites with each new large development that could also serve as a community park. Storage sites for regional non-potable systems would need to be of the size that is consistent with community parks rather than neighborhood parks, with about one storage site for every three square miles.

There are clear economies of scale to the development of larger regional ponds/lakes to serve non-potable as opposed to several small storage ponds. This fact combined with the cost advantages of having storage on site to irrigate the regional park makes this planning approach very practical.

There are several different advantages to development of regional non-potable storage sites at the future community parks:

- The size of community parks would allow the potential for future expansion of non-potable storage as development occurs. Initial storage can be sized to meet the demand of the initial development that is driving the regional non-potable system, but the planning for the site could be approached to allow future development of a major non-potable storage site.

- The non-potable system will be located on site to serve the major irrigation demands of the community park turf areas.
- The community parks will be greatly enhanced by having the amenities of a reservoir on site.
- Cost sharing on the development of the site between the Parks and Water Departments will provide an overall savings to the Water Department.
- Within the larger regions being considered for community parks (approximately three square mile regions) there may be existing reservoirs that could be purchased for non-potable storage or areas with topography that could result in low cost water storage.
- The storage location may be oversized to allow for regional stormwater detention based on the Stormwater Master Plan. This will provide an additional use for the site and potentially another source of funds for site development.

Just as the Water Department could consider the expansion of water storage on site as future development is added, the Parks Department could also delay the development of the community park until enough of the surrounding neighborhoods and business centers are in place. Both the Water Department and the Parks Department should consider all possible ways to delay costs on the development of storage and the park lands to coincide well with the timing and amount of development in order to reduce the financial impact to the Water Department.

NON-POTABLE PLANNING STEPS

Below are steps the Water Department should take each time a development proposal is brought to the City that appears to be a candidate for non-potable turf irrigation.

1. When new development is proposed for those areas identified as prime regional non-potable sites (i.e., those sites with untreatable supplies and either existing storage or natural topography that lends itself to storage), the development will be required to include at least 20 acres of common space/open space irrigation and the developer will be required to construct a regional non-potable system.
2. When new development is proposed outside of those prime areas that has a minimum of 20 acres of common space/open space turf area (large landscape areas - commercial/industrial sites, large landscape areas - multi-family developments, large landscape areas - residential common space/public space/buffer yards, parks/sports complexes/golf courses, schools). The 20-acre limit will trigger the requirement for the development of a non-potable irrigation system. It is also possible two or more adjacent developments that are proposed at the same time, when combined, make non-potable the lowest cost of water service. Those developments under the Greeley-Loveland Irrigation Company system will be required to build non-potable systems if they are reasonably cost effective.
3. Water Department staff will complete an engineering study for new development not identified as prime regional candidates to determine:

- Locations of nearest water sources for non-potable supplies (canal laterals, existing regional non-potable system with available capacity, existing regional non-potable system with the ability to increase the capacity)
 - Locations of existing reservoirs that could be used for a new regional storage site for non-potable
 - Locations of potential sites, such as natural draws, that could be used for cost effective construction of a dam for a new regional non-potable reservoir
 - Cost analysis of an individual non-potable system that would serve the proposed development alone (diversion structure, pump plants, non-potable transmission line to proposed development, on-site storage)
 - Cost analysis of a regional non-potable system to serve the proposed development. Calculate the increase in costs to oversize the various components of the project design (diversion structure, primary pump station, transmission line to regional storage, and land acquisition)
4. Concurrently with step 3 of this process, the Water Department staff will meet with the Parks Department to consider if there are any non-potable storage sites that would serve as a community park for the region. Those sites that would serve as prime regional non-potable sites will either be reserved through the development process or obtained by the Parks Department. Additional funding may be available if the site could serve as a regional stormwater facility.
 5. Concurrently with step 3 of this process, the Water Department staff should meet with the Public Works Department to determine the possibility of using a regional non-potable storage site for regional storm-water control.
 6. If the result of the evaluation completed in step 3 is the best source of supply is located on-site (within the lands being developed), it is assumed the non-potable system infrastructure will be constructed at the same time as the rest of the development infrastructure. If the best source of supply is off-site (not located on the proposed development), then the Water Department will need to determine the timing of construction of the off-site non-potable system infrastructure. The Water Department may need to delay the construction of off-site infrastructure in order to complete negotiations with property owners. There also may be instances where the Water Department delays the construction to see if additional development is proposed in the general area of the non-potable system to improve the cost effectiveness through economies of scale.
 7. A final step will be required if 1) the non-potable system being built is planned as a regional site (a system serving more than one development) and 2) the system design needs to be finished because the system is ready to be constructed. The Water Department will need to make final determination on the amount of oversizing that will be completed for the various system components. The calculation on the amount of additional non-potable demand that could be served by the system will need to take into account the parcels that could be served by the system (geographic constraints), expected

land uses in the area, and an estimate of the timing of development of the adjacent parcels.

8. The Water Department has budgeted \$750,000 annually for non-potable development. These funds can be used by the Water Department to implement the non-potable system oversizing. The Water Department will need to further define its priorities for use of these funds particularly as it relates to maintenance and improvements for existing City facilities and amount reserved for over-sizing of new facilities.

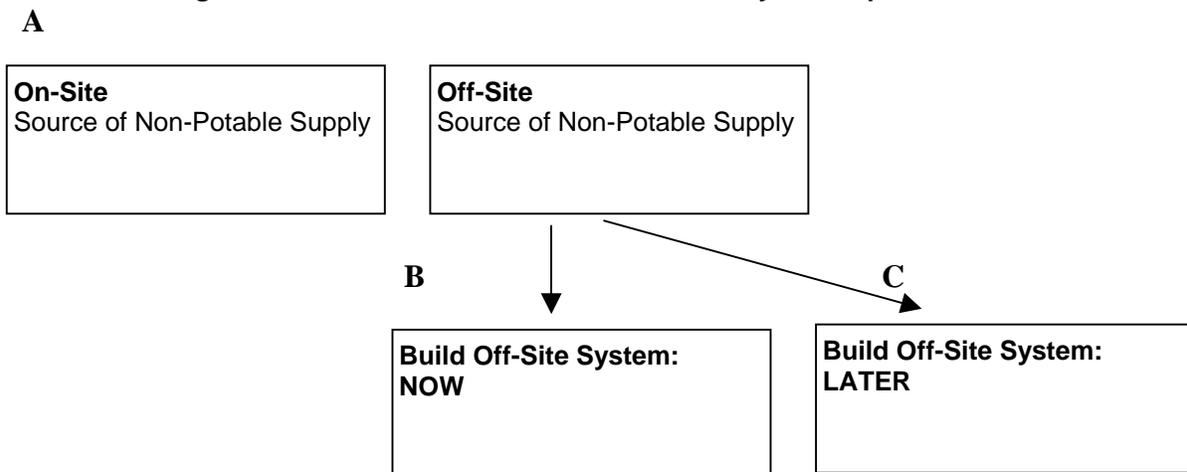
NON-POTABLE PLANT INVESTMENT FEES

For the past several years non-potable plant investment fees have been determined using a flat fee per irrigated acre. From this point forward, non-potable plant investment fees will be based on the actual cost of construction of the non-potable system. This actual cost will include the incremental costs to reduce excess leakage from the Greeley Loveland canal.

The Water Department will only proceed with providing non-potable water service to new development when the cost will be equal to or less than potable water service. In the Greeley-Loveland Irrigation Company service area, the maximum that a developer will pay in plant investment fees for non-potable water service will be equal to the plant investment fees for potable water service.

There are three different development scenarios that need to be considered for the determination of non-potable plant investment fees. In each of the scenarios the Water Department will always maintain the right to perform a feasibility analysis and make a final determination on whether to proceed with a non-potable water service project. The three development scenarios are based on the outcome of the planning steps listed above.

Figure 7: Non-Potable Plant Investment Fees by Development Scenario



Development Scenario A:

If the source of non-potable supply is located on the property being developed (on-site source of supply) it is assumed that the non-potable system infrastructure will be constructed at the same time as the rest of the development infrastructure. Under this scenario the developer will construct the complete non-potable system (based on Water Department standards for non-potable system construction). The Water Department may determine that the proposed non-potable system could serve more than the current development and in turn elect to oversize the system components. In this case the Water Department will participate with the developer in the system design.

If the system is being oversized to serve future development, the costs of the “delivery system” will be split out from the costs of the “on-site distribution system”. The Water Department’s portion of the construction costs will be the added cost for oversizing the “delivery system” portion of the system. The developer will pay for the “delivery system”, assuming no oversizing, and the cost of the on-site distribution system. Under this development scenario the developer will not pay any plant investment fees to the City.

Any future development that ties into the non-potable system for water service will pay off-site plant investment fees. These fees use the same cost per acre-foot that the first developer paid for the construction of the “delivery system” with additional costs for the time value of money.

Development Scenario B:

This scenario is described for developments where the source of non-potable supply is located off-site (not within the proposed development) and there is no delay in the construction of the off-site delivery system. In this event the developer will pay for and construct the on-site non-potable distribution system. The Water Department will design, pay for and construct the non-potable delivery system. If the off-site delivery system is designed to only serve the proposed development, the non-potable plant investment fees paid to the City will be equal to the cost of the off-site delivery system.

If the system is being oversized to serve future development, the costs of the “delivery system” will be used to determine non-potable plant investment fees. The Water Department’s portion of the construction costs will be the added cost for oversizing the “delivery system” portion of the non-potable system. The developer will pay non-potable plant investment fees equal to the cost of the “delivery system”, assuming no oversizing.

Any future development that ties into the non-potable system for water service will pay off-site plant investment fees. These fees will use the same cost per acre-foot that the first developer paid for in the construction of the “delivery system” with additional costs for the time value of money.

Development Scenario C:

This scenario is described for developments where the source of non-potable supply is located off-site (not within the proposed development) and the City delays the construction of the off-site delivery system. The decision to delay the construction of the delivery system would be due to timing of acquisition of the lands needed for the off-site system and/or the decision by the Water Department to wait until additional developments in the region are proposed.

As with all three development scenarios, the developer will pay for and construct the on-site non-potable distribution system. When the decision is made to move forward with the construction of the off-site delivery system, the Water Department will design, pay for and construct the system.

Under this development scenario, the off-site delivery system costs will not be known until construction is completed. Therefore, the developer will pay plant investment fees equal to the cost of serving the site with potable irrigation water service. This amount will be based on the following:

$$\text{Non-Potable Plant Investment Fees} = \text{Irrigation Demand (ac-ft)} * \$7,500/\text{ac-ft}$$

Note: The \$7,500/ac-ft value is as of Jan. 1, 2004 and is subject to change in the future by the Greeley Water and Sewer Board.

The irrigation demand will be calculated using an annual water demand of 2.54 acre-feet for turf irrigation. The cost of \$7,500 per acre-foot of non-potable irrigation demand is the cost to the Water Department to add new potable capacity (see Chapter 5 for more discussion on the cost of adding potable system capacity). An example of applying this formula to determine the non-potable plant investment fees is as follows:

Combined total open space/common space irrigated turf area =	40 acres
Annual metered water demand = 2.54 acre-feet per acre * 40 acres =	102 ac-ft
Total non-potable plant investment fees = 102 ac-ft * \$7,500 =	\$765,000
Net non-potable plant investment fees = \$765,000 minus (on-site non-potable distribution system costs)	

The developer will pay the “net non-potable plant investment fees” to the City to account for their financial investment of the on-site construction of the non-potable distribution system. The “net non-potable plant investment fees” will be paid to the City after the construction of the on-site non-potable system is completed.

If the off-site delivery system is designed to only serve the proposed development (the initial development plus any additional developments that came on line during the construction delay), the Water Department will use its non-potable capital fund to pay for the full construction of the off-site system.

If the Water Department anticipates there will be additional future development, they may decide to oversize the system capacity. The Water Department’s portion of the construction

costs will be the added cost for oversizing the “delivery system” portion of the non-potable system. The “net non-potable plant investment fees” will be used to pay for the off-site system construction, assuming no oversizing.

Any future development that ties into the non-potable system for water service will pay off-site plant investment fees. These fees will be set using the same cost per acre-foot that the first developer paid for the construction of the “delivery system” with additional costs for the time value of money.

PLANT INVESTMENT FEES FOR LARGE TURF AREA POTABLE IRRIGATION

During this master planning process it was discovered that potable plant investment fees for taps serving open space/common space irrigation are being subsidized by the existing Greeley rate payers. To reinforce the City’s position on growth paying its own way, potable plant investment fees for open space/common space turf irrigation are being changed. The plant investment fees will be determined by calculation of open space/common space turf irrigation and not by number and size of taps. The formula for determining the plant investment fees will be as follows:

Potable Irrigation Plant Investment Fees = Irrigation Demand (ac-ft) * \$7,500/ac-ft

Note: The \$7,500/ac-ft value is as of Jan. 1, 2004 and is subject to change in the future by the Greeley Water and Sewer Board.

DETERMINATION OF NON-POTABLE WATER RATES

Non-potable water rates have been set at approximately two thirds that of potable water rates. Non-potable water rates will now be determined using the same method as used for potable. A rate study will be performed each year to determine the operations and maintenance costs and the replacement costs to ensure that rates are adequately covering these expenses.

SYSTEM DESIGN, OWNERSHIP, AND OPERATIONS AND MANAGEMENT

Currently, there are several privately owned and operated non-potable systems within the City of Greeley. From this point on the Water Department will own, operate and maintain all new non-potable systems after construction, including the distribution system up to the meter locations within the development.

The non-potable system components that are constructed by the developer will be done in accordance with City standards for non-potable water service. Developers will dedicate all necessary easements and rights-of-way to the City for the Water Department’s on-going operations and maintenance of the system.

CHAPTER 7: NON-POTABLE WATER DEDICATION

The development of non-potable polices in this master planning effort have run concurrently with the completion of Greeley's *Water Master Plan*. Several of the guiding policy positions that were formulated in the *Water Master Plan* have helped to develop consistent polices in the *Non-Potable Master Plan*. Guiding policy positions for non-potable water dedication include:

- 1. Growth should pay its own way:** This position has been emphasized many times by both the Water and Sewer Board and the City Council. In the area of non-potable dedication, this position is reflected by new policy in the following ways:
 - Non-potable dedication credit will be calculated at a 50-year drought firm yield (Greeley's drought planning standard). By determining dedication credit in this manner, developers will provide sufficient water for their demands and non-potable water will be provided at the same level of service to the Greeley customers as is done with potable water. Developers will be required to dedicate sufficient untreatable water to supply their non-potable demands.
 - The amount of credit given for non-potable dedication will be based on whether the water will be put to use through a non-potable system. If the water will be used for non-potable uses on the developed property, then full credit will be given. On the other hand, if the water being dedicated will not be used for non-potable uses the credit that will be given will reflect the market value of the water right being dedicated. This policy change for the Greeley Irrigation Company shares is still pending (see "Implementation Steps" in Chapter 8).
- 2. Allow dedication of water historically used on lands being developed:** The Water and Sewer Board will determine each year if it has a need for various untreatable supplies. Under certain conditions discussed later in this chapter, the City will provide an avenue for developers to utilize the water rights for dedication that they acquired with the land they are developing. This has been a long-standing Water and Sewer Board policy that will continue and is common for the majority of neighboring communities.
- 3. The Water Department does not have an immediate need for additional untreatable irrigation shares:** The Water Department does not have an immediate need to acquire additional untreatable supplies. The Water Department has a surplus of untreatable supplies above and beyond the current non-potable demands. Projections for 2020 also indicate that the City will have surplus untreatable supplies. As discussed in Chapter 3, the challenge that the Water Department is facing is to fully utilize the surplus untreatable supplies that it currently owns. There is not an immediate need to acquire additional surplus shares. Therefore, the City should not accept untreatable supplies for dedication unless they were historically used on the lands being developed. The Water Department will also evaluate whether it can put this water to use each year before accepting additional untreatable irrigation shares.
- 4. New private non-potable systems will not be allowed:** In the past the Water Department has allowed developments to construct their own independent non-potable systems and use their own water supply for the system. The Water Department will no

longer allow developers to build their own systems and maintain ownership of their own water supplies. Rather, the Water Department will own all non-potable systems and the Water Department will own all non-potable water supplies used in conjunction with those systems. This policy position is being established to ensure that all Greeley customers receive the same level of service.

Over the years there have been many proposals by developers to use and/or dedicate untreatable supplies in the City of Greeley. Prior to this master planning effort there has not been a firmly established position on many of the critical non-potable dedication issues such as, what water will be accepted for non-potable dedication, under what circumstances untreatable supplies can be accepted, and what dedication credit will be offered. These issues are addressed in detail below. In general, untreatable water rights will be accepted for dedication if they meet two conditions, 1) water rights are on the Water Department's list of acceptable non-potable water rights and 2) water rights were historically used on the land being developed. The amount of dedication credit will be based on whether or not the proposed development will be utilizing a non-potable system.

NON-POTABLE WATER RIGHTS CRITERIA

The Water Department will maintain a list of non-potable water rights that will be accepted by the City for dedication. As water rights are being considered for inclusion on the list of acceptable water rights they will be evaluated using the following criteria:

- 1. Drought Yield:** The water right must yield in the 50-year drought.
- 2. Future Certainty:** The water right must have future certainty – City must have full confidence that the water right will be in place for perpetuity (no legal or physical reason to believe otherwise)
- 3. Sufficient Quantity:** City must intend to take in a sufficient quantity of the irrigation shares being proposed for dedication to warrant staff time toward the water court process and ongoing administration.

If a water right has been evaluated and it does not meet each of the three tests above then it will be placed on the list of water rights not accepted by the City. This list of unacceptable water rights will be maintained by the Water Department and made available to developers with reasons why it was not previously accepted for dedication.

ACCEPTABLE NON-POTABLE WATER RIGHTS LIST

- 1. Greeley Loveland System Shares**
- 2. Greeley Irrigation Company Shares**
- 3. New Cache la Poudre Irrigating Company Shares (Canal No. 2)**
- 4. New Cache la Poudre Reservoir Company Shares**
- 5. Fossil Creek Reservoir Company Shares (preferred shares)**

The City has been accepting Greeley Loveland System shares as well as Greeley Irrigation Company shares. Greeley Loveland System shares will be accepted by the City as it is currently done. Greeley Irrigation Company shares will be accepted for dedication but only under the conditions laid out in this chapter. New Cache (a/k/a: Canal No. 2) System shares will be accepted for dedication because of the projected growth of the City on the north side of the Poudre River onto Canal No. 2 lands. Even though water rights are included on this list of acceptable water rights, Water Department staff still maintains the right to review and accept or reject the particular shares being dedicated to ensure that they meet each of the non-potable water rights criteria listed above.

If a developer has historic water on the land being developed, other than those listed above, they may request that the Water Department evaluate adding the water right to the list. If the water right is not added to the City's list of acceptable water rights for dedication, the developer will pay the City standard cash-in-lieu payments up to 5 acre-feet and dedicate CB-T to meet additional dedication requirements..

WELLS/SPRINGS/SEEPS FOR NON-POTABLE SUPPLY

Under certain circumstances the City may accept water supplies that are taken from wells, springs, or seeps located on the lands being developed. The Water Department will evaluate each of these proposals on a case-by-case basis. The sources must be included in a court approved water augmentation plan or be decreed for the type and place of proposed use. Not until a decree for an augmentation plan has been obtained, will a well, spring, or seep be allowed for use with a non-potable system. Records from the State Engineer's Office (well permits, etc) may also be reviewed to determine if such sources can be used for a non-potable system.

The other primary consideration in the evaluation of wells, springs, or seeps for a water supply will be the determination of drought protection provided by the decreed augmentation plan. The decreed replacement water supply that is used to augment the sources must provide, at a minimum, the same level of service as the rest of Greeley's water service (firm supply in the 50-year drought). There must be future certainty on both the drought yield and the physical and legal reliability of the augmentation supply before the City will accept a plan utilizing these sources.

If approved for dedication, the dedication credit for wells, springs, or seeps can only be used for direct use in a non-potable system. No credit will be given for water supplies above and beyond the non-potable demand.

DEVELOPMENT OF LANDS WITH AND WITHOUT "HISTORIC WATER"

If a water supply being presented for dedication is "Historic Water" (water that historically has been used to irrigate the land that is being developed) it will be accepted by the City for dedication. One of the guiding policy positions for the Non-Potable Master Plan was the commitment by the City to accept water rights for dedication if they were historically used

on the lands being developed. The only condition to this position is that the water right being proposed for dedication must meet all three criteria stated above for inclusion on the “Acceptable Non-Potable Water Rights List”.

The amount of dedication credit for “Historic Water” that is included on the “Acceptable Non-Potable Water Rights List” will depend on whether or not the development is proposing a non-potable system. See below for more definition on the credit available for non-potable dedication.

“Non-Historic Water” is water that has not been used historically to irrigate the land that is being developed. “Non-Historic Water” will not be accepted for water dedication. In all cases, when land is being developed that does not have historic water, the developer will pay the City the standard cash-in-lieu fees. Cash-in-lieu payments will be required regardless if the development is proposing a non-potable irrigation system or not.

NON-POTABLE CASH-IN-LIEU

Each year the Water Department will determine quantity of surplus untreatable supplies beyond the City’s projected demands. If a proposed development, that is proposing a non-potable system, does not have historic water the City can elect to offer some of its water for non-potable cash-in-lieu payments, if it is determined that excess supplies are available.

The non-potable cash-in-lieu payments are independent from the City’s standard cash-in-lieu rates. The non-potable cash-in-lieu rates will be based on the market value of the water rights being provided for non-potable uses. In addition, the City will add a per acre-foot administration fee. This per acre-foot administrative fee will be equal to the per acre-foot administrative fee utilized in the development of the City’s standard cash-in-lieu payments.

This policy position is to encourage development of non-potable systems under Canal No. 3 and, in the future, systems under Canal No. 2. The non-potable cash-in-lieu will only be offered when 1) a non-potable system is being proposed for the development, 2) there is excess Greeley-owned non-potable supplies and 3) when non-potable service is the lowest cost alternative for water service. The non-potable cash in lieu, if offered by the City, will be allowed up to the expected non-potable demand. The remaining potable demand must be satisfied with standard cash-in-lieu payments.

If the construction of a non-potable system is being delayed, the City will not offer non-potable cash-in-lieu. However, if the non-potable system is constructed within 10 years of the start up of the initial development, the City, at the time of construction, may elect to provide City non-potable supplies to the developer. In this event the City will refund the difference between the cash-in-lieu paid and the non-potable cash-in-lieu back to the developer/landowner.

WATER DEDICATION REQUIREMENT FOR IRRIGATION

A total water dedication of 3 acre-feet per acre for irrigated landscape will be required for new developments. The Water Department will also require the developer to submit a landscape and irrigation plan showing the extent of proposed irrigation. If a developer intends to use low water demand irrigation systems, such as drip irrigation, they may submit documentation to the Water Department for their consideration. Water Department staff will evaluate the potential water demand savings and consider a reduction in the water dedication required.

In order to protect against potential future increases in water demand, the Water Department will develop a base water allotment program similar to the program used for potable taps. If a new development in the future adds turf acreage and/or changes from a low water demand irrigation system to a standard irrigation system the developer will need to pay surcharges or provide additional water dedication to the City.

DEDICATION CREDIT

Greeley Loveland System Shares:

Shares in the Greeley Loveland System have historically been accepted for dedication if the shares have been used on the lands being developed. This policy remains unchanged for the Greeley Loveland System. Credit given for the dedication of Greeley Loveland System shares is the same regardless if the proposed development has a non-potable system or not.

Greeley Irrigation Company Shares/New Cache System Shares:

Greeley Irrigation Company shares, New Cache la Poudre Irrigating Company shares, New Cache la Poudre Reservoir Company shares, preferred Fossil Creek Reservoir shares, and Windsor Reservoir Company shares will be accepted for dedication if they were historically used on the lands being developed. Shares will be accepted on an *all or none basis*. Either all shares historically used to irrigate the developed land are dedicated or none of the shares of water will be used for dedication. This position is taken to simplify the water court transfer process if required. Credit for the shares will be given based on the following formula:

1. Dedication credit for the water right is based on firm yield in the 50-year drought (growth is paying its way). This is the same drought design standard for all Greeley water service whether potable or non-potable.
2. Dedication credit for the water right is based on historic consumptive use, not historic delivery. Dedication based on historic consumptive use credit will protect the City in the event that the City is required by a change of use through water court to replace historic return flows.
3. Full consumptive use credit will be given for water that is dedicated and used for non-potable service on the developed property. The City will accept the water at full credit up

to the calculated non-potable demand (one acre-foot of dedication credit for each one acre-foot of GIC or New Cache historic consumptive use credit).

4. For supplies above and beyond the non-potable system demand, or in cases where a non-potable system is not being proposed, the City will accept the shares at a credit that reflects the current market value of non-potable supplies for the lower end of the Poudre River. This “credit” will be applied against the cash-in-lieu requirements for the proposed development.

These new policies on dedication credit represent a potential change in policy for the Greeley Irrigation Company (GIC) shares dedicated to the City. Previously, the Water Department allowed dedication of GIC shares up to two thirds of the projected demand when the land being developed was historically irrigated under the GIC system. This change in policy reflects the City’s effort to have growth pay its own way, however this change will likely have an impact on development of affordable housing on the east side of Greeley. This new policy and potential alternatives for lessening the impacts should be discussed further with the Water and Sewer Board and the City Council prior to finalizing the policy changes for GIC shares. This issue is discussed further in the “Implementation Steps” in Chapter 8.

EXAMPLE OF DEDICATION CREDIT

The cash-in-lieu and market values below are only presented as an example and may not be representative of actual values. Per Greeley’s Water Master Plan the Water Department will be establishing a Future Water Account and these water supplies will be offered to new development for cash-in-lieu payments. Currently, the City offers cash-in-lieu payments based on the cost of CBT supplies. Not until the Water Department has acquired water for the Future Water Account will the cash-in-lieu amounts be changed from the CBT costs. The Standard Cash-in-Lieu listed below, \$10,000 per acre-foot, is only an estimate of what the Water Department may be able to offer for cash-in-lieu payments once the first portion of the Future Water Account is established.

Conditions: 40 acres
3 shares Greeley Irrigation Company (used on 20 acres)
Proposed non-potable system with 5.0 acres common space irrigation
Standard Cash-in-Lieu = \$10,000/ac-ft
Market Value of GIC = \$2,500/ac-ft (firm yield CU)

Water Dedication Requirement w/o non-potable credits: $3.0 \text{ ac-ft} \times 40 \text{ acres} = 120 \text{ ac-ft}$

Water dedication calculations:

1. Calculation of firm yield of historic non-potable water:

$3 \text{ shares GIC} \times 10.3 \text{ ac-ft per share} = 30.9 \text{ ac-ft}$

2. NP Direct Use Credit (ac-ft credit):

$3.0 \text{ ac-ft/acre} \times 5 \text{ acres} = 15 \text{ ac-ft}$

Reduces water dedication requirement: $120 \text{ ac-ft} - 15 \text{ ac-ft} = 105 \text{ ac-ft}$

3. NP Cash-in-Lieu Credit (cash credit):

Excess NP water = 30.9 ac-ft – 15 ac-ft = 15.9 ac-ft

NP Cash-in-Lieu Credit = 15.9 ac-ft x \$2,500/ac-ft = \$39,750

4. Cash-in-Lieu Payment:

Cash-in-Lieu payment w/o NP Cash-in-Lieu Credit = 105 ac-ft x \$10,000/ac-ft = \$1,050,000.

Cash-in-lieu payment with NP Cash-in-Lieu Credit = \$1,050,000 – \$39,750 = \$1,010,250.

5. Final Water Dedication: 3.0 shares of GIC and \$1,010,250 Cash-in-Lieu

CHAPTER 8: IMPLEMENTATION AND MONITORING

A non-potable master plan will be revised once every five years. This will coincide with the City's Water Master Plan that was completed in October 2003 and is schedule to be formally revised and re-distributed in five years.

In addition to the 5-year update of the Non-Potable Water Master Plan, the Water Department will also perform an annual review of several items related to non-potable water. These will be evaluated and presented to the Water and Sewer Board each year. This chapter also includes a list of implementation steps to be completed by the Water Department Staff during the calendar year of 2004.

MASTER PLAN ANNUAL REVIEW ITEMS

At the end of each year the Water Department will do an annual review of each of the following items:

1. **Non-Potable Supplies/Demands Calculation:** Each year the Water Department will review and amend the values included in Tables 1 and 5 (total untreatable supplies, non-potable demands, and surplus) both for the current year and for 2020. If the Water Department moves forward with the Sell/Buy Alternative for surplus untreatable supplies, the acre-feet of untreatable supplies sold and new potable supplies bought will also be tracked.
2. **Non-Potable Irrigation GIS Database:** The Water Department's database for non-potable irrigation will be maintained throughout the year as sites are added and as existing sites are modified. Each year the database will be checked to verify that all new sites have been correctly added to the database and that existing sites, with modifications to the turf area, have been amended. This review step also includes updating Tables 8 and 10 in this report.
3. **Non-Potable System Cost Database:** The Water Department will develop a cost database for each non-potable system that is developed in any year. This database will include a cost breakdown by major non-potable system component. This database will assist the Water Department in future projections of constructing non-potable systems. It is important for the Water Department to do an accurate job of projecting non-potable system costs to ensure that the infrastructure costs are less than the infrastructure costs associated with potable service.
4. **Potable Capacity Cost Calculation:** Each year the Water Department will evaluate the cost of adding potable capacity to meet turf irrigation demands. This cost will be compared to the cost of adding a non-potable system to serve an irrigation demand. The potable capacity cost is determined using the City's 20 year Capital Improvements Program (CIP). During any one year period changes may be made to

the CIP that would impact the cost of adding potable system capacity. Changes to the potable capacity cost would result in a change to 1) the formula used to make a go/no-go decision on new developments with less than 20 acres (Chapter 5, page 48) and 2) the formula used to determine the potable plant investment fees for open space/common space potable irrigation (Chapter 6, page 56).

5. **Regional Systems Data:** Data will be maintained on several items for regional non-potable systems in Greeley. This data will include mapping of the lands that Staff projects will be served by the system, the total capacity and available capacity of the various system components, the Water Department's dollar investment in oversizing of the system, and money placed in escrow by developers for future construction of a non-potable system (see Chapter 6, page 55).
6. **Non-Potable Capital Budget Review:** Each year the Water Department Staff will review the projected non-potable systems that will be developed under "Development Scenario C" to ensure that sufficient funds are available to construct off-site non-potable system components for the up coming year.
7. **Meeting with Parks Department:** Each year the Water Department Staff will meet with the Parks Department to review proposals and planning by both departments. In particular the Water Department will inform the Parks Department of any potential sites that could be used for both regional non-potable systems and community parks. Water Department Staff will also get a review of the Parks Department's planning for the year and any sites that they are considering for future community parks.
8. **Non-Potable Water Rates:** It was determined in this master plan that the water rates for non-potable water service should be reviewed and set each year similar to how the potable water rates are handled. A non-potable rate model will be established and used each year to ensure that rates cover the true cost of operations and management of non-potable water service and system replacement costs.
9. **15% Non-Potable Goal Tracking:** Each year the Water Department will calculate the increase in new potable metered demands and new non-potable metered demands to determine percent of total new water demands that are being met with non-potable water service.
10. **Addendum to Master Plan:** The Non-Potable Water Master Plan will be reviewed each year to determine any significant changes to the plan. These changes will be recorded in an annual written addendum to the master plan.
11. **Annual Report to the Board:** All of the annual review items listed above will be completed in December of each year. Each January the Staff will present to the Water and Sewer Department Board the major points of the annual reviews items.

MASTER PLAN 2004 IMPLEMENTATION STEPS

1. **Complete Surplus Untreatable Supplies Alternatives Steps:** As laid out in Chapter 3 of this report there are some additional steps that must be taken prior to selecting a final alternative for using the City's projected surplus of untreatable water supplies: These include:
 - e) Evaluate with a greater level of detail the demand for untreatable supplies at the Poudre River/South Platte River confluence and the potential market value for those supplies.
 - f) Evaluate the sizing and timing of the Poudre – Greeley-Loveland Transfer alternative phasing in relation to the availability of the City's excess non-potable supplies.
 - g) If any additional information is provided to the Water Department that supports the preliminary estimate of the Poudre – Greeley-Loveland Transfer system construction costs at \$4,000 per acre-foot reconsider the cost comparison of the two alternatives.
 - h) If the Poudre – Greeley-Loveland Transfer option is determined to be the preferred option for Greeley's surplus untreatable supplies, perform the following additional studies:
 1. Study in more detail the costs on pumping for the Poudre – Greeley-Loveland Transfer alternative.
 2. Begin talks with the entities in Greeley who own private non-potable irrigation systems under the Greeley Loveland System regarding Greeley providing supplies from the Poudre – Greeley-Loveland Transfer Project in exchange for their potable supplies.
2. **Develop a Regional Non-Potable System Map:** Item 5. in the annual review items above is to complete an annual update to the regional non-potable system map. This map needs to be created with the existing regional non-potable systems shown with the parcels served, the available capacity and the projected lands that will be served with the systems at full development.
3. **Develop a Future Regional Non-Potable System Location Map:** To ensure that those locations that would serve as optimum sites for regional non-potable systems are reserved, Water Department Staff will develop a map that includes those locations within the City's growth area that would serve as prime locations for regional non-potable systems. Upon completion of the regional map, Water Department Staff will meet with the Planning and Parks Departments to begin the process of reserving these locations through the development process.
4. **Review Construction Standards for Non-Potable Systems:** In order to implement the actions laid out in this master plan, a complete set of design standards will need to be in place to provide to developers who will be constructing a portion or all of the non-potable systems that will be dedicated back to the City after construction. The standards that are in place need to be reviewed to determine if they are complete and ready for utilization by developers under the new policies of this master plan.

5. **Determine how the Non-Potable Budget will be used on an Annual Basis:** The Water Department has budgeted \$750,000 annually for non-potable development. These funds can be used by the Water Department to implement non-potable system oversizing. The Water Department will need to further define its priorities for use of these funds particularly as it relates to maintenance and improvements for existing City facilities and amount reserved for oversizing of new facilities.
6. **Develop Files for Acceptable/Unacceptable Water Rights:** Per Chapter 7 the Water Department will maintain a list of acceptable and non-acceptable water rights for dedication to the City. The Water Department will need to establish a file on each acceptable water right and the amount of dedication credit provided for each water right. Also a file will need to be developed for each water right that has been evaluated and has been deemed “unacceptable”. The file should provide documentation for why the water right was found to be unacceptable. The Water Department may choose to obtain a legal opinion from the Water Department’s water attorney to further support the unacceptable status. The files maintained by the Water Department on these water rights will demonstrate to developers that the Water Department is using a consistent approach to non-potable water supply dedication. The Water Department should immediately obtain a legal and engineering position page on various categories of wells that are within Greeley’s growth boundaries (Coffin wells, Poudre Plan wells, wells augmented by Central Colorado Water Conservancy District, etc).
7. **Meet with New Cache Ditch and Reservoir Company:** If the Water Department determines that there will be a sufficient quantity of New Cache shares dedicated to the City, Staff should meet with ditch company officials to discuss firm yield estimates, delivery issues (seasonal constraints, calls for water, etc), and possible future delivery points back to the Poudre River that the City may utilize in the future.
8. **Complete the Non-Potable Policy Positions:** The Water Department will need to review each of the policy positions established in the Non-Potable Water Master Plan to determine if there are further actions needed to firmly establish the new policies. For policy positions that are a change in policy from what is currently in place, the Water Department will need to establish a date for the change in policy to become effective. Also the Water Department may develop further backup documentation, if needed, to support each of the new policy positions.
9. **Finalize Policy Change on Dedication Credit for Greeley Irrigation Company Share Dedication:** The Water and Sewer Board and City Council will need to work together on the proposed change of policy on dedication of GIC shares and its potential impact on the development of affordable housing on the east side of Greeley. The policies include:
 - 1) When reasonably cost-effective, non-potable systems are required for 20 acres or more of open space irrigation in developments with Greeley-Loveland irrigation supplies. Those developments with untreatable irrigation supplies (e.g., Greeley

Irrigation Company and New Cache Irrigation Company) will be required to construct non-potable systems for open space irrigation of greater than 20 acres.

- 2) In general, Water Department will not develop non-potable systems to serve single family residential. However, there may be unique circumstances where the Water Department will consider a non-potable system if implementation of the system would be reasonably cost effective and safe.
- 3) Water Department will own and maintain all new non-potable systems.
- 4) Developer will pay for and construct the on-site non-potable system components and dedicate the system over to the Water Department along with necessary easements and/or rights-of-ways.
- 5) Water Department will construct the off-site non-potable system components and charge the developer a Plant Investment Fee based on the actual cost of the off-site improvements.
- 6) Water Department will strongly seek opportunities to develop regional non-potable systems that will serve multiple developments and reduce the overall cost of service.
- 7) Water Department will investigate opportunities to develop regional non-potable systems that can also serve as regional (community) parks.
- 8) Non-potable rates will be established each year in the same manner as potable rates by use of a standard rate model.
- 9) Plant Investment Fees for open space/common irrigation for potable service will be calculated on an acre-foot demand basis using the true cost of providing new potable capacity.
- 10) City will accept historic water for dedication regardless of whether the development is using a non-potable system or not (full credit with non-potable system and reduced credit without).
- 11) Water Department will maintain a list of acceptable and non-acceptable water rights for dedication including the firm yield credit of each.
- 12) The City will offer non-potable cash-in-lieu if it is determined that the City has surplus supplies available for sale (price set at market value) and the proposed development is planning a non-potable system.

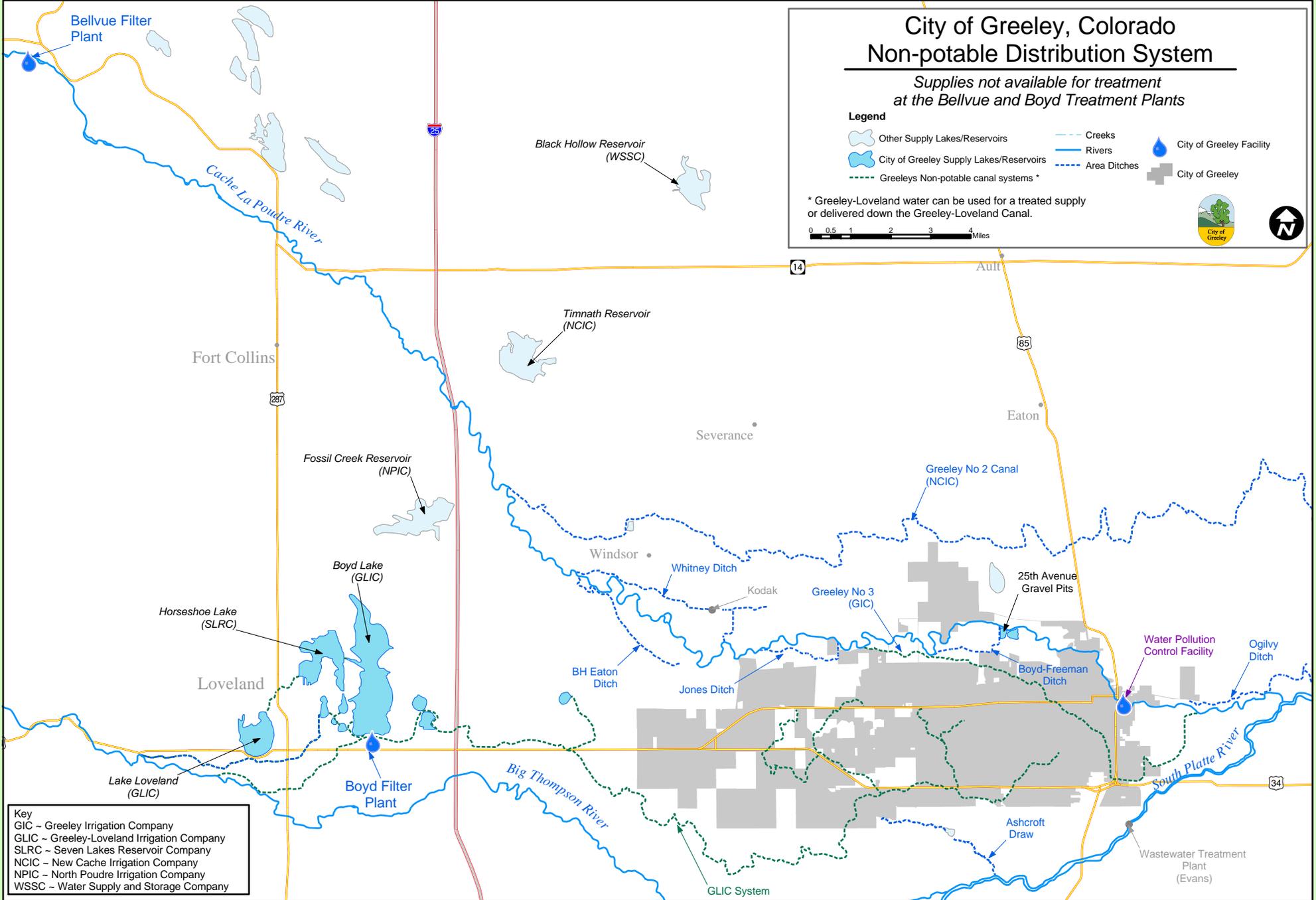
City of Greeley, Colorado Non-potable Distribution System

*Supplies not available for treatment
at the Bellvue and Boyd Treatment Plants*

Legend

-  Other Supply Lakes/Reservoirs
-  City of Greeley Supply Lakes/Reservoirs
-  Greeleys Non-potable canal systems *
-  Creeks
-  Rivers
-  Area Ditches
-  City of Greeley Facility
-  City of Greeley

* Greeley-Loveland water can be used for a treated supply or delivered down the Greeley-Loveland Canal.



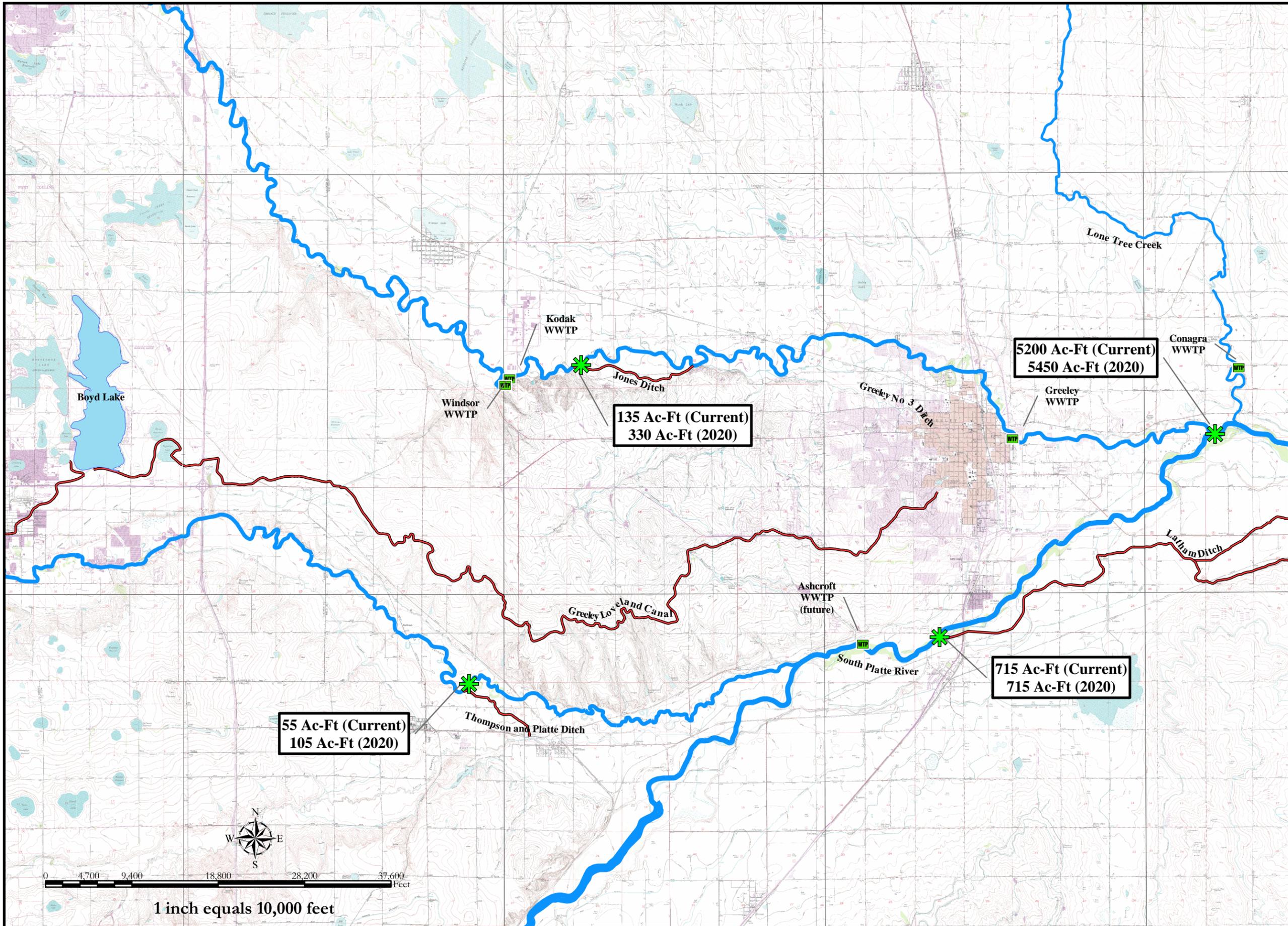
Key
 GIC - Greeley Irrigation Company
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 NCIC - New Cache Irrigation Company
 NPIC - North Poudre Irrigation Company
 WSSC - Water Supply and Storage Company

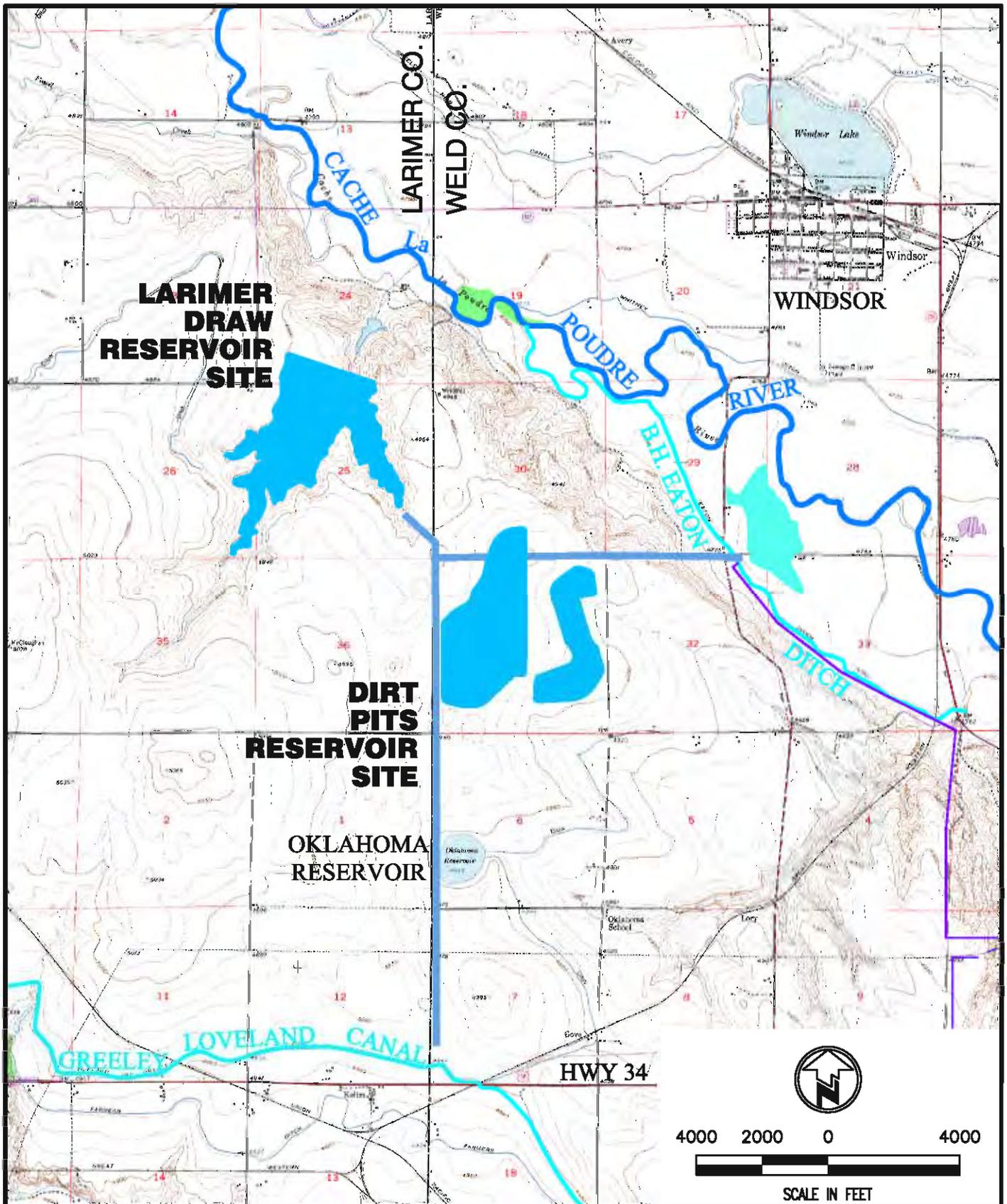


Greeley Loveland Return Flow Obligations

Map

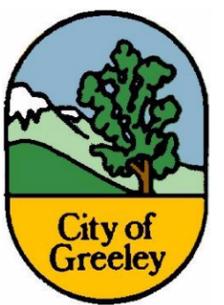
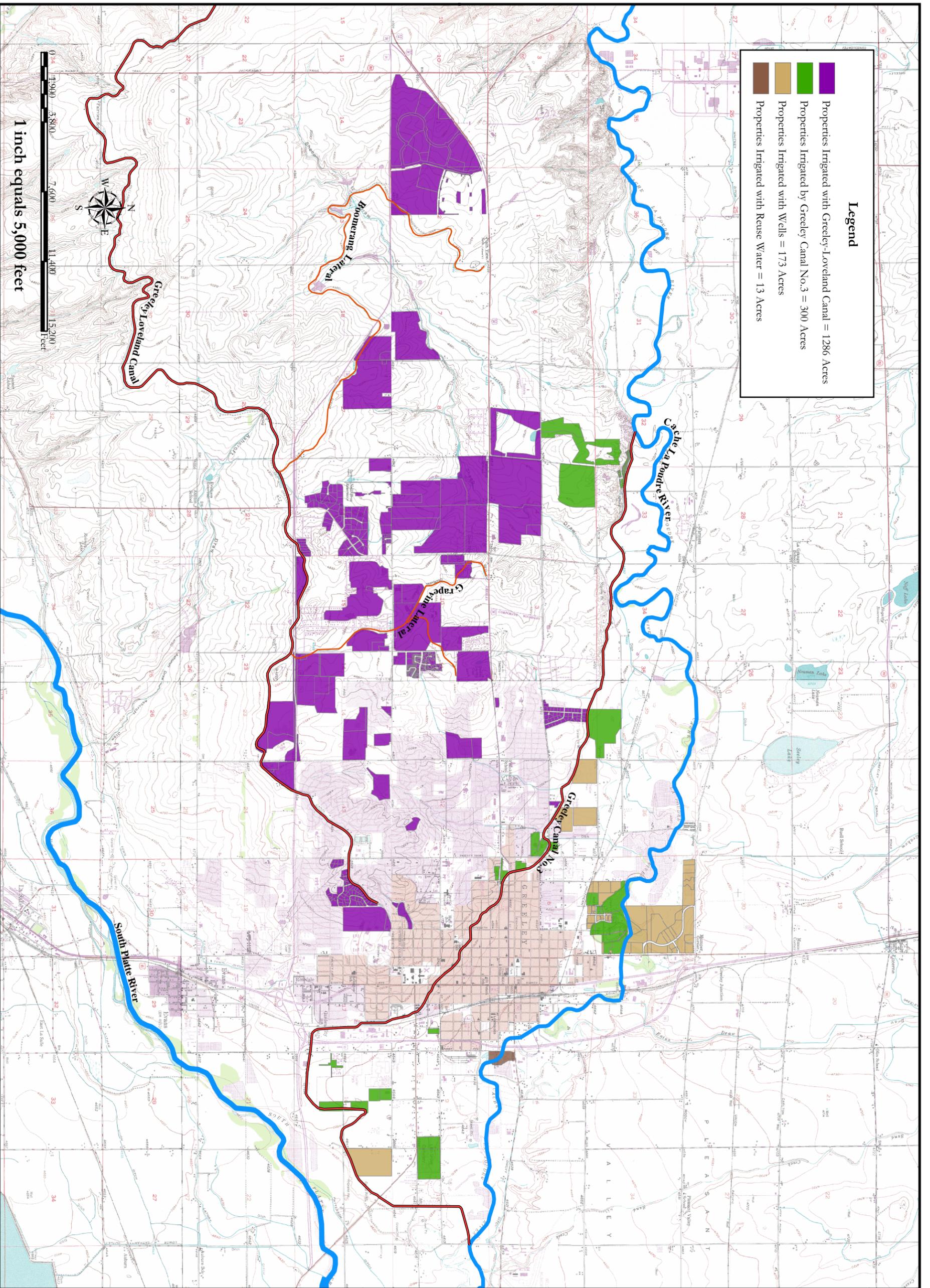
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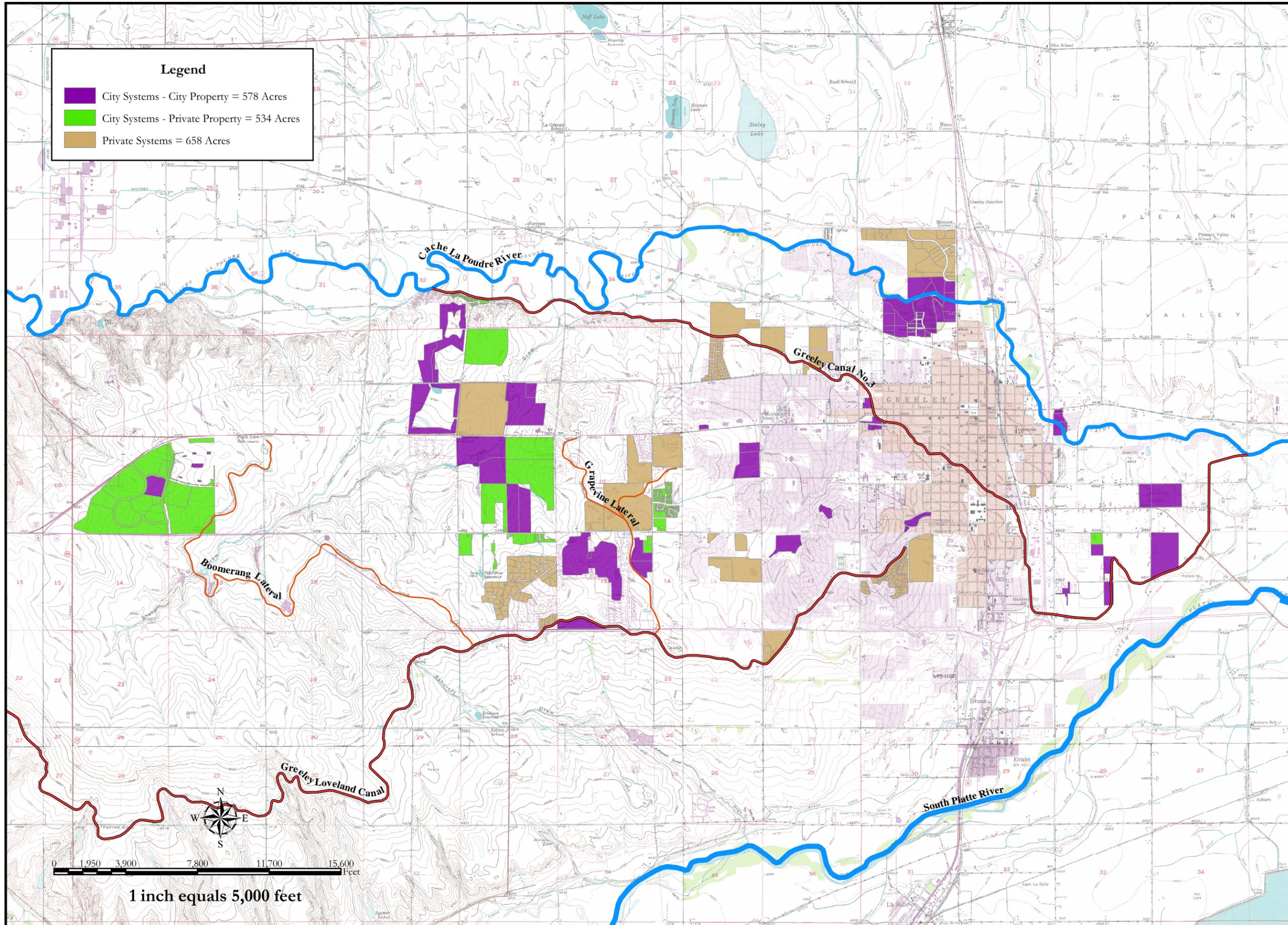
Dirt Pits Vicinity Map

Map
3



Parcels with Non-Potable Irrigation by Water Source

Map
4



Parcels with Non-Potable Irrigation by System Ownership

Map

5

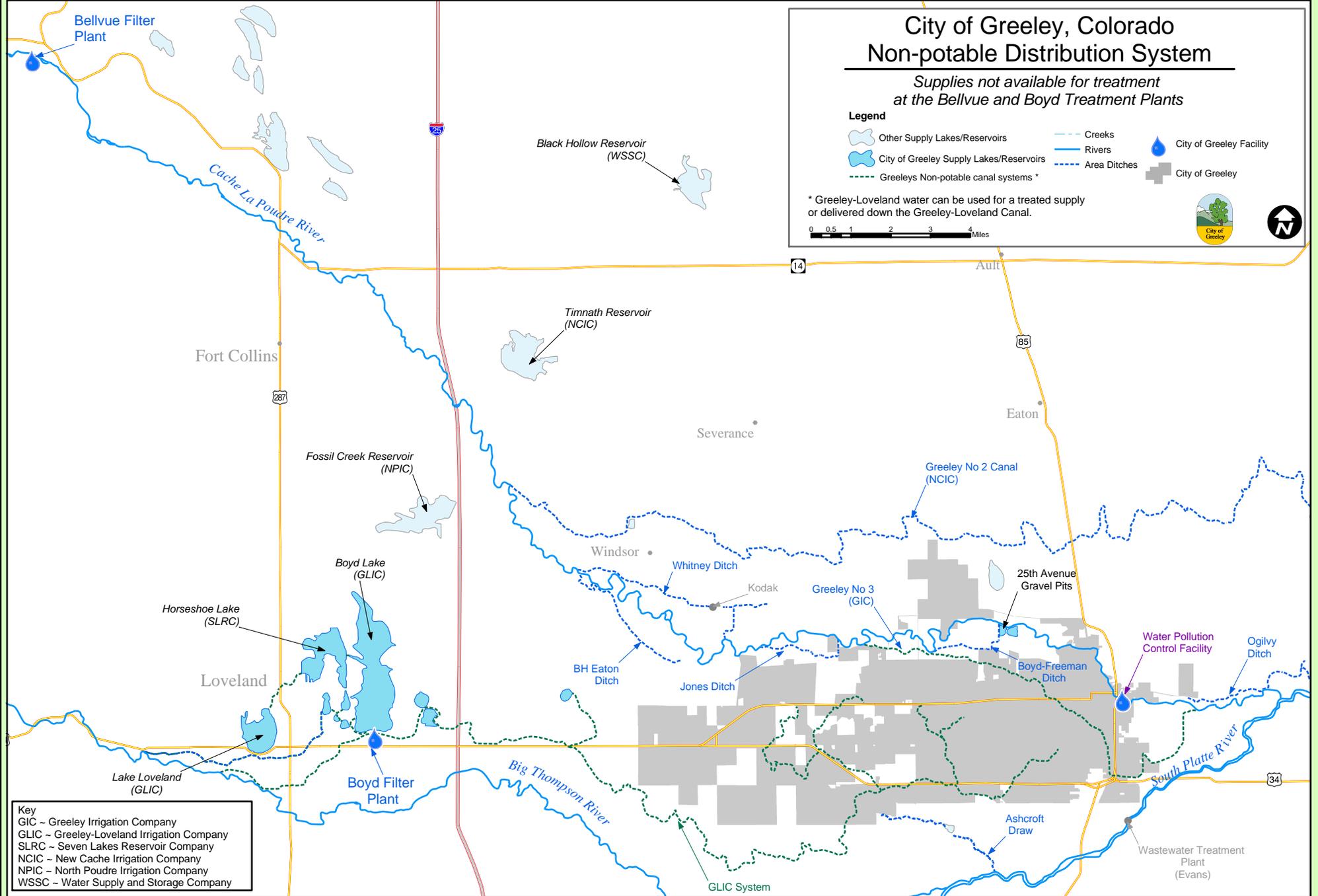
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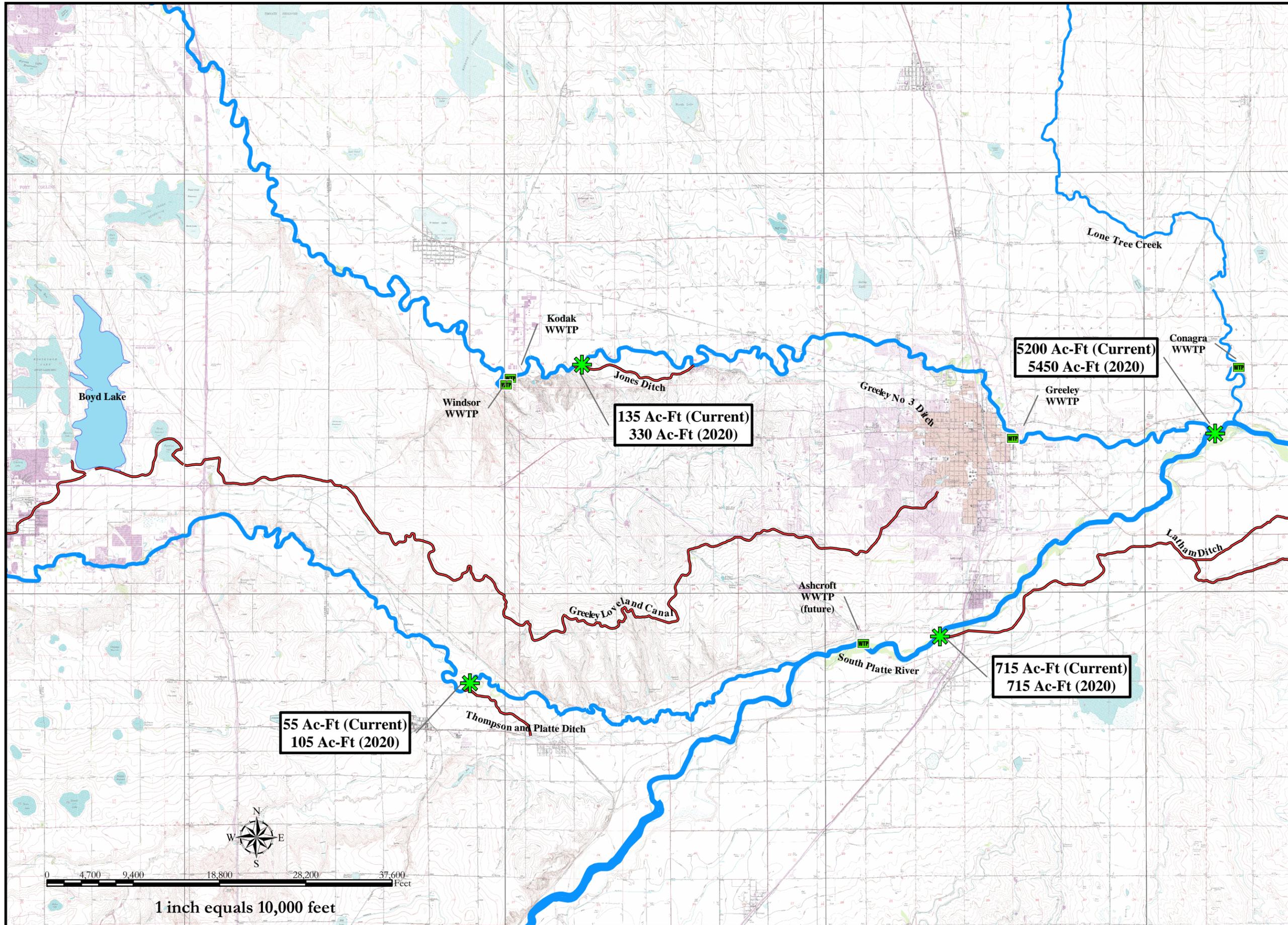
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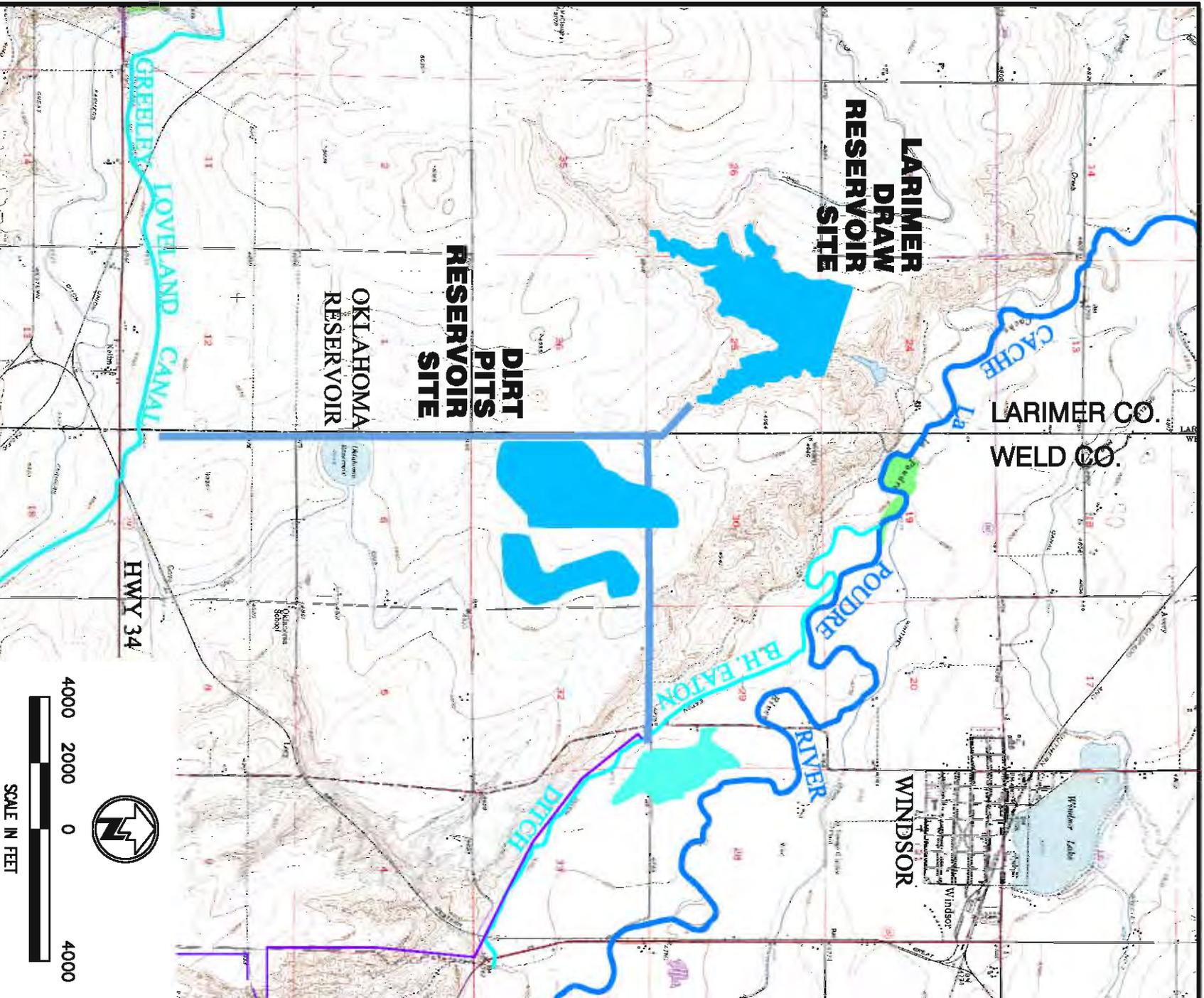


Greeley Loveland Return Flow Obligations

Map

2

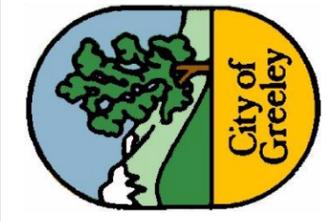
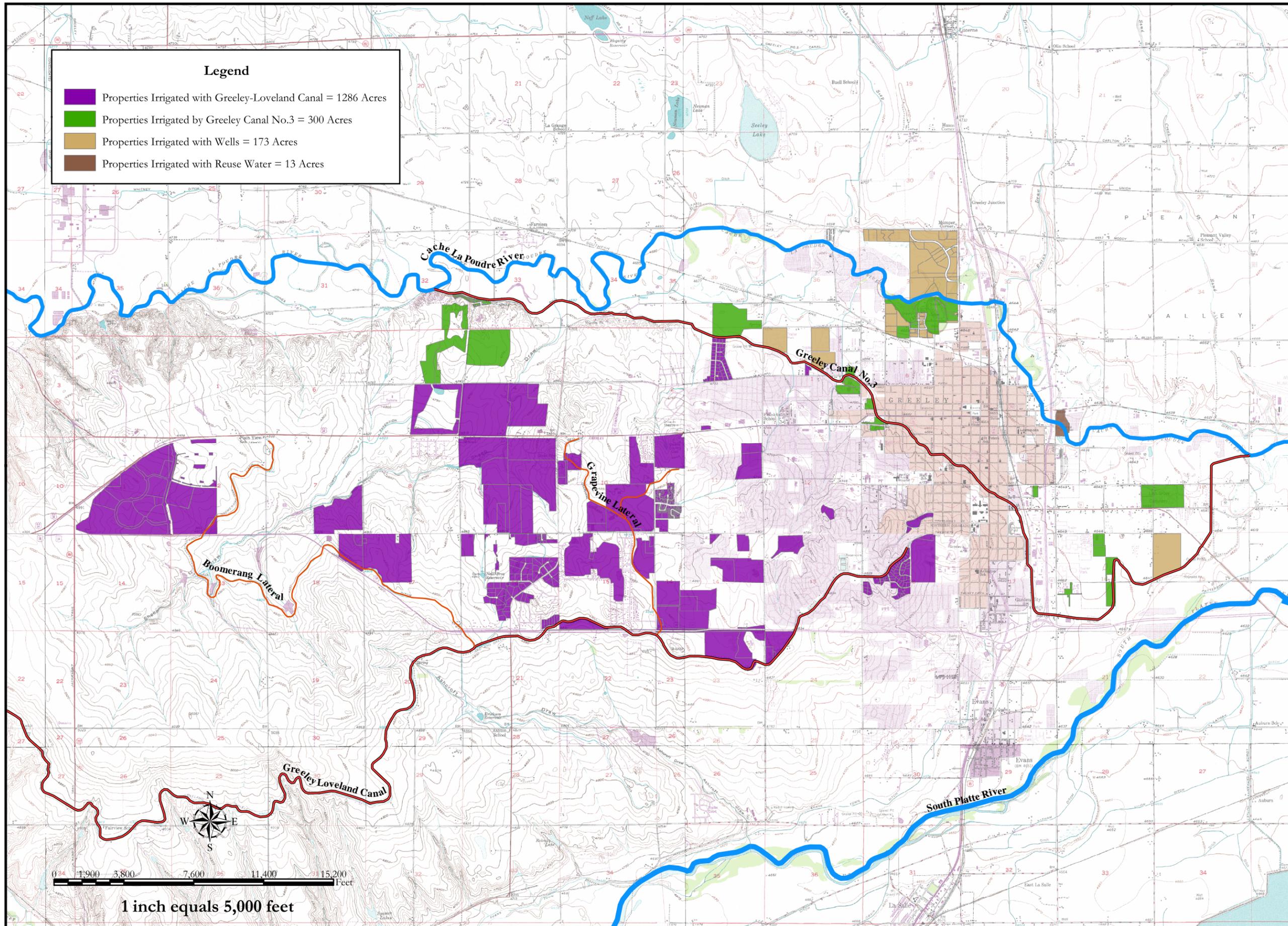




Dirt Pits Vicinity Map

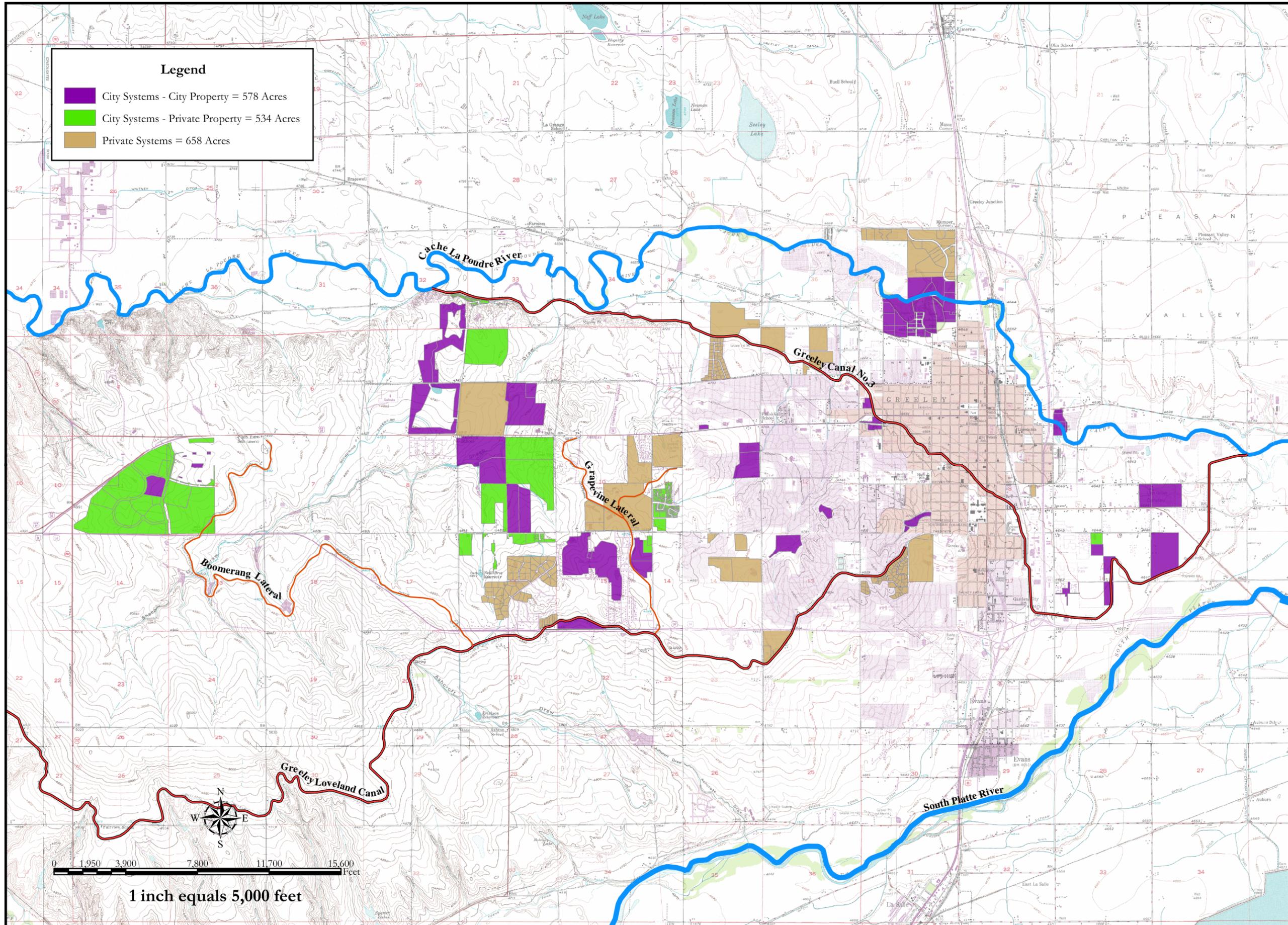
Map

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**Parcels with Non-Potable Irrigation
by Water Source**

Map
4



Parcels with Non-Potable Irrigation by System Ownership

Map

5