COLORADO
WATER INNOVATION CLUSTER

PROJECT REPORT:

LAKE CANAL ALTERNATIVE AGRICULTURAL PRACTICES AND IN-STREAM FLOW DEMONSTRATION PROJECT

Prepared for

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INTRODUCTION

On behalf of the Colorado Water Innovation Cluster (CWIC) as the lead grant applicant, this report documents the findings of the project entitled **Lake Canal Alternative Agricultural Practices and In-Stream Flow Demonstration Project**. We are providing documentation of the original project intent; current status; process, findings and outcomes; lessons learned; considerations for future water transfers and a project summary.

Project Description

The intent of this project was to provide a demonstration of a number of techniques and technologies which could potentially be useful in addressing the municipal/industrial/environmental water "gap" identified in the Statewide Water Supply Initiative (SWSI) studies completed under the auspices of the Colorado Water Conservation Board (CWCB). Under this project, willing shareholders under the Lake Canal Co. service area would implement fallowing, regulated deficit irrigation, and/or other alternative agricultural practices to lease the saved portion of their consumptive use for stream flow enhancement in the Cache la Poudre River between the Lake Canal Co.'s river diversion (north of Fort Collins) and the Greeley No. 3's river diversion (west of Greeley). This transfer was intended to be facilitated by an Interruptible Water Supply Agreement (IWSA) between the Lake Canal Company as the owner or authorized user of the decreed water rights and herein referred to as the "Lender" and The Nature Conservancy (TNC) and the Fort Collins Natural Areas program collectively referred to as the "Borrowers". As specified by the IWSA statutory rules, the term of the agreement could be 10 years and the option can be exercised during any three years of the term. However, to meet the intent of this demonstration project, the IWSA was for a period of one year and would have been exercised during the 2012 irrigation season. Lake Canal participants would manage the alternative transfer using a packaged software and field instrumentation solution, developed by Regenesis Management Group, in concert with research and development agreements with Colorado State University (CSU) and the U.S. Department of Agriculture's Agricultural Research Service, Water Management Unit (USDA ARS).

Summary of Objectives

The Objectives of the project were to:

1. Provide a technical, operating proof-of-concept demonstration of Regenesis Management Group, LLC technology which supports alternative to permanent buy and dry agricultural water transfers.
2. Provide a water supply for stream flow enhancement in the Poudre River from approximately the Lake Canal Co.'s river diversion to the Greeley No. 3 river diversion.
3. Develop an IWSA agreement which could be used in the future to provide water for a variety of other uses outside the canal company's service area. Show that an IWSA can be used to reduce transaction costs to lower the risk of pilot or demonstration projects involving alternate water uses or transfers.
4. Demonstrate the economics of alternative agricultural water transfers in partnership with willing Lake Canal shareholders / irrigators.
5. Demonstrate that alternatives to permanent agricultural water transfers, such as fallowing and regulated deficit irrigation, can be completed in a manner which does not adversely impact other water right holders.
6. Demonstrate how collaborative partnerships between public, private, agricultural, and environmental entities can be built and sustained for joint problem solving to further the goals of the partnering entities.

7. Determine which factors contribute to or detract from participation in alternative transfer methods on the part of agricultural producers, municipal utilities, environmental/conservation groups, and others, including State regulatory agencies.

Project Review

The CWIC project team was originally interested in attempting an alternative transfer in 2011, but grant funding to support the project was not contractually available until November of 2011. Immediately after signing the grant contract with CWCB, initial meetings were held with the Lenders and Borrowers to develop and negotiate the details of the IWSA agreement. On February 29, 2012, the IWSA agreement was executed.

The water borrowers agreed to a fixed amount of money for a one-year water lease with Lake Canal Co. shareholders. Given the fixed sum of money available for leases and the rate for leases when the grant application was submitted in November 2010, the project team anticipated that 200 acre-feet could be transferred under this project. However, market-based water lease rates increased significantly from November 2010 to February 2012, and the amount of leased water to be transferred decreased from 200 acre-feet to 60 acre-feet. The agreed-to lease rate was $500 per acre-foot.

Four farmers in the Lake Canal Co. service area agreed to participate in the project. The irrigated acres and anticipated crops on these farms in 2012 were:

- Farm 1 - 22 acres of irrigated corn
- Farm 2 - 38 acres of irrigated winter wheat
- Farm 3 - 67 acres of irrigated grass hay
- Farm 4 – 35 acres of irrigated corn

On March 1, 2012, the application for the IWSA was made with the State Engineer's Office (SEO). The application for the IWSA is included here as Appendix A.

Subsequently, comments to the IWSA application were received from four entities:

- State Engineer's Office (SEO)
- Colorado Water Conservation Board, Stream and Lake Protection Section
- New Cache La Poudre Irrigating Company (NCLPIC)
- Northern Colorado Water Conservancy District (Northern Water)

Meetings and/or follow-up conversations were conducted in April and May 2012 with each entity. A summary of the comments and responses to each entity is presented later in this report. The communications from and response to comments from each entity is attached in Appendix B.

In April 2012, the already below-normal snowpack dropped dramatically and there was little spring precipitation. In May 2012, the Lake Canal river decree was only in priority long enough to be used for initial start up and flushing of the canal system. There was no direct flow water available for irrigating under the Lake Canal system or operation of the IWSA in the spring of 2012.

On May 8, 2012, Tracey Kosloff with SEO Department of Water Resources was advised of the situation. Her recommendation was to submit an amended IWSA plan (to address the SEO comments) in the fall of 2012 for transfer of water in 2013 assuming adequate snowpack during the winter of 2012/2013.

Representatives of the project team met with the Borrowers May 18, 2012. The Borrowers reaffirmed their desire to participate in 2013. At that point, it was understood and agreed by the Borrowers that the transfer of water would be postponed until 2013 since there was insufficient water available to operationally transfer in 2012.

The Lake Canal service area was flown on August 10, 2012 to obtain multi-spectral imagery to include RGB, NIR, and thermal sensors. This imagery was intended to help in the ongoing discussion of alternative practices and maintenance of historic return flows. This aerial imagery was commissioned without cost implications to the project.

In October 2012, discussions were restarted with the water lenders and borrowers to resurrect the IWSA for 2013. In November 2012, Regenesis Management Group commissioned a Market Rate Study by Honey Creek Resources, Inc. The study found that “operators can make an equivalent return farming under currently reasonable price and yield assumptions. To provide adequate incentive for filling a lease pool, prices offered to irrigators may need to be increased and/or other incentives provided.”

Over the course of four months, we were not successful finding a price nor an amount of water that the Lenders and Borrowers could agree on because of concerns about 2013 water supplies, the ongoing drought and the increased market-driven rate for leased water due to prevailing commodity prices and demand for water from the oil and gas sector for hydrofracking. Therefore, the project was terminated without physically transferring water.

Although the project did not go as anticipated, the project team feels that Objectives 3 to 7 were completed and results can be reported relevant to process, findings and lessons learned that should be considered in future alternative water transfers.

PROCESS AND FINDINGS

IWSA Agreement and Legal Work

The total breadth of legal work required for this project is difficult to describe. Because of the range of participants involved, essentially every element in the "water process" and legal framework came into play. This project is both vertically and horizontally integrated and the legal work required coordinating and creating relationships and agreements between each of the participants. The signed IWSA agreement is provided in Appendix A.

The project is vertically integrated because it includes:

- Water supplier/water rights holder/Lender - Lake Canal Co.
- Water rights users/Borrowers - Municipal (Fort Collins Natural Areas) and Environmental (The Nature Conservancy)

Each of the participants is notable and their participation gives great credibility to both the process and the results.

The project is horizontally integrated by virtue of what the applicant is rather than what the grant applicant is not -- a water user. The applicant is not a ditch company or irrigation district. Rather, CWIC is a recently formed entity that has its vision "to produce long-term solutions to global water issues". Its board includes representatives of academia (CSU), municipal interests (Fort Collins) and the private sector (Aqua Engineering, Stewart Environmental Consultants, BHA Design, Hach-Lange Global Innovation, In-Situ, Riverside Technology, Rubicon, Regenesis Management Group, and an attorney (Edward M. Bendelow).

This concept of a variety of entities/participants working together in a "Cluster" has application in a variety of uses and is exemplified in the just announced award of $600,000 to a similarly situated and sister entity, the "Energy Cluster", also based in Fort Collins.

Another component to the horizontal integration of this application is the role of the State Engineer and the operative statute. The use of an interruptible supply agreement is provided by a recently adopted statute, CRS 37-92-309 (2005) and is discussed with favor in a 2005 decision by the Colorado Supreme Court. *ISG, LLC v. Arkansas Valley Ditch Association,* 120 P.2d 724, (at 732, 733 and 734); wherein the Court favorably comments on the use of contracts and generally supports such short term agreements.

An IWSA process suggests that the State Engineers participation is reflective of a new role. The traditional process is a water court proceeding. This application allows the State Engineer to act in an "adjudicatory" role, without the need to go through the water court process. The decision to proceed at the administrative level, results in an enormous savings in the legal and engineering costs of a water court proceeding which are collectively termed transaction costs.

Another unique legal element of this application is an alternative use of the statute which was adopted in response to the severe drought conditions experienced in 2002 and the need for municipalities to secure temporary water supplies. This application is for a different reason, which is to see if a concept works, "proof of concept". If it does then the traditional water court change of use can be pursued (or not). If it doesn't, no permanent changes have occurred and different approaches can be pursued or the project terminated. In short, it facilitates experimentation at the scientific level, without all the permanency and complexity of a water court proceeding. It adds an entirely new area of flexibility to the process, consistent with both the legislative intent in the statute and the comments of the Supreme Court as noted above.

There are two tiers of agreements needed. The first is the Interruptible Water Supply Agreement (IWSA). The second is a variety of "sub-agreements", needed to implement the IWSA:

- IWSA - This agreement should have four parties: CWIC, Lake Canal, Fort Collins Natural Areas and The Nature Conservancy. The responsibilities need to be defined. NOTE: This will change depending on the parties, but all should be included.
- "Sub-Agreements" - Agreements between the participants will be negotiated, administered or monitored by CWIC. They are identified as:
    - Lake Canal Company and Ft. Collins
    - Lake Canal shareholders and Ft. Collins
    - Lake Canal shareholders and Nature Conservancy
    - CWIC and various vendors, suppliers and contractors.

The basic goal of these efforts is to establish not only water transfers and techniques, which will be discussed in the engineering section of the proposal, but to establish collaborative efforts between all the participants. This project includes all potential participants needed to organize the institutional framework necessary to implement an alternative transfer method. In so doing, it is not solely advancing the cause of the project proponents, but rather demonstrating that a vertical and horizontal collaborative effort is not only possible but productive. The nature and willingness of all participants has been identified. It is not believed to be the case, but it will be confirmed that there are no contractual or other prohibitions against the participation by any of the parties.

No grant funds were used for preparation of a court case.

Engineering

The State Engineer has developed rules and regulations for the submittal and evaluation of IWSAs. The rules require that applicants submit an Engineering Report describing the methodology, supporting data, and results of the analysis used to quantify the water right(s) subject to the IWSA. The Engineering Report prepared for this project provided data and information similar to that required by the State Engineer in their rules and regulations pertaining to IWSAs.

This project, however, involved practices that were not contemplated in the IWSA regulations. For example, regulated deficit irrigation was proposed as a means of reducing consumptive use of water supplies rather than fallowing. Also, realtime measurement of return flows and transferrable consumptive use was proposed rather than relying exclusively on the results of a historical use analysis to determine transferrable consumptive use and return flow obligations.

Due to these variances, the engineering effort included a consumptive use analysis based on the crop types that were proposed to be deficit irrigated rather than a historical use analysis based on historical cropping patterns. The consumptive use analysis was thought to be more relevant with respect to this IWSA than a historical use analysis because it quantifies consumptive uses based on the specific crops that impact the IWSA and provides a projection of potential transferrable consumptive use potentially derived during the irrigation season. It should be noted that a historical use analysis reflecting the historical cropping pattern was recommended by the SEO to quantify the water rights (i.e. historical consumptive use and return flows) involved in the proposed transfer and to set limits on transferrable consumptive use.

The complete Engineering Report is provided in Appendix A. A summary of the key points from the engineering report follows.

Water Right

The Lake Canal Co. diverts water from the north bank of the Cache La Poudre River in the SE ¼ of the SE ¼ of Section 32, Township 9N, Range 69W. Figure 1 in the Engineering Report (Appendix A) shows the ditch system and the location of the farms participating in the IWSA. The total decreed diversion rate for irrigation for the Lake Canal is 158.35 cubic feet per second (CFS). The Lake Canal water right was decreed in Case No. 0320 and has an appropriation date of November 1, 1872. There are a total of 260 outstanding shares in the Lake Canal Company.

Many farms under the Lake Canal also receive storage water from the Lake Canal Reservoir Company (LCRC). The LCRC owns four reservoirs: North Gray Reservoir, South Gray Reservoir, Gray Reservoir No. 3 and Lake Canal Reservoir No. 1. Water released from North and South Gray Reservoirs and Gray Reservoir No. 3 is diverted into the Lake Canal from Box Elder Creek. Lake Canal Reservoir No. 1 releases are delivered to shareholders via laterals under the Lake Canal. There are 160 outstanding shares in the LCRC.

Table 1 (Appendix A) summarizes the water rights associated with the four reservoirs.

In addition to Lake Canal Company and LCRC water supply, some farms in the Lake Canal service area receive water from the Cache La Poudre Reservoir Company (CLPRC), which stores water in Timnath Reservoir. Table 2 (Appendix A) describes the CLPRC water rights associated with Timnath Reservoir. There are 3,000 outstanding shares in the CLPRC, but only 358.5 shares are applied to the lands in the Lake Canal service area.

There are other sources of water are available to irrigators in the Lake Canal service area. Most notably, Colorado-Big Thompson (C-BT) storage water is regularly delivered to farms under the Lake Canal throughout the irrigation season but primarily during July and August.

The participating farms in the IWSA own shares in the Lake Canal Company, LCRC and CLPRC. Each participating farm holds various numbers of shares in some or all of these companies. The water supplies for the farms in the IWSA are:

- Farm 1 – 3 ¼ shares Lake Canal Company; 9 shares CLPRC
- Farm 2 – 12 shares Lake Canal Company; 10 shares LCRC; 40 shares CLPRC
- Farm 3 – 3 ½ shares Lake Canal Company; 8 shares CLPRC
- Farm 4 – 2 shares Lake Canal Company; 10 shares LCRC

Consumptive Use Analysis

To support the requirements of the IWSA application, the amount of transferrable consumptive use that could be derived from the water rights used to irrigate the subject farms and the amount of return flow obligation that would result from the full use of this water was analyzed. The analysis incorporated historical diversion records and climatic data to estimate potential consumptive use of irrigation supplies on the anticipated crops to be grown on lands participating in the IWSA.

The consumptive use analysis found the average consumptive use for all surface water supplies by farm was:

- Farm 1 (22 acres, irrigated corn) – 36.3 Acre-Feet (AF)
- Farm 2 (38 acres, irrigated winter wheat) – 14.7 AF
- Farm 3 (67 acres, irrigated grass hay) – 73.1 AF
- Farm 4 (35 acres, irrigated corn) – 38.0 AF

The total amount of consumptive use associated with the participating farms and the anticipated crops in 2012 is 162.1 AF based on average water deliveries and climatological drivers. As previously noted the goal was to generate 60 AF of transferrable consumptive use for the project. For the project, Farm 2 was not going to irrigate the 38 acres of winter wheat generating 14.7 AF of consumptive use water. The balance of the 60 AF would have come from regulated deficit irrigation activities or foregoing of late season irrigations on Farms 1, 3 and 4 making available a portion of the consumptive use shown above.

Calculation of Return Flows

Irrigation with the water rights associated with these farms generated both surface and subsurface returns to the Cache la Poudre River. The total return flow for each farm was estimated to be:

- Farm 1 (22 acres, irrigated corn) – 24.2 Acre-Feet (AF)
- Farm 2 (38 acres, irrigated winter wheat) – 9.8 AF
- Farm 3 (67 acres, irrigated grass hay) – 48.7 AF
- Farm 4 (35 acres, irrigated corn) – 25.3 AF

To calculate the return flows an irrigation efficiency of 60% was assumed and that the participants would take delivery of water shares based on consumptive use needs as they occur. Surface return flow obligations were to be provided and measured during the course of the transfer. Temporary recharge pits were envisioned to be installed on each farm to meet subsurface return flow obligations in an easily defined manner.

Proposed Operations

Diversion of the Water Right

When water was being diverted from the Cache la Poudre River for delivery to Lake Canal Company shareholders, and regulated deficit irrigation was being conducted on participating farms as a means to generate transferrable consumptive use, the Lake Canal diversions at the Lake Canal river headgate were to be reduced by an amount that equaled the daily amount of consumptive use reduction and surface return flow obligations of the participating farms. The transferred consumptive use and surface return flow obligation would thereby be left in the Cache la Poudre River.

When deliveries of storage water from LCRC and the CLPRC were being taken by participating farms, a different method for delivering transferrable consumptive use was proposed. Saved consumptive use from the reduced delivery of storage supplies was to remain in storage in either the S. Gray Reservoir or Timnath Reservoir depending on whether LCRC or CLPRC shares are being utilized and transferred. The amount that remained in storage would correspond to the amount of transferrable consumptive use that was derived on a daily basis. Release rates of storage supplies would be reduced appropriately to hold the transferrable consumptive use in storage until a preferable time period for a release (late September or early October).

Water Borrowers desired for the transferrable consumptive use water to pass through Fort Collins. When the direct flow right was in priority, this goal would occur naturally as described above. When transferrable consumptive use was derived from reduced use of storage water, this goal could not be achieved because the reservoirs only release water downstream of Fort Collins. To allow transferrable consumptive use to pass through Fort Collins, the intent was to have a water trade agreement with a C-BT water holder such that water remaining in storage from reduced consumptive use would be released to satisfy a request for C-BT and the actual C-BT water would be released and stay in the river and pass through Fort Collins at a suitable rate and time period. The Lake Canal Co. superintendent and the Water Commissioner agreed to coordinate with each other to accomplish this trade of supplies.

Water Measurements

All water diverted was to be adequately measured to the satisfaction of the Division Engineer pursuant to Paragraph 15.7.1.H.8 of the IWSA Rules. Instrumentation of participating farms to be implemented included measurement of farm headgate deliveries; surface return flows; deliveries to on-farm recharge basins; monitoring estimation of subsurface return flows; and soil moisture measurement for farm water management and irrigation scheduling. This instrumentation was to be connected to the Regenesis Management Group / SWIIM® water management system via SCADA Remote Terminal Units (RTUs) and suitable instrumentation.

RTUs would be installed and programmed to continuously record data for the instrumentation affixed to the RTU. Cellular modem communications were to be utilized as a primary communication and spread spectrum radios between RTUs in close proximity. All RTUs and instrumentation would be solar powered. Data would be collected continuously and downloaded to a server database on a 24-hour, ended-at-midnight basis.

Specific equipment proposed for monitoring included:

- Headgate deliveries: Existing Parshall flumes retrofitted with wet wells such that RTUs and pressure transducers could be installed prior to commencing operations.
- Surface return flows: New flume installations with electronics for data collection and transmission. Topography of each field would determine the locations of the flumes. Number of flumes deployed at each field would be commensurate with the number of surface runoff outfalls.
- Soil moisture: Sentek soil moisture sensors with a vertical array of seven capacitance soil moisture sensors spaced to capture data describing the rootzone soil moisture as well as subsurface soil

moisture movement below the rootzone. Sensors below the rootzone would be used to estimate subsurface return flows.

- Inflows to recharge pits: Long throated portable flumes would be installed at the inlet to the recharge pits to be constructed on each farm.

Proposed monitoring plans for each farm would have included maps showing the specific locations where surface water return flows, soil moisture, and headgate deliveries would be measured.

In addition to surface level measurements, satellite imagery and low-elevation aerial imagery would be obtained and reported. Satellite imagery would be downloaded whenever quality imagery was available. Low-elevation aerial imagery was to be flown weekly during the irrigation season to include multispectral imagery from RGB, NIR, and heat signature sensors.

Determination of Transferrable Consumptive Use and Return Flow Obligations

Near real-time monitoring and measurement of consumptive use and return flows does not indicate how much consumptive use or return flow occurred if the farm had been irrigated under historical practices. The amount of consumptive use and return flows that would have occurred under historical irrigation practices are hereinafter referred to as baseline consumptive use and baseline return flows. In a regulated deficit irrigation scenario, the amount of transferrable consumptive use is the difference between baseline consumptive use and the amount of consumptive use that actually occurs. The same is true for return flows.

It was proposed that the amount of transferrable consumptive use and return flow obligation accruing at each farm be determined by irrigating a portion of one farm normally and baseline amounts of consumptive use and return flow (both surface and subsurface) be measured or estimated. A portion of each farm would be deficit irrigated or simply dryland farmed (in the case of Farm 2) and actual amounts of consumptive use and return flows would be measured as well. The baseline and actual amounts of consumptive use and return flows would be compared and transferrable consumptive use and return flow obligations is the difference between baseline and actual conditions at each farm.

Delivery of Transferrable Consumptive Use and Return Flow Obligations

The proposed operation was described above in Diversion of Water Right. Additionally the following should be noted.

During the negotiations of the IWSA agreement, some “aspiration elements” were identified. These are operational goals that were to be pursued to the maximum extent practical during the execution of the water delivery. These elements are:

1. Enhanced flows were to be continued to the Greeley #3 diversion downstream of Fort Collins so this flow is available to downstream water users thus minimizing the potential for injury to other water rights. The City of Greeley was interested in taking delivery of the storage right portion of the consumptive use water to be subsequently stored in one of their storage facilities.
2. The flow rate of the release from storage would be influenced by the hydrologic circumstance of the river, base flow rate in the river and other subjective factors at the time of the release. The advantageous flow rate was thought to be in the range of 2 to 10 CFS.
3. For the participating farms, calculations of historic consumptive use show the breakout between river decreed water and storage decreed water and the relative CU quantities for each. As irrigation occurs, it was desirable for as much of the consumptive use water to come from storage as possible because this would allow for a release to the river to be made at a time of year and at a rate that would bring about the greatest perceived impact to the base flow in the river at the time of the release.

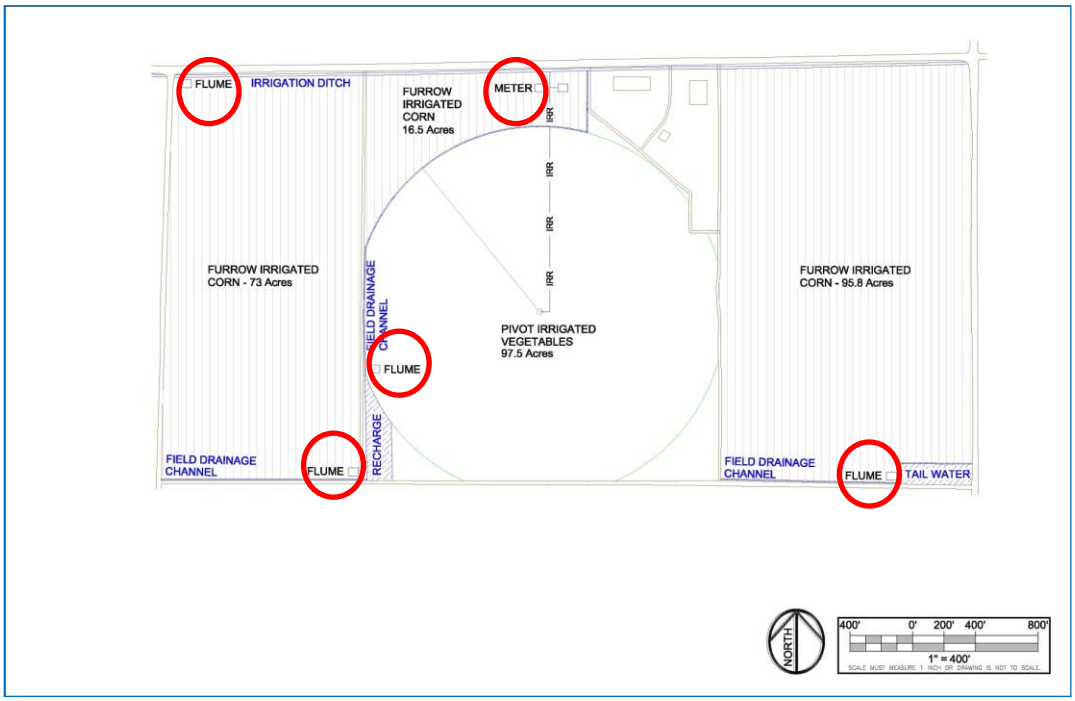
Evaporative Losses

The procedure for calculating evaporative losses in reservoirs and temporary recharge pits was described. The procedure calls for the use of the Northern Water Windsor weather station to calculate pan evaporation which then is used to calculate pond or reservoir evaporation. Stage-area-capacity was to be developed for both reservoirs and recharge pits.

Water Accounting

All measurements were to be collected continuously and downloaded daily for each 24-hour period ending at midnight. Data was to be aggregated on an internet accessed server and reports generated either daily or weekly. An example, and draft accounting form, is contained in the Engineering Report (Appendix A)

The figure below shows the conceptual layout of a farm as representative of many farms in the South Platte Basin.



The assumed water measurement points are circled in the figure for clarity and to identify new or upgraded instrumentation. Lake Canal Co. measures water at farm turnouts. So in this case, one of the necessary flumes may already be installed but may not be instrumented with SCADA and a water surface level sensor. Other flumes shown in the figure conceptually are likely added, in order to satisfy the requirements of a change decree or operational reporting requirements of the SEO.

This exemplary layout does not show a weather station. Every farm involved in the lease operation would not need a weather station. However, it is estimated that one weather station would be suitable to every 10,000 acres of farm fields involved in an IWSA of this type. For the Lake Canal project, a privately owned weather station about two miles south of the participating farms was available for localized project data.

The exact instrumentation requirements and layout must be done on a farm-by-farm basis. These concepts were discussed at length with SEO staff and found to be generally acceptable.

Water measurement devices, sensors and SCADA hardware needed to monitor this conceptual farm is estimated to cost approximately $20,000. This cost could be borne by:

1. Borrower(s) in a lease arrangement
2. Farmer Participants
3. Proportional sharing of costs between 1. and 2.
4. Cost sharing using NRCS EQIP contract funds.

Soil moisture sensors are envisioned to be a key instrumentation component of a water leasing program. The purpose of soil moisture sensors is twofold:

1. Soil moisture monitoring to predict when the next irrigation should occur (i.e. soil moisture based irrigation scheduling)
2. Monitoring to understand at least the fact of, or the lack of, subsurface moisture movement below the root zone which would indicate subsurface return flows

Stacked sensors on a vertical soil moisture sensing strip provide flexibility for sensors to be located both within and below the root zone depths. These sensors are made by several manufacturers and are available and affordable. The photograph below shows a recent installation for testing of this technology having sensors down to the 7-foot level.

IWSA Application and Response

Application for IWSA was made on March 1, 2012. Comments to the IWSA application were received from the following entities:

- State Engineer's Office
- Colorado Water Conservation Board, Stream and Lake Protection Section
- New Cache La Poudre Irrigating Company
- Northern Water

Responses to the IWSA are contained in Appendix B and are summarized herein.

State Engineer's Office (SEO)

Tracy Kosloff of the SEO submitted a letter containing 15 initial comments. These comments can be summarized as:

1. Provide greater detail in the calculations of historic consumptive use analysis, crop coefficients, irrigation efficiency, proposed exchange of C-BT Water, timing of releases, calculation of subsurface return flows and how to account for surface return flows from precipitation,
2. Use of the term "in-stream flow" should be avoided for the purposes of this project (see CWCB comments for more detail on this issue)
3. For each farm, provide greater detail of irrigation system(s), operational plans, soil moisture measurement locations and the impact of deficit irrigation on end of season soil moisture content,
4. How will aerial and satellite imagery be used?

A meeting with representatives from the SEO was held on April 9, 2012 to discuss in detail all their comments. A response memorandum to the issues was drafted but not completed or formally presented to SEO because of the delay in exercising the IWSA. An example of the detail the SEO requested for instrumentation was provided above in the Water Measurement section.

Colorado Water Conservation Board, Stream and Lake Protection Section (ISF Section)

ISF Section stated that it supported the efforts outlined in the IWSA proposal but had three comments related to C.R.S. §37-92-309:

1. Use of the term "in-stream flows" potentially creates confusion with their Instream Flow programs and protections.
2. The proposed exchanges could potentially extend to reaches of the Poudre River where CWCB holds instream flow rights.
3. Although CWCB does not hold instream flow rights in this vicinity, if it did it would be requesting more detail about the method of consumptive use quantification and maintenance of return flows so as to not cause injury.

Alternative terms to "in-stream flows" were suggested with "borrowed water" being the most likely to be used.

New Cache La Poudre Irrigating Co. (NCLPIC)

Fischer, Brown Bartlett & Gunn, PC sent a response on behalf of NCLPIC. Comments were:

1. Assurance of maintenance of historic return flows to Greeley Canal No. 2
2. Calculation of the "saved" portion of the water under the deficit irrigation practices
3. Opportunity for formal NCLPIC Board approval of the IWSA operations in accordance with their Catlin bylaws
4. Quantification of historical use of the shares in NCLPIC appears to be based on diversion records rather than farm delivery records.
5. Storage of saved consumptive use credits in Timnath Reservoir (NCRC storage facility) and the additional administrative duties, costs and agreement with NCLPIC.

Assurances were provided to NCLPIC as to maintenance of the return flows, and issues related to the historical use analysis were investigated and clarified. No formal Board approval was requested, however, because of the delay in exercising the IWSA.

Northern Water

Trout, Raley, Montano, Witner & Freeman, PC sent a response on behalf of Northern Water. The concern was the use of C-BT Project water and North Water's allotment contract and rules.

On April 19, 2012, a meeting was held with Northern Water. This meeting clarified Northern Water's issues with the proposed use of C-BT water in an exchange and they suggested an acceptable approach to resolving the issue. The meeting resulted in a verbal agreement that a trade of supplies that does not change the decreed character of C-BT water would be permissible. On April 27, 2012 a letter was sent to Northern Water documenting the outcomes and agreements of the meeting. On May 10, 2012, a letter confirming these understandings was later received from Trout, Raley, Montano, Witner & Freeman, PC.

LESSONS LEARNED

Throughout the term of this project, many meetings and in-depth discussions were held with representatives of the water right Lender, Borrowers, potential farmer participants, and project team members. These discussions provided insight for future IWSA applicants. The following list of observations is offered as consideration for those future applicants. The list is presented in no particular order or priority.

1. Historic difficulties between Lender and Borrower surfaced repeatedly throughout the project. At one point, it looked as if old issues of the past might negate the agreement. However, as it has played out, the project may now be a basis for improved relationships in the future.
2. The Nature Conservancy (TNC) generally works in a “willing seller – willing buyer” mode of operation. However, this IWSA agreement has some “un-willing seller – unwilling buyer” aspects. At one point it was noted that water is more difficult to appraise than land. The primary issue here was a suitable lease rate ($/AF) that was understandable and supportable to both sides of the agreement. In 2012, corn, wheat, and alfalfa prices were at record high levels. From the producer perspective, it was hard to understand giving up an increment of consumptive use water that could be used to produce a valuable crop.
3. Early in the discussions, one of the Borrowers commissioned an economic study to evaluate the market lease rate. Although the report was not shared with the other participants, after the report was submitted the Borrower seemed more amenable to discussing a higher rate for the consumptive use water. During the discussions, the news media was reporting on other lease rate agreements in other parts of the state. These reports also impacted the discussions. The observation here is that it may be beneficial for participants to have independent evaluations done prior to beginning the discussion of a suitable rate for consumptive use water.
4. Everyone was concerned about making an agreement that appears to set some kind of price precedent -- even for a “demonstration” or "proof of concept" project. A valuable discussion occurred in which consideration was given to the potential for an economic index that could drive a rate discussion in a given year. An index might be based on something like "corn futures" or another commodity index to provide a starting point in a discussion.
5. Midway through the negotiations, the Borrowers started referring to the “value proposition” of the water as opposed to being a more magnanimous project participant. The value proposition for conservation interests wishing to leave water in the river included the timing and flow rate of the water. Stating the obvious, the best value proposition for the Borrowers is late season, stored water that can be released in consideration of current river conditions. Thus, late season stored water presents a significantly higher value proposition for this type of exchange than direct flow water when the river may already be flowing at seasonal high levels.
6. Water or a management option that allow the greatest flexibility on the timing of the delivery has the greatest valve.
7. Initially, only direct flow was considered for the alternative transfer. However, too effectively deficit irrigate, a minimum level of crop development is required. This development can occur after direct flow water goes out of priority or toward the end of a direct flow period depending on conditions. Generally, to effectively deliver saved consumptive use water from the farms involved in this project,

both direct flow and late season storage water must be used in conjunction in consideration of a total annual volume that is perceived to be significant.

8. Does there need to be a direct connection between the timing of the saved consumptive use water and delivery of water to the river? Does consumptive use water need to be "saved" before it can be "spent" for this type of exchange to be believable and observable?
9. Participants need to outline all their needs/requirements at the onset of the negotiation process otherwise it could have unintended consequences. For example, late in the negotiation process, it was discovered that some river management elements (timing, volume, ecological benefits) had value added for some participants. These elements were never considered in the initial discussions. These elements added another layer of complexity to the water transfer and management.
10. Navigating the social and political considerations of the negotiation process was very time consuming and required a number of face-to-face meetings. It was important to build trust among the project participants.
11. Mistrust of Borrowers is a significant issue in the agriculture community. Potential farmer participants were pretty blunt about this. Potential farmer participants cited past observations and interactions with potential Borrower organizations and suspicions regarding the actual reasons for their participation in the project as roots of mistrust.
12. Could an unintended consequence of this project be that this type of alternative water transfer is seen as another tool to get water out of the river and into the treatment plant thereby decreasing river flows?
13. In the final negotiations, past relationships are very important if not key.
14. The impact of prevailing commodity prices and demand for water from the oil and gas sector on the price of lease water could have never been anticipated. The initial lease rate of $225 per CU AF was not enough to get farmers interested in the project because of the high market rate on key crops plus the assumption that oil and gas water leasing was increasing demand.
15. The physical characteristics of the river diversion must be considered. Ideally the river diversion needs the capability to divert the full flow of water then to divert and put back in the river that amount that is to be left in the river. The Lenders need to show a physical diversion of the water.
16. There was an emphasis to minimize the number of legal agreements for this alternative transfer. However, is this really representative of the true number and type of agreements required for the IWSA? Does the potential number of agreements make this type of IWSA too complicated?

SUMMARY

This project started out with seven specific Objectives that included the physical transfer of water. Although we were not able to implement the physical transfer, we were able to:

1. Identify the potential of a borrowed water supply for the Cache la Poudre River from approximately the Lake Canal diversion to the Greeley No. 3 diversion, west of Greeley.
2. Demonstrate the potential to use an IWSA agreement to provide water for other uses outside the ditch service area.
3. Demonstrate the economic factors in an alternative agricultural water transfer.
4. Demonstrate that alternatives to permanent agricultural water transfers, such as fallowing and regulated deficit irrigation, can be completed in a manner which does not adversely impact other water rights holders.
5. Demonstrate how collaborative partnerships between public, private, agricultural, and environmental entities potentially could be built and sustained for joint problem solving.

6. Determine which factors contribute to or detract from participation in alternative transfer methods on the part of agricultural producers, municipal utilities, environmental groups, and others, including State regulatory agencies.

In the process of developing, submitting, and following up on the IWSA, the project team identified a number of key issues. The following are the most significant:

1. Water Rights Decree: It was initially envisioned that the Lake Canal river decree would be the primary water for the IWSA. As farmer participants were identified and as discussions continued with the Borrowers, it became evident that the river decree coupled with the late season storage water sources were needed to meet the value proposition that the Borrowers desired.
2. Water Lease Rate: The compensation level or water lease rate to be paid per leased AF of consumptive use water was the most difficult discussion element within the project. In spring 2012, corn and wheat prices were high and potential participating farmers were quite concerned about a rate for saved water that adequately made up for the opportunity cost of using all their CU water for crop production. With corn and wheat prices are at record levels and the lease rate being paid by oil and gas concerns ultimately was the undoing of water transfer operations.
3. Interaction with Department or Water Resources (DWR): The meeting with DWR staff following the IWSA application was a significant and positive interaction. The discussion at the IWSA comment review meeting was detailed and overall positive. The discussion revolved around river management with respect to when, where, and how the transfer could take place; the instrumentation of the river diversion, headgates, and fields. Significant and valuable discussions occurred with the need to adequately monitor and report on return flows and the water balance for the irrigated fields.
4. Historic relationships and sociology: There is a long history of past difficulties between the Lenders and Borrowers. This project may have provided progress in mitigating that negative history.

The Colorado Water Innovation Cluster on behalf of the project team members would like to thank CWCB for the opportunity this grant provided.

APPENDIX A – IWSA APPLICATION

Application for Interruptible Water Supply Agreement Between the Lake Canal and the City of Fort Collins and the Nature Conservancy

Prepared for
State Engineer
1313 Sherman Street
Denver, Colorado 80203
February 29, 2012

Aqua Engineering Inc.
Innovative Water Solutions

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Fort Collins, CO 80525-3196
970.229.9668 office
970.226.3855 fax
www.aquaengineering.com

February 29, 2012

Mr. Dick Wolfe
State Engineer
Colorado Division of Water Resources
1313 Sherman Street, Room 818
Denver, Colorado 80203

Mr. Wolf:

On behalf of the Colorado Water Innovation Cluster (CWIC), attached is the application for an Interruptible Water Supply Agreement (IWSA) between Lake Canal Company (Water Lender) and The Nature Conservancy and the Fort Collins Natural Areas program (Water Borrowers).

In 2011, the Colorado Water Conservation Board (CWCB) funded The Lake Canal Alternative Agricultural Practices and In-stream Flow Demonstration Project. This application for acceptance of an IWSA is submitted as partial fulfillment of that grant.

The intent of this one year demonstration project is to develop an IWSA, demonstrate new techniques and technologies necessary to document saved consumptive use water, identify and provide potential solutions to issues to alternative transfer methods and report the findings to CWCB.

Under this project, willing farmer shareholders under the Lake Canal service area will implement fallowing, dryland crops, deficit irrigation, and/or other alternative agricultural practices to facilitate a lease of saved consumptive use for in-stream flows in the Cache La Poudre River between the Lake Canal river diversion and on downstream to points east of Interstate 25. Lake Canal Company, Lake Canal Reservoir Company and Cache La Poudre Reservoir Company water will be utilized. Saved consumptive use water will be released to the Poudre River on a periodic basis during the 2012 irrigation season. The intent is that the exchange will be conducted pursuant to 37-92-309, C.R.S.

Although this is an application for an IWSA, it is inherently a request for a variance or adaptation of some of the Rules for the IWSA because it does not appear that the Rules and Regulations for IWSAs contemplate the specific deficit irrigation and investigative activities to be conducted under this project.

Attached is a check for $2,389 per 2 CCR 402-15.6.

Please contact me with questions about this application.

Sincerely,

Robert W. Beccard, P.E.
CWIC Grant Team Project Manager

Application for Interruptible Water Supply Agreement Between the Lake Canal and the City of Fort Collins and the Nature Conservancy

Prepared for
State Engineer
1313 Sherman Street
Denver, Colorado 80203
February 29, 2012

COLORADO
WATER INNOVATION CLUSTER

Table of Contents

List of Abbreviations

C-BT	Colorado-Big Thompson
cfs	cubic feet per second
CLPRC	Cache La Poudre Reservoir Company
C.R.S.	Colorado Revised Statutes
CWCB	Colorado Water Conservation Board
CWIC	Colorado Water Innovation Cluster
CSU	Colorado State University
IR	Near infrared
IWSA	Interruptible Water Supply Agreement
LCRC	Lake Canal Reservoir Company
RGB	Red Green Blue
RTU	Remote Terminal Unit
USDA	U.S. Department of Agriculture

Section 1

Justification and Need

The Colorado Water Conservation Board (CWCB) has funded The Lake Canal Alternative Agricultural Practices and In-stream Flow Demonstration Project (Project). This application for acceptance of an Interruptible Water Supply Agreement (IWSA) is submitted as part of the scope of work for that grant. It must be noted that although this is an application for an IWSA it is inherently a request for a variance or adaptation of some of the Rules for the IWSA because it does not appear that the Rules and Regulations for IWSAs contemplate the specific deficit irrigation and investigative activities to be conducted under this project. The IWSA application and project is intended to be brought about pursuant to 37-92-309, C.R.S.

The intent of this one year demonstration project is to develop an IWSA, demonstrate new techniques and technologies necessary to document saved consumptive use water, identify and provide potential solutions to issues to alternative transfer methods and report the findings to CWCB.

This IWSA is between the Lake Canal Company (Water Right Owner) and The Nature Conservancy and the Fort Collins Natural Areas program (Water Borrowers). Under the Project, willing farmer shareholders under the Lake Canal service area will implement dryland crops, deficit irrigation, and/or other alternative agricultural practices to facilitate a lease of saved consumptive use for in-stream flows in the Cache La Poudre River between the Lake Canal river diversion and on downstream to points east of Interstate 25. Lake Canal Company, Lake Canal Reservoir Company (LCRC) and Cache La Poudre Reservoir Company (CLPRC) water is used for irrigation on the participating farms and reservoirs associated with these companies will be used for temporary storage of the saved CU water until the water can be released to the Poudre River on a periodic basis during the 2012 irrigation season. Reservoir storage will also help facilitate an exchange to allow water identified under the IWSA to pass through Fort Collins proper. The intent is that the exchange will be conducted pursuant to 37-92-309, C.R.S.

162 acres of grass hay, corn or wheat will be deficit irrigated or dryland cropped. No fallowing is anticipated during this one year pilot project.

Canal structures and participating farms fields will be instrumented to measure inflow, surface return flows, and soil moisture. Data will be collected continuously using solar-powered remote terminal units. Instrumentation is further described herein. Aerial photography including RGB, near infrared and heat signature imagery will be flown weekly and calibrated with evapotranspiration measured at NCWCD's weather station designated as the "Windsor" weather station. The measured consumptive use and return flows under deficit irrigation or dryland cropping conditions will be compared to "control" portions of the fields that will be irrigated as they have been historically.

The calculation of saved consumptive use water will be accomplish using a packaged software/field instrumentation solution developed by Regenesis Management Group, in concert with cooperative research and development agreements with Colorado State University (CSU) and the U.S. Department of Agriculture (USDA).

The amount of saved consumptive use water will be documented and reported monthly. Under the operations defined, the saved consumptive use water would not be eligible for transfer until the savings has been documented and reported. Once the amount of saved consumptive use water is documented, the Water Borrowers will influence the timing of the delivery to the Poudre River.

When direct flow water is being diverted from the Cache La Poudre River for delivery to Lake Canal Company shareholders, and deficit irrigation is being conducted, the Lake Canal diversions at the Lake Canal river headgate will be reduced by an amount that equals the daily amount of consumptive use reduction and surface return flow obligations from the participating farms. The transferred consumptive use and return flow obligation will thereby be left in the Cache La Poudre River.

When deliveries of storage water from LCRC and the CLPRC are being taken by shareholders and would otherwise be taken by farms participating in the IWSA, a different method for delivering transferrable consumptive use is used. Saved consumptive use from the reduced delivery of storage supplies will remain in storage in either the S. Gray Reservoir or Timnath Reservoir depending on whether LCRC or CLPRC shares are being transferred. The amount that remains in storage will correspond to the amount of transferrable consumptive use that is derived on a daily basis. Release rates of storage supplies will be reduced appropriately to keep the transferrable consumptive use in storage.

Ultimately the intent is to delivery up to 60 Acre-Feet of saved consumptive use water sometime between July and the end of October 2012.

Additional details of the IWSA and the Project are provided in the following sections.

Section 2

Proof of Notice

The following is a Certificate of Service pursuant to Section 37-92-309(3)(1), C.R.S. and Rule 15.7.1.F of the IWSA Rules.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that on the 1st day of March, 2012, true and correct copies of the Application for Interruptible Water Supply Agreement Between the Lake Canal and the City of Fort Collins and The Nature Conservancy for 2012-2013 and supporting documents were served upon the following via U.S. Mail or Electronic Mail as indicated:

Via U.S. Mail:

Mr. Dick Wolfe
State Engineer
1313 Sherman Street, Room 818
Denver, Colorado 80203

Via E-Mail:

Mr. David Nettles
Division Engineer
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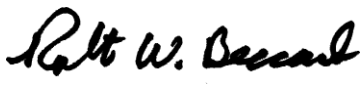

By:

Section 3

Narrative Description

Section 3 of the application provides the information requested in Paragraph 15.7.1.H.3 of the IWSA Rules. The following descriptions are a summary of details described in the Engineering Report.

3.1 Description of the Water Right

The Lake Canal diverts water from the north bank of the Cache La Poudre River in the SE ¼ of the SE ¼ of Section 32, Township 9N, Range 69W. Figure 1 in the Engineering Report (Appendix B) shows the ditch system and the location of the farms participating in the IWSA. The total decreed diversion rate for irrigation for the Lake Canal is 158.35 cubic feet per second (cfs). The Lake Canal water right was decreed in Case No. 0320 and has an appropriation date of November 1, 1872. There are a total of 260 outstanding shares in the Lake Canal Company.

Many farms under the Lake Canal also receive storage water from the Lake Canal Reservoir Company (LCRC). The LCRC owns four reservoirs: North Gray Reservoir, South Gray Reservoir, Gray Reservoir No. 3 and Lake Canal Reservoir No. 1. Water released from North and South Gray Reservoirs and Gray Reservoir No. 3 is diverted into the Lake Canal from Box Elder Creek. Lake Canal Reservoir No. 1 releases are delivered to shareholder via laterals on the Lake Canal. There are 160 outstanding shares in the LCRC.

Table 1 summarizes the water rights associated with the four reservoirs.

Table 1. Description of LCRC water rights

Water Right	Appropriation Date	Source	Case No.	Amount (AF)	Location
North Gray Reservoir	April 1, 1882	Box Elder Creek	CA 1591	135	NE ¼ of the SW ¼ of the NE ¼ of Section 34, Township 8N, Range 68W
North Gray Reservoir, 1st Enl	November 1, 1902	Box Elder Creek	CA 1591	140	
North Gray Reservoir, 2nd Enl	November 15, 1904	Box Elder Creek	CA 2031	57	
South Gray Reservoir	April 1, 1882	Box Elder Creek	CA 1591	275	SW ¼ of the NE ¼ of the SW ¼ of Section 34, Township 8N, Range 68W
South Gray Reservoir, 1st Enl	November 1, 1902	Box Elder Creek	CA 1591	236	
South Gray Reservoir, 2nd Enl	November 16, 1904	Box Elder Creek	CA 2031	222	
Gray Reservoir No. 3	November 14, 1904	Box Elder Creek	CA 2031	111	NE ¼ of the SW ¼ of the SE ¼ of Section 34, Township 8N, Range 68W
Lake Canal Reservoir No. 1	October 15, 1898[1] December 1, 1901[2]	[1]Cache la Poudre River, Ames Slough, and Cooper Slough [2]Box Elder Creek	CA1591	803	SW¼ of the NE¼ of the NE ¼ of Section 7, Township 6N, Range 67W

In addition to Lake Canal Company and LCRC supplies, some farms in the Lake Canal service area receive water from the Cache La Poudre Reservoir Company (CLPRC), which stores water in Timnath Reservoir. Table 2 describes the CLPRC water rights associated with Timnath Reservoir. There are 3,000 outstanding shares in the CLPRC, but only 358.5 shares are applied to the lands in the Lake Canal Service area.

Table 2. Description of CLPRC Water Rights

Water Right	Appropriation Date	Source	Case No.	Amount (AF)
Timnath Reservoir	March 17, 1892	Cache La Poudre River	CA 1591	8,379
1st Enlargement	December 1, 1902	Cache La Poudre River	CA 2031	1,740
Refill	December 31, 1923	Cache La Poudre River	CA 11217	5,948
Refill	December 31, 1923	Cache La Poudre River	CA 11217	4,171

Other sources of water are available to irrigators in the Lake Canal service area. Most notably, Colorado-Big Thompson (C-BT) storage water is regularly delivered to farms under the Lake Canal throughout the irrigation season but primarily during July and August.

The participating farms in the IWSA own shares in the Lake Canal Company, LCRC and CLPRC. Each participating farm holds various numbers of shares in some or all of these companies.

3.2 Proposed Use of the Water Right

Saved consumptive use water will be used for in-stream flows in the Cache La Poudre River between the Lake Canal river diversion and on downstream to points east of Interstate 25.

3.3 Diversion of the Water Right

When direct flow water is being diverted from the Cache La Poudre River for delivery to Lake Canal Company shareholders, and deficit irrigation is being conducted on participating farms as a means to generate transferrable consumptive use, the Lake Canal diversions at the Lake Canal river headgate will be reduced by an amount that equals the daily amount of consumptive use reduction and surface return flow obligations from the participating farms. The transferred consumptive use and return flow obligation will thereby be left in the Cache La Poudre River.

When deliveries of storage water from LCRC and the CLPRC are being taken by shareholders and would otherwise be taken by farms participating in the IWSA, a different method for delivering transferrable consumptive use is used. Saved consumptive use from the reduced delivery of storage supplies will remain in storage in either the S. Gray Reservoir or Timnath Reservoir (depending on whether LCRC or CLPRC shares are being transferred). The amount that remains in storage will correspond to the amount of transferrable consumptive use that is derived on a daily basis. Release rates of storage supplies will be reduced appropriately to keep the transferrable consumptive use in storage.

Water Borrowers involved in this IWSA want the transferrable consumptive use to pass through Fort Collins. When the direct flow right is in priority, this goal will occur naturally as described above. When transferrable consumptive use is derived from reduced use of storage water, this goal will be difficult to achieve because the reservoirs can only release water downstream of Fort Collins. To accomplish this goal, the CWIC intends to have an exchange agreement with a C-BT water holder such that water

remaining in storage from reduced consumptive use will be released to satisfy a request for C-BT and the actual C-BT water will be released so as to pass through downtown Fort Collins at a suitable rate and time period. The Lake Canal superintendent and the Water Commissioner will coordinate to accomplish this exchange of supplies.

3.4 Source of Replacement Water

The source of replacement water is Lake Canal Company, Lake Canal Reservoir Company and Cache La Poudre Reservoir Company water. Replacement of return flows will be made by delivering a portion of these water rights directly to the river (for surface return flows) or to recharge (for subsurface return flows).

Section 4

Interruptible Water Supply Agreement

A copy of the agreement between the loaning Water Right Owner(s) and the Water Right Borrower(s) showing both parties consent to operate the Interruptible Water Supply Agreement is provided. Appendix A contains a copy of the agreement under this application pursuant to Section 37-92-309, C.R.S. and Paragraph 15.7.1.H.4 of the IWSA Rules.

Section 5

Engineering Report

The Engineering Report requested under Paragraph 15.7.1.H.5 and Rule 15.8 of the IWSA Rules is contained as Appendix B of this application. The Engineering Report was prepared by Brown and Caldwell.

Section 6

Erosion and Noxious Control

For this project, irrigated land will not be fallowed; therefore erosion and noxious weed control will not be required pursuant to Paragraph 15.7.1.H.6 of the IWSA Rules.

Section 7

Monthly Accounting Form

The proposed monthly accounting form for the IWSA conforms to the requirements of Paragraphs 15.7.1.H.6 and Section 15.9 of the IWSA Rules and contains all information necessary for the administration of the plan including transferrable consumptive use, all diversions, return flow requirements, and replacement water deliveries. An example of the accounting form is contained in Appendix C. Data collection and reporting relative to the accounting form are described in the Engineering Report (Appendix B).

Section 8

Water Measurement

Section 8 provides a description of how the water proposed under the IWSA will be measured. Pursuant to Paragraph 15.7.1.H.8 of the IWSA Rules, all water diverted under the proposed IWSA shall be adequately measured to the satisfaction of the Division Engineer or the designee. The following is a summary of detailed monitoring and instrumentation description contained in the Engineering Report.

Instrumentation of participating farms will be implemented to include measurement of headgate deliveries, measurement of surface return flows, estimation of subsurface return flows and soil moisture measurement for farm water management and irrigation scheduling as well as monitoring and estimation of sub-surface return flows. Instrumentation will also be deployed to measure deliveries to on-farm recharge basins with staff gages being used to measure the depth of water.

Remote terminal units (RTUs) will be installed and programmed to continuously record data for the instrumentation affixed to the RTU. Cellular modem communications will be utilized as cellular service is fully available and of suitable signal quality. All RTUs and instrumentation will be solar powered. Data will be collected continuously and downloaded to a server database on a 24-hour, ended-at-midnight basis.

The specific equipment used for monitoring and the general location where the equipment is deployed is described below:

- Headgate deliveries: Existing Parshall flumes retrofitted with wet wells such that RTUs and pressure transducers can be installed prior to commencing operations.
- Surface return flows: New flume installations with electronics for data collection and transmission. Topography of each field determines the locations of the flumes. Number of flumes deployed at each field will be commensurate with the number of surface runoff outfalls.
- Soil moisture: Is anticipated to be Sentek soil moisture sensors with a vertical array of seven capacitance soil moisture sensors spaced so as to capture the rootzone soil moisture as well as subsurface soil moisture below the rootzone. Sensors below the rootzone will be used to estimate subsurface return flows.
- Inflows to recharge pits: Long throated portable flumes will be installed at the inlet to the recharge pits to be constructed on each farm.

Specific monitoring plans will be developed for each farm. The plans will include maps showing the specific locations where surface water return flows, soil moisture, and headgate deliveries will be measured. The amount of instrumentation deployed at each farm will be to the satisfaction of the State Engineer. CWIC will be developing farm specific monitoring plans for participating farms as soon as possible.

In addition to surface level measurements, satellite imagery and low-elevation aerial imagery will be obtained and reported. Satellite imagery will be downloaded whenever quality imagery is available. Low-elevation aerial imagery is flown weekly to include multispectral imagery from RGB, IR, and heat signature sensors.

Appendix A: Interruptible Water Supply Agreement

INTERRUPTIBLE WATER SUPPLY AGREEMENT

COMES NOW Lake Canal Company; and the City of Fort Collins and the Nature Conservancy; (collectively the Parties) and herby Stipulate and Agree:

PARTIES

Lake Canal Company (Lake Canal) is a Mutual Ditch Company composed of shareholders who are landowners within Larimer and Weld County. Lake Canal is the owner or through separate agreement, authorized user of the decreed water rights more fully described on Exhibit 1.

The City of Fort Collins (Ft. Collins) is a Colorado Municipality.

The Nature Conservancy (Nature Conservancy) is a District of Columbia non-profit corporation.

Ft. Collins and Nature Conservancy are collectively referred to as the "Borrowers".

RECITALS

1. The Parties desire to enter into this Interruptible Water Supply Agreement (IWSA) under which Lake Canal will supply water to Ft. Collins and Nature Conservancy as follows:

   A. Lake Canal, as the loaning water right owner is able, during the term of this Agreement, in cooperation with the Colorado Water Innovation Cluster, as described in Exhibit 1, to ensure that its shareholder/operators participating hereunder temporarily reduce their use of sufficient portions of the water rights as the basis for delivery of water to the Borrowers hereunder as described in Exhibit 1; and,

   B. By such temporary cessation of use of its water rights by the participating Lake Canal shareholder/operators, and through on-farm documentation of the participating Lake Canal shareholder/operators' water use as more fully described in Exhibit 1, Lake Canal can make water available for delivery to the Poudre River west of I-25 for lease to Borrowers, which consists of 100% consumptive use water, with no return flow component or obligation whatsoever for the Borrowers, by means of direct flow, and/or storage in one of the following: South Gray Reservoir, Timnath Reservoir or such other reservoir as the parties mutually agree; and

   C. Borrowers have arranged to deliver the water provided to them hereunder to the City of Greeley in the Greeley #3 Canal, for use by Greeley. Another location of delivery to an end use acceptable to the State Engineer may be established through mutual agreement of the Parties.

2. A description of the historical consumptive use, return flow, the potential for material injury to other water rights relating to the IWSA, conditions proposed to prevent such injury, and an accurate description of the land where the water is decreed for use are attached as Exhibit 1.

3. The plan for replacement water, accounting, delivery, and reporting to replace all lagged return flow for the period during which return flows are shown to occur is attached as Exhibit 1.

NOW THEREFORE, for and in consideration of the mutual covenants and agreements set forth herein, the receipt and sufficiency of which is hereby acknowledged, the Parties agree as follows:

4. **Term**

This agreement shall be for a period of one year from the date of this Agreement, unless previously terminated as set forth herein.

5. **Definitions**

A. LAKE CANAL WATER RIGHTS means the water rights as outlined in Exhibit 1. Water delivered under said water rights will be delivered by the shareholders/landowners identified in Exhibit 1.

B. SUBSCRIPTION AGREEMENT means an agreement between Lake Canal and the landowners committing said landowners' pro rata portion of Lake Canal Water Rights to satisfy the water delivery obligation of Lake Canal pursuant to this IWSA.

C. CONSUMPTIVE USE WATER means the portion of water consumed during use that does not become return flow available for further use.

D. CONDITIONS PRECEDENT means the Parties' obligation to perform pursuant to this IWSA are contingent upon full satisfaction of all of the following conditions:

i. The State Engineer shall have approved, pursuant to C.R.S. 37-92-309 and 2 CCR 402-15 (The IWSA rules), the application by the Colorado Water Innovation Cluster on behalf of the Parties for the delivery of leased water under the terms of this Agreement as more fully described in Exhibit 1; and,

ii. Lake Canal shall have entered into a Management Agreement with the Colorado Water Innovation Cluster (CWIC) for the administration of this IWSA, including but not necessarily limited to the following tasks:

a. All technical aspects of instrumentation, on farm operations, monitoring, documentation and reporting of the water savings achieved by the Lake Canal shareholders
b. Drafting, submission and support of an application to the State Engineer for approval of the operation of this IWSA, as described in Exhibit 1.
c. All administrative obligations to enable actual delivery of water to the Borrowers according to this Agreement.

6. **The Lease**

Upon satisfaction of the Conditions Precedent, Lake Canal will make available for lease to Fort Collins and Nature Conservancy up to 60 acre feet of water (the Leased Water) from the water rights listed on Exhibit 1 for delivery to the Poudre River west of I-25. This water will consist of 100% consumptive use water, with no return flow component or obligation, by means of direct flow and/or storage in one of the following: South Gray Reservoir, Timnath Reservoir or such other reservoir as the parties agree and as approved by the State Engineer. In the event that the Conditions Precedent have not been satisfied by the end of July 1, 2012, this IWSA shall automatically terminate and be of no further force and effect.

7. **Delivery of water**

A. Borrowed water will be delivered into the Poudre River at a location west of I-25 reasonably satisfactory to the Borrowers. When water is from storage, releases will be made at any such time as Borrowers direct but before Oct 31, 2012. Borrowers shall give advance notice of their direction for release of the stored water as required by the Water Commissioner.

B. Delivery will be provided as described in Exhibit 1.

8. **Measurement**

Under the Management Agreement, the CWIC shall measure, document and maintain monthly records of deliveries hereunder to Ft. Collins and the Nature Conservancy and shall be responsible for all reporting of operations under this Agreement to the Colorado Division of Water Resources.

9. **Payment**

Pursuant to the terms of this lease, the lease rate for water leased hereunder shall be $500 per acre foot of consumptive use water delivered hereunder. Upon delivery of the leased water in accordance with the terms of this IWSA, Lake Canal shall provide to the Borrowers an accounting and invoice for the water released and delivered hereunder as measured and documented by Lake Canal, and the Borrowers shall pay the amounts due hereunder within 30 days of the receipt of such accounting and invoice by the Borrowers. If Ft. Collins and the Nature Conservancy do not pay the amount due by the required day, they shall be assessed a carrying charge of 1.5% per month on the unpaid balance.

10. **Termination**

A. Upon termination of this agreement, Lake Canal shall have no obligation to supply water to Ft. Collins and the Nature Conservancy wave any claim to continued water supply by Lake Canal after termination, and Ft. Collins and the Nature Conservancy shall no longer have any obligation to make payment hereunder to Lake Canal.

B. Ft. Collins and the Nature Conservancy shall give Lake Canal written notice of its intent to terminate this agreement ("notice of termination") and shall make all payments required by this agreement. In addition, at Ft. Collins and the Nature Conservancy request, Lake Canal shall

deliver to them all the water that is required to be delivered under this agreement for the period in which the notice of termination is given.

11. **Force Majeure**

A. If at any time during the term of this agreement, either Ft. Collins and the Nature Conservancy is rendered unable to operate or Lake Canal is rendered unable to deliver water pursuant to the terms of this agreement as a result of actions by federal, state or local governments, or their agencies, the affected party shall give notice to the other party within thirty (30) days from the date the affected party has notice or knowledge of governmental action or proposed action. The notice shall specify: (1) the nature of governmental action or proposed action, (2) the impact on the affected party, (3) the projected date on which the governmental action or proposed action will preclude the affected party from operating pursuant to this agreement, and (4) a description of the actions that the affected party will take with respect to the governmental action or proposed action. The Parties shall continue to perform under this agreement until the date that the affected party is precluded from continuing operations by the governmental action or proposed action.

B. Ft. Collins and the Nature Conservancy shall only be obligated to pay Lake Canal for water delivered at the date of the discontinuance of operations. Lake Canal shall deliver water hereunder until such day as it is precluded from operating pursuant to this agreement, and Ft. Collins and the Nature Conservancy shall only pay Lake Canal for water actually delivered prior to the time in which the discontinuation of operation occurs. If at any time during the term of this agreement the affected party is able to continue or restart operations in compliance with federal, state or local law, the affected party shall have the option of reinstating this agreement by providing written notice to the affected party. The affected party shall specify in the written notice the date on which this agreement shall be reinstated, and obligations under this agreement shall remain in full force and effect the date of such reinstatement.

12. **Review by State Engineer and Water Court Proceedings**

The Parties agree to fully cooperate in review by or hearings before the State Engineer and any water court proceedings that are necessary to implement performance under this agreement. Each party shall bear its own costs and attorneys' fees associated with such proceedings. However, it is the obligation of the CWIC to secure any and all approvals of this IWSA or any other applications or agreements necessary to deliver water to Borrowers hereunder, as described in Exhibit 1.

13. **Priority of Delivery**

It is expressly understood between the Parties, that should Lake Canal contract with other entities or individuals for delivery of water, such deliveries shall not interfere with, and shall be subordinate to, the delivery obligations imposed on Lake Canal by this agreement.

14. **Changes in Quantity or Timing of Delivery**

The Parties may, by separate, written agreement: (1) increase or decrease the amount or timing of water deliveries from the amount that will be delivered to Ft. Collins and the Nature Conservancy by Lake Canal, subject to any required regulatory review or approvals.

15. **Indemnification**

To the extent permitted by law, each of the Parties agrees to save and hold the others harmless from and against all liability from damage to property, or death of any person, or liability for claims arising out of or specifically related to actions of such Party and its officers and employeesin their performance of this agreement.

16. **Audits**

Lake Canal agrees to maintain accurate records in accordance with sound accounting principles to evidence compliance with this agreement. Said accounting records shall present a fair and accurate accounting of all charges to Ft. Collins and the Nature Conservancy under this agreement. Upon 30 days written notice, Lake Canal shall provide Ft. Collins and the Nature Conservancy with access to such accounting records, so that Ft. Collins and the Nature Conservancy can determine whether Lake Canal is in compliance with the provisions of this agreement. These accounting records shall be made available to Ft. Collins and the Nature Conservancy during the term of this agreement and for a period of twenty-four (24) months thereafter.

17. **Default; Remedies**

In the event of default hereunder by any party, the remedies are as set forth below unless otherwise provided in this agreement. The remedies of the Parties shall survive termination of this agreement.

A default shall be deemed to have occurred if any party breaches its obligations hereunder and fails to cure such breach within 30 days of receipt of written notice specifying the breach.

Upon a default by any party, the non-defaulting party shall be entitled to seek any available remedy under law or equity (including, without limitation, the performance and/or damages) and the prevailing party shall also be entitled to recovery of its reasonable attorneys' fees, expert witness fees, and court costs. The Parties acknowledge that due to the unique subject matter of this agreement, legal remedies may be inadequate, damages may be difficult to determine, and it may be impossible to return the non-defaulting party to the status quo as it existed at the time of default. As a result, the non-breaching party shall have the right to specific performance under the terms and conditions of this agreement.

Date of the Agreement: February 29, 2012.

APPROVED

LAKE CANAL CO.

By Rodney Nelson

Title President

APPROVED

CITY OF FORT COLLINS

By

Title City Manager

APPROVED AS TO FORM:

Deputy City Attorney

NATURE CONSERVANCY

By John Sanderson

Title Director of Science/Water Program Manager

Appendix B: Engineering Report

Exhibit 1

Engineering Report Supporting the Application for an Interruptible Water Supply Agreement on the Lake Canal

Prepared for
The Colorado Water Innovation Cluster
Fort Collins, Colorado

February 29, 2012

Brown AND Caldwell
1697 Cole Boulevard, Suite 200
Golden, Colorado 80401

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List of Abbreviations

AF	Acre-feet
ASCE	American Society of Civil Engineers
ASCE-PM	ASCE Standardized Penman-Monteith
ATM	Alternative Agricultural Water Transfer Methods
AWAS	Alluvial Water Accounting System
AWC	Available Water Holding Capacity
C-BT	Colorado-Big Thompson
CDSS	Colorado Decision Support System
CLPRC	Cache La Poudre Reservoir Company
CWCB	Colorado Water Conservation Board
CWIC	Colorado Water Innovation Cluster
cfs	Cubic feet per second
ET	Evapotranspiration
ft	Feet
gpd/ft	Gallon per day per foot
GIS	Geographical Information System
IDSCU	Integrated Decision Support Consumptive Use Model
in	Inch
IWSA	Interruptible Water Supply Agreement
LCRC	Lake Canal Reservoir Company
NCWCD	Northern Colorado Water Conservancy District
NRCS	Natural Resource Conservation Service
RTU	Remote Terminal Unit
SPDSS	South Platte Decision Support System
StateCU	State Consumptive Use Model
SWSI	Statewide Water Supply Initiative

Section 1

Introduction

The Colorado Water Innovation Cluster (CWIC) is a group of several entities in the Fort Collins area that are interested in exploring innovative and entrepreneurial ways to grow the water resources and technology sector of their local economy. Specifically, the CWIC identifies initiatives that, among other things, involve innovative uses of technologies and contribute to the body of research around water.

In concert with these goals, the CWIC pursued and was awarded an Alternative Agricultural Water Transfer Methods (ATM) grant from the Colorado Water Conservation Board (CWCB) to undertake a demonstration project that will execute a temporary alternative water transfer from shareholders on the Lake Canal. The intent of the project, as described in the ATM grant application (CWIC, 2010) is to demonstrate a number of techniques and technologies which will be useful in addressing the municipal/industrial/environmental water "gap" identified in the previous Statewide Water Supply Initiative (SWSI) studies completed by the CWCB.

The CWIC grant application provides a concise description of the overall project, which is included below:

> Briefly, under the proposed project, willing shareholders under the Lake Canal service area will implement fallowing, deficit irrigation, and/or other alternative agricultural practices to lease the saved portion of their direct flow consumptive use for in-stream flows in the Cache La Poudre River between the Lake Canal diversion and the Greeley No. 3 diversion, west of Greeley. This transfer will be facilitated by an Interruptible Water Supply Agreement (IWSA) between the Lake Canal Company, The Nature Conservancy, and the Fort Collins Natural Areas program. As specified by the IWSA statutory rules, the term of the agreement will be 10 years and the option can be exercised during 3 years of the term. The first option year will be exercised during the 2012 irrigation season, while the second and third years will be at the option of the participants. Lake Canal will accomplish the demonstration using a packaged software/field instrumentation solution, developed by Regenesis Management Group, in concert with research and development agreements with Colorado State University and the U.S. Department of Agriculture.

Since the submittal of the grant application, the project team has expanded the potential scope of the proposed IWSA to include not only the direct flow right associated with the Lake Canal, but also storage water applied to lands within the Lake Canal service area from the Lake Canal Reservoir Company (LCRC) and the Cache La Poudre Reservoir Company (CLPRC). In addition, initially it was anticipated that the term of the IWSA would be ten years, but it has since been reduced to a period of one year with the temporary transfer occurring in 2012.

The State Engineer has developed rules and regulations for the submittal and evaluation of IWSAs. The rules require that applicants submit an Engineering Report that describes the methodology, supporting data, and results of the analysis used to quantify the water right(s) subject to the IWSA. This report provides data and information similar to that which is required by the State Engineer in their rules and regulations pertaining to IWSAs. This project, however, involves practices that were not contemplated in the IWSA regulations. For example, deficit irrigation will be used as a means of reducing consumptive use of water supplies rather than fallowing. Realtime measurement of return flows and transferrable consumptive use will be conducted rather than relying exclusively on the results of a historical use analysis to determine transferrable consumptive use and return flow obligations.

As a result of these variances, this Engineering Report includes a consumptive use analysis based on the crop types that will be deficit irrigated this year rather than a historical use analysis based on historical

cropping patterns. The consumptive use analysis was thought to be more relevant with respect to this IWSA than a historical use analysis because it quantifies consumptive uses based on the specific crops that will be impacted by the IWSA, and it provides a projection of potential transferrable consumptive use that could be derived in the coming irrigation season. A historical use analysis, based on historical cropping patterns that may include a number of different crops, would not provide as meaningful a projection of potential transferrable consumptive use from the IWSA. In addition, the report also includes a section that describes the measurement and monitoring equipment, how this equipment will be deployed, and how it will be used to monitor and measure return flows and transferrable consumptive use.

Section 2

Consumptive Use Analysis

This section of the report describes the engineering analysis performed by Brown and Caldwell to quantify the consumptive use of Lake Canal Company, LCRC, and CLPRC shares relative to the fields and crops that will be impacted by the activities associated with the IWSA.

2.1 Description of Water Rights

The Lake Canal diverts water from the north bank of the Cache La Poudre River in the SE ¼ of the SE ¼ of Section 32, Township 9N, Range 69W. Figure 1 shows the ditch system and the location of the farms participating in the IWSA. The total decreed diversion rate for irrigation for the Lake Canal is 158.35 cubic feet per second (cfs). The Lake Canal water right was decreed in Case No. 0320 and has an appropriation date of November 1, 1872. There are a total of 260 outstanding shares in the Lake Canal Company.

Many farms under the Lake Canal receive storage water from the LCRC. The LCRC owns four reservoirs: North Gray Reservoir, South Gray Reservoir, Gray Reservoir No. 3 and Lake Canal Reservoir No. 1. Water released from North and South Gray Reservoirs and Gray Reservoir No. 3 is diverted into the Lake Canal from Box Elder Creek. Lake Canal Reservoir No. 1 releases are delivered to shareholders via laterals on the Lake Canal. There are 160 outstanding shares in the LCRC.

Table 1 summarizes the water rights associated with the four reservoirs.

Table 1. Description of LCRC water rights

Water Right	Appropriation Date	Source	Case No.	Amount (AF)	Location
North Gray Reservoir	April 1, 1882	Box Elder Creek	CA 1591	135	NE ¼ of the SW ¼ of the NE ¼ of Section 34, Township 8N, Range 68W
North Gray Reservoir, 1st Enl	November 1, 1902	Box Elder Creek	CA 1591	140	
North Gray Reservoir, 2nd Enl	November 15, 1904	Box Elder Creek	CA 2031	57	
South Gray Reservoir	April 1, 1882	Box Elder Creek	CA 1591	275	SW ¼ of the NE ¼ of the SW ¼ of Section 34, Township 8N, Range 68W
South Gray Reservoir, 1st Enl	November 1, 1902	Box Elder Creek	CA 1591	236	
South Gray Reservoir, 2nd Enl	November 16, 1904	Box Elder Creek	CA 2031	222	
Gray Reservoir No. 3	November 14, 1904	Box Elder Creek	CA 2031	111	NE ¼ of the SW ¼ of the SE ¼ of Section 34, Township 8N, Range 68W
Lake Canal Reservoir No. 1	October 15, 1898[1] December 1, 1901[2]	[1]Cache la Poudre River, Ames Slough, and Cooper Slough [2]Box Elder Creek	CA1591	803	SW¼ of the NE¼ of the NE ¼ of Section 7, Township 6N, Range 67W

In addition to Lake Canal Company and LCRC supplies, some farms in the Lake Canal service area receive water from the CLPRC, which stores water in Timnath Reservoir (aka Cache La Poudre Reservoir). Table 2 describes the CLPRC water rights associated with Timnath Reservoir. There are 3,000 outstanding shares in the CLPRC, but only 358.5 shares are applied to lands in the Lake Canal service area.

Table 2. Description of CLPRC Water Rights

Water Right	Appropriation Date	Source	Case No.	Amount (AF)
Timnath Reservoir	March 17, 1892	Cache La Poudre River	CA 1591	8,379
1st Enlargement	December 1, 1902	Cache La Poudre River	CA 2031	1,740
Refill Right	December 31, 1923	Cache La Poudre River	CA 11217	5,948 absolute 4,171 conditional

Other sources of water are available to irrigators in the Lake Canal service area. Most notably, Colorado-Big Thompson (C-BT) water is regularly delivered to farms under the Lake Canal throughout the irrigation season but primarily during July and August.

The lands subject to the IWSA will be on four farms, and each of the farms is supplied by the various sources of irrigation water described above. The water rights subject to the IWSA were historically used for irrigation at these farms. Table 3 lists the farms and the water supplies used for irrigation.

Table 3. Water Supplies for Farms in IWSA

Farm	Irrigation Water Supply to Farm
Buchleiter	3 ¼ shares of Lake Canal Company 9 shares of CLPRC
Hill	12 shares of Lake Canal Company 10 shares of LCRC 40 shares of CLPRC
Sondrup	3 ½ shares of Lake Canal Company 8 shares of CLPRC
Johnson	2 shares of Lake Canal Company 10 shares of LCRC

2.2 Consumptive Use Analysis

To support the requirements of the IWSA application, Brown and Caldwell analyzed the amount of transferrable consumptive use that could be derived from the water rights used to irrigate the subject farms and the amount of return flow obligation that would result from the full use of this water. The analysis incorporated historical diversion records and climatic data to estimate potential consumptive use of irrigation supplies on the anticipated crops to be grown on lands participating in the IWSA. The amount of transferrable consumptive use and return flow obligation that is generated during the execution of the IWSA will be measured and determined in a realtime manner. The goal of the CWIC is to generate 60 AF of transferrable consumptive use.

Brown and Caldwell used the State of Colorado Division of Water Resources' StateCU consumptive use model to perform the analysis. The Modified Blaney-Criddle method, with calibrated crop coefficients, was used to quantify the crop consumptive use. The sections below describe the model input, assumptions and model results.

2.2.1 Study Period

The study period for the consumptive use modeling was selected to represent the longest period of reliable diversion and climate data. For this analysis the study period was from 1975 through 2008. Hydrobase records of releases prior to 1975 from the Gray Reservoirs did not clearly show whether these releases were diverted into the Lake Canal, and therefore onto irrigated lands in the Lake Canal service area. The study period chosen for this analysis represents a wide range of hydrologic conditions and includes wet, dry, and normal years.

2.2.2 Diversion Records

Diversion data and reservoir release data for water rights associated with the Lake Canal Company, LCRC, and CLPRC were obtained from HydroBase (a component of the Colorado Decision Support System [CDSS]), and are shown in Appendix A Tables A-1 through A-3. The diversion data compiled for this analysis were representative of irrigation deliveries from natural flow and storage sources. Diversions made for other uses were not incorporated into the consumptive use analysis. In some cases, diversion records were unclear as to their end use. For example, for many years after 1985, releases records from the Gray Reservoirs were not specific as to whether the releases where diverted into the Lake Canal and delivered to lands in the Lake Canal service area. It is very likely that some or all of those releases were diverted into the Lake Canal, but Brown and Caldwell conservatively did not include those records in the consumptive use analysis. As a result, it is possible that the consumptive use associated with LCRC supplies is understated. Brown and Caldwell consulted with Mr. George Varra, District 3 Water Commissioner, to verify the diversion records and to interpret the diversion codings in Hydrobase.

The river headgate diversions and reservoir releases were prorated based on the ratio of total shares associated with the farms and the outstanding shares in the various ditch and reservoir companies.

Ditch conveyance losses for the water delivered to the subject farms vary based on the location from where water is diverted. Lake Canal staff estimated that ditch losses are 15% for diversions at the headgate from the Cache La Poudre River, 11% for diversions into the Lake Canal from Box Elder Creek (LCRC supplies can be delivered via Box Elder Creek), and 4% for water delivered from Timnath Reservoir. The annual pro-rated farm headgate deliveries, which account for both the water rights delivered to the farms and the appropriate ditch losses are presented in Tables A-4a through A-6c. It is possible that the farm headgate deliveries of Lake Canal Company shares is somewhat overstated, because the Lake Canal diverts water that is used for operational and maintenance purposes as well as for irrigation needs. Waters that are diverted for operational and maintenance purposes are not delivered to farms and are not measured, but are either lost to seepage (and eventually return to the river) or are run out the end of the ditch system.

2.2.3 Irrigated Parcels

2.2.3.1 Buchleiter Farm

The irrigated area and cropping patterns for the Buchleiter Farm were derived from information obtained from Mr. Gerald Buchleiter. Mr. Buchleiter's farm is 45 acres, and 22 acres of the farm have been irrigated with Lake Canal Company and CLPRC shares. During the upcoming irrigation season, Mr. Buchleiter intends to irrigate 22 acres of corn on his farm. This information was input into the StateCU model. The location of the Buchleiter Farm is shown in Figure 2.

2.2.3.2 Hill Farm

The irrigated area and cropping pattern for the Hill Farm was derived from information obtained from Mr. Ken Kinevel. Mr. Kinevel reported that 300 acres were historically irrigated with Lake Canal Company and LCRC shares. Mr. Kinevel intends to include 2 fields on this farm in the IWSA. The fields are 12 acres and 26 acres, respectively for a total of 38 acres. Historically, irrigation water was distributed to these two fields in a joint manner as if they were one field. Mr. Kinevel has already planted winter wheat on both of these fields. The Hill Farm was represented in the StateCU model as one 38-acre field planted to irrigated winter wheat. The location of the Hill Farm is shown in Figure 3.

2.2.3.3 Sondrup Farm

The irrigated area and cropping pattern for the Sondrup Farm was derived from information obtained from Mr. Brad Moose. The Sondrup farm is 67 acres and has historically been irrigated with Lake Canal Company and CLPRC shares. Mr. Moose intends to irrigate grass hay on this field during the upcoming irrigation season. The Sondrup Farm was modeled in StateCU as a 67-acre field planted to irrigated grass. The location of the Sondrup Farm is shown in Figure 4.

2.2.3.4 Johnson Farm

The irrigated area and cropping pattern for the Johnson Farm was derived from information obtained from Mr. Brad Moose. The Johnson farm is 35 acres and has historically been irrigated with Lake Canal Company and LCRC shares. Mr. Moose intends to irrigate corn on this field during the upcoming irrigation season. The Johnson Farm was modeled in StateCU as a 35-acre field planted to irrigated corn. The location of the Johnson Farm is shown in Figure 4.

2.2.4 Irrigation Efficiencies

All fields involved in this analysis utilize flood and furrow irrigation practices. The farms included in this analysis were assumed to have a maximum irrigation efficiency of 60 percent for gravity flood irrigation. This maximum efficiency is within the range of achievable irrigation efficiencies cited in several engineering references for flood and furrow irrigation (CWRRI, 2004; Klamm and Brenner, 1995; NRCS, 2006; USDA-SCS, 1991; Leonard Rice, 2006).

2.2.5 Soils Data

Soils data were available from the Natural Resources Conservation Service (NRCS) Web Soil Survey, and include information regarding the available water holding capacity (AWC) of each soil type. The predominant soil types are sandy loams with some clay loam and loam for the irrigated parcels participating in the IWSA. The average AWC for the Buchleiter and Johnson Farms is 0.14 in/in, and the average AWC for the Hill and Sondrup Farms is 0.13 in/in.

2.2.6 Climate Data

The climate data required for a Blaney-Criddle analysis include mean monthly temperature, monthly precipitation, and fall and spring frost dates. These data are available from HydroBase, but many climate stations have gaps present in their data. The South Platte Decision Support System (SPDSS) includes weather data sets in which missing data has been synthesized. For this analysis, Brown and Caldwell utilized pre-synthesized data from the SPDSS for the Fort Collins weather station from 1975 through 2006. Data from the Fort Collins weather station for 2007 and 2008 were downloaded from Hydrobase. Only one gap in the 2007 – 2008 data was found (May of 2008), and the data gap was filled using long term average temperature, precipitation and frost date data.

2.2.7 Calibrated Crop Coefficients

In a historical consumptive use analysis, evapotranspiration (ET) refers to the combination of evaporation of water from soil and transpiration of water from vegetation. Using specialized equipment, ET can be measured directly by quantifying various physical parameters and soil water balance at the desired location during a specific time period. Typically, however, such measurements are not available on working farms, and empirical equations that use meteorological data as input are commonly used to calculate potential ET. This value is then compared with the historical water supply, consisting of precipitation and irrigation water, to determine consumptive use of the irrigation supply. While there are many empirical methods for calculating potential ET, the two most widely accepted methods are the American Society of Civil Engineer's Standardized Penman-Monteith (ASCE-PM) and the Modified Blaney-Criddle.

The ASCE-PM method is a two part process. First the potential ET for a reference crop, alfalfa or grass, is calculated on a daily basis. Then the reference crop ET is related to another crop through the use of crop coefficients. Research has shown that for most conditions the ASCE-PM method currently provides the best estimate of potential ET and is considered by many federal and international organizations to be the standard method for defining and computing ET. This method's accuracy is mainly due to the large number of daily meteorological parameters that are used as input. These parameters include maximum and minimum air temperature, maximum and minimum relative humidity, solar radiation, wind speed and latitude. Because most weather stations were not equipped to record all of the needed input parameters prior to the early 1990s, the ASCE-PM method's ability to calculate historical consumptive use is limited.

In contrast to the ASCE-PM method, the Modified Blaney-Criddle method is simpler and calculates potential ET on a monthly time scale. The Blaney-Criddle method only requires monthly mean temperature, frost dates, and latitude along with a set of crop coefficients for each crop. Because of the wide availability of this data for long study periods going back to 1950, the Blaney-Criddle method is very well suited for historical consumptive use analyses. With fewer meteorological inputs, the crop coefficients have a much more significant impact in this method and are responsible for implicitly incorporating the average effects of meteorological parameters which are not included in the input. As a result, Blaney-Criddle coefficients tend to perform best in the area where they were developed, producing less accurate results when transferred to other locations.

To address the lack of long term daily data needed for the ASCE-PM method and the limitations of Blaney-Criddle crop coefficients developed at a different location, Blaney-Criddle crop coefficients were calibrated to the ASCE-PM method. Calibration is accomplished by using the ASCE-PM method to calculate potential ET for years when the data are available, then adjusting the Blaney-Criddle crop coefficients for the same location until the Blaney-Criddle method produces similar ET results. The

average potential ET values for the two methods are compared on a monthly basis to ensure that ET remains representative throughout the entire growing season rather than just annually.

For the historical consumptive use analysis discussed in this report, Integrated Decision Support Consumptive Use model (IDSCU) was used to calculate the ASCE-PM method ET values. Brown and Caldwell developed an Excel spreadsheet to compute potential ET via the Blaney-Criddle method and to perform a constrained optimization, which yields a smooth curve throughout the growing season. Local calibration was done using meteorological data from Fort Collins East weather station for both the ASCE-PM and Blaney-Criddle methods. This station is operated and maintained by the Northern Colorado Water Conservancy District (NCWCD). The Fort Collins East station was chosen due to its close proximity to the study areas as well as the quality of the data from this station, which is maintained in accordance with the policies set forth by NCWCD (http://www.northernwater.org/DataPolicy.aspx). The study period used for calibration was from 1995 to 2008 and represents the bounds of available meteorological data needed for the ASCE-PM method. The study area used for calibration was assumed to be at latitude 40.62°N and at an elevation of 5,156 ft.

The default crop coefficients used in IDSCU which are based on the ASCE Manual of Practice No. 70 (1990) were not used to calculate the ASCE-PM potential ET. Rather, a more refined set of crop coefficients were used which were developed by one of Manual 70's contributing authors, Richard Allen, and published by the American Society of Agricultural and Biological Engineers in their book "Design and Operation of Farm and Irrigation Systems, 2nd Edition" (2007). Crop characteristics used by both methods to determine the start and length of the growing season reflect information published in ASCE Manual 70 as well as Soil Conservation Service Technical Report No. 21. For crops using monthly mean temperature to trigger planting date, it was assumed that frost after the planting date had no impact on the crop within the model.

2.2.8 Calculation of Potential Consumptive Use

The crop irrigation water requirements for the irrigated fields participating in the IWSA were calculated using the StateCU model developed by the State of Colorado. This application of the model uses the Modified Blaney-Criddle method, climate data from the Fort Collins weather station and includes a soil moisture budget. Calibrated crop coefficients for irrigated corn, grass hay, and winter wheat were derived as described above, and were used for the consumptive use analysis.

The crop irrigation requirement is the amount of irrigation water needed to meet 100% of the consumptive use of the crop, and does not include crop water needs met by effective precipitation. Tables A-7 through A-10 show the calculated crop irrigation water requirements after subtracting effective precipitation.

The consumptive use of surface water supply is based on a monthly water balance and is calculated based on the surface irrigation water supply available to meet the crop irrigation water requirement. The consumptive use analysis was conducted on both the total water supply available to each farm based on their holdings of shares in the Lake Canal Company and reservoir companies and based on their holdings of shares in the Lake Canal Company alone. The analysis was conducted in this way so that the amount of consumptive use associated with both direct flow and storage rights could be quantified. The consumptive use associated with storage rights was considered to be the consumptive use associated with all of the water rights available to the farm minus the consumptive use associated with the direct flow rights.

Tables A-11 through A-14 present the consumptive use of all the irrigation water supplies (based on the holdings of shares shown in Table 3) available to each farm participating in the IWSA. Tables A-15

through A-18 show the results of the consumptive use analysis for Lake Canal Company shares on each farm.

The total average annual amount of transferrable consumptive use associated with all of the supplies available to each farm is 162.1 acre-feet per year. Table 4 summarizes the results of the consumptive use analysis on a farm-by-farm basis.

Table 4. Summary of Consumptive Use Analysis Results by Farm

Farm	Acreage	Crop	Avg Consumptive Use of all Surface Water Supplies		Avg Consumptive Use of Lake Canal Shares		Avg Consumptive Use of Storage Supplies	
			AF	Inches	AF	Inches	AF	Inches
Buchleiter	22	Corn	36.3	19.8	23.7	12.9	12.6	6.9
Hill	38	Winter Wheat	14.7	4.6	14.2	4.5	0.5	0.2
Sondrup	67	Grass	73.1	13.1	54.5	9.8	18.6	3.3
Johnson	35	Corn	38.0	13.0	27.6	9.5	10.4	3.6
		Total:	162.1		120.0		42.1	

It is anticipated that deficit irrigation will be used to lessen the consumption of irrigation supplies and to generate transferrable consumptive use on all but the Hill Farm. On the Hill Farm, winter wheat has already been planted, and it is anticipated that the wheat will not be irrigated this year (with the exception of a portion of the field that may be irrigated to establish baseline consumptive use and return flow amounts). As a result, the potential average amount of transferrable consumptive use would be commensurate with the data in Table 4. On the Buchleiter, Sondrup and Johnson farms, deficit irrigation will be used to lessen the consumptive use of surface water supplies and to generate transferrable consumptive use. The amount of transferrable consumptive use generated from deficit irrigation activities will be dependent on effective rainfall amounts, timing of irrigation applications, etc.

As stated previously, the goal of the CWIC is to generate 60 acre-feet of transferrable consumptive use from the overall project. The consumptive use amounts show in Table 4 represent the total amount of consumptive use that the various sources of water could potentially yield in an average year, and deficit irrigation activities will conserve and make available for transfer only a portion of the amounts shown in Table 4.

2.2.9 Calculation of Return Flows

Irrigation with the water rights associated with these farms generated both surface and subsurface returns to the Cache La Poudre River. Return flows from the participating farms accrue to the river in the approximate locations shown in Table 5 below:

Table 5. Locations Where Subsurface Return Flows have Historically Accrued

Farm	Legal Location
Buchleiter	Section 11, Township 6N, Range 68W
Hill	Section 11, Township 6N, Range 68W
Sondrup	Section 11, Township 6N, Range 68W
Johnson	Section 13, Township 6N, Range 68W

For the purposes of this engineering report and to develop a general understanding of return flows associated with the use of surface water irrigation supplies at these farms, the total amount of potential return flow was estimated (see Table 6). On each of these farms, a portion of return flows will occur as surface returns and a portion will occur as subsurface returns. During the execution of this water transfer, actual surface and subsurface return flows will be measured and return flow obligations will be determined on a realtime basis.

Table 6. Average Annual Surface and Subsurface Return Flows from Participant Farms

Farm	Total of Surface and Subsurface Return Flows (AF)
Buchleiter	24.2
Hill	9.8
Sondrup	48.7
Johnson	25.3

Return flows calculated in Table 6 were estimated based on the assumed irrigation efficiency of 60 percent. Review of prorata farm headgate deliveries of Lake Canal Company shares would suggest that more water is delivered to the farms than is needed for gross irrigation requirements and that the actual irrigation efficiency is rather low. However, the Lake Canal diverts water for operational and maintenance purposes early in the irrigation season (in addition to irrigation purposes) and does not deliver this water to the farms. It was assumed for this report that the participant irrigators would take delivery of Lake Canal Company shares based on consumptive use needs as they occur and that the resulting return flows would correspond to a 60 percent irrigation efficiency.

Again, this information was developed and is presented as an estimate of potential return flow obligations. Actual return flow obligations will be determined and provided on a realtime basis during the execution of the IWSA.

Surface return flows will be provided as obligations are measured and determined during the course of the temporary transfer. Groundwater return flows, however, will need to be provided in a manner that reflects historical timing, location, and amount. The Alluvial Water Accounting System (AWAS) model was used to assess the timing of groundwater return flows.

The AWAS model was developed by the Integrated Decision Support Group (IDS) and utilizes the Glover Method to lag groundwater returns to river under an alluvial aquifer condition. The model uses input data that include harmonic average transmissivity, specific yield, distance from the parcel to the river, and distance from the river to the alluvium boundary. Brown and Caldwell used GIS coverages of South Platte alluvial aquifer data acquired from the Colorado Decision Support System website (http://cdss.state.co.us/GIS/Pages/Division1SouthPlatte.aspx) to determine the appropriate Glover parameters for each farm (see Table 7).

Table 7. Glover Parameters for Each Farm

Farm	Distance from River to Alluvial Boundary (feet)	Transmissivity (gpd/ft)	Specific Yield	Distance from River to Farm (feet)
Buchleiter	9,950	50,000	0.2	2,100
Hill	12,500	50,000	0.2	9,350
Sondrup	13,800	50,000	0.2	7,200
Johnson	12,600	50,000	0.2	5,900

The timing of groundwater return flows were assessed on a unit basis. Table 8 shows the results of the lagging analysis.

Table 8. Results of Lagging Analysis for Each Farm

Farm	Time Required for Various Percent of Subsurface Return Flow to Accrue to River (years)		
	50%	90%	100%
Buchleiter	0.5	5	18
Hill	5	13	31
Sondrup	4	15	35
Johnson	3	12	30

The participants in the IWSA will excavate temporary recharge pits on their farms. Groundwater return flow obligations that are determined on a realtime basis will be delivered to the pits. Because the pits will be excavated on the participating farms, the timing of return flows recharged at the pits will be essentially the same as historical timing. It is not anticipated that accounting for subsurface return flows will need to be conducted in years after 2012, because return flow obligations will be delivered to recharge pits located on the farms involved in the IWSA, and lagging of the subsurface return flows will be essentially the same as it was historically.

Section 3
Proposed Operations

3.1 Introductory Comments

This section of the Engineering Report presents proposed operations for the IWSA. As of the date of this report, farm-specific monitoring plans have not been developed with participating irrigators. The CWIC understands that the State Engineer may not grant approval of the IWSA until these plans are finalized for each participant. The CWIC is working diligently to complete these plans as soon as possible and will submit them to the State Engineer upon completion.

3.2 Monitoring and Instrumentation

Instrumentation of participating farms will be implemented to include measurement of headgate deliveries, measurement of surface return flows, estimation of subsurface return flows, soil moisture measurement (for farm water management and irrigation scheduling as well as monitoring and estimation of subsurface return flows). In addition, instrumentation will be deployed to measure deliveries to temporary on-farm recharge pits, and staff gages will be used to measure the depth of water in recharge pits.

Remote terminal units (RTUs) will be installed and programmed to continuously record data for the instrumentation that is affixed to the RTU. Cellular modem communications will be utilized as cellular service is fully available and of suitable signal quality under the Lake Canal system. All RTUs and instrumentation will be solar powered. Data will be collected continuously and downloaded to a server database on a 24-hour, ended-at-midnight basis.

The specific equipment to be used for monitoring and the general location where the equipment will be deployed is described below:

- Headgate deliveries: Farm headgates on the Lake Canal system have Parshall flumes downstream of the headgate but these flumes do not have wet wells. For the project, wet wells will be retrofitted to the existing Parshall flumes such that RTUs and pressure transducers can be installed prior to commencing operations.
- Surface return flows: New flume installations with electronics for data collection and transmission will be used to measure and record surface return flows that exit each field. The topography of each field will determine the locations where the flumes are deployed. The number of flumes deployed at each field will be commensurate with the number of surface runoff outfalls from each field.
- Soil moisture: Soil moisture measurements will be used for on-farm water management and irrigation scheduling as well as monitoring and estimation of sub-surface return flows. The soil moisture instrumentation is anticipated to be Sentek soil moisture sensors which are a vertical array of seven capacitance soil moisture sensors spaced so as to capture the rootzone soil moisture as well as subsurface soil moisture below the rootzone. Sensors below the rootzone will be used to estimate subsurface return flows.
- Inflows to recharge pits: A long throated portable flume will be installed at the inlet of the recharge pit to be constructed on each farm.

Specific monitoring plans will be developed for each farm. The plans will include maps showing the specific locations where surface water return flows, soil moisture, and headgate deliveries will be measured. The amount of instrumentation deployed at each farm will be to the satisfaction of the State Engineer. As described previously, the CWIC will be developing farm-specific monitoring plans for participating farms as soon as possible.

In addition to surface level measurements, satellite imagery and low-elevation aerial imagery will be obtained and reported. Satellite imagery will be downloaded whenever quality imagery is available. Cloud cover and satellite operations may, however, affect the suitability of satellite imagery. Low-elevation aerial imagery will be flown frequently (weekly) from Fort Collins – Loveland Airpark to include multispectral imagery from RGB, IR, and heat signature sensors.

3.3 Determination of Transferrable Consumptive Use and Return Flow Obligations

Realtime monitoring and measurement of consumptive use and return flows will occur at the participating farms, but this information does not indicate how much consumptive use or return flow would have occurred if the farm had been irrigated under historical practices. The amount of consumptive use and return flows that would have occurred under historical irrigation practices are hereinafter referred to as baseline consumptive use and baseline return flows. In a deficit irrigation scenario, the amount of transferrable consumptive use is the difference between baseline consumptive use and the amount of consumptive use that actually occurs. The same is true for return flows.

There are several potential ways to establish baseline amounts of consumptive use and return flows. Examples are described below:

- Simulation Modeling and Monitoring: A simulation model could be applied to the participating field to estimate the amount of daily consumptive use that would have occurred under normal irrigation. Climatic data from a nearby weather station would be input into the model. Conceptually, Lake Canal staff and participating irrigators would need to be consulted to determine when various irrigation supplies would normally be used. The simulation model should use the ASCE-PM or similar method to estimate daily, baseline consumptive use amounts and return flow obligations. Actual consumptive use and return flow amounts derived from monitoring data would be subtracted from simulated baseline amounts to determine transferrable consumptive use and return flow obligations.
- Monitoring Participant Fields: A portion of the participating field would be irrigated using normal practices while the remaining portion of the field would be irrigated in a deficit situation. The difference in consumptive use and return flows from the different portions of the field would determine the amount of transferrable consumptive use available and the return flow obligation.
- Monitoring Neighboring Fields: Baseline amounts of consumptive use and return flow could be determined by monitoring neighboring, normally-irrigated fields planted to the same crop as the participant fields. The neighboring fields would need to have a similar water supply, soils, topography, etc. as the participant field. The amount of transferrable consumptive use and return flow obligation accruing on the participating farm would be estimated by comparing baseline levels of consumptive use and return flows on neighboring farms with measured amounts on the participating farm.

For the purposes of this project, the amount of transferrable consumptive use and return flow obligation accruing at each farm will be determined by the second method listed above. At each participating farm,

a portion of the farm will be irrigated normally, and baseline amounts of consumptive use and return flow (both surface and subsurface) will be measured. A portion of each farm will also be deficit irrigated or simply dryland farmed (in the case of the Hill Farm), and actual amounts of consumptive use and return flows will be measured on these portions of the farms. The baseline and actual amounts of consumptive use and return flows will be compared, and transferrable consumptive use and return flow obligations will be the difference between baseline and actual conditions at each farm.

As a part of the overall project, other means of determining baseline consumptive use and return flows may also be explored concurrently with the method described above.

3.4 Delivery of Transferrable Consumptive Use and Return Flow Obligations

When water is being diverted from the Cache La Poudre River for delivery to Lake Canal Company shareholders, and deficit irrigation is being is being conducted on participating farms as a means to generate transferrable consumptive use, the Lake Canal diversions at the Lake Canal river headgate will be reduced by an amount that equals the daily amount of consumptive use reduction and surface return flow obligations from the participating farms. The transferred consumptive use and return flow obligation will thereby be left in the Cache La Poudre River. Subsurface return flow obligations will be delivered to the temporary recharge pits that will be excavated on each farm.

When deliveries of storage water from LCRC and the CLPRC are being taken by shareholders and would otherwise be taken by farms participating in the IWSA, a different method for delivering transferrable consumptive use will be used. Saved consumptive use from the reduced delivery of storage supplies will remain in storage in either the Gray Reservoirs or Timnath Reservoir (depending on whether LCRC or CLPRC shares are being transferred). The amount that remains in storage will correspond to the amount of transferrable consumptive use that is derived on a daily basis. Release rates of storage supplies will be reduced appropriately to keep the transferrable consumptive use in storage. However, surface return flow obligations will be released from storage and will be conveyed to the Cache La Poudre River. Subsurface return flow requirements will also be released and will be delivered to the temporary recharge pits located on each farm.

The Water Borrowers involved in the IWSA would like the transferrable consumptive use to pass through downtown Fort Collins. When the direct flow right is in priority, this goal will occur naturally as described in the first paragraph of this section. When transferrable consumptive use is derived from reduced use of storage water, this goal will be difficult to achieve because the reservoirs can only release water downstream of Fort Collins. To accomplish this goal, the CWIC intends to have an exchange agreement with a C-BT water holder such that water remaining in storage from reduced consumptive use will be released to satisfy a request for C-BT and the actual C-BT water will be left in the river (by reducing headgate diversions) so as to pass through downtown Fort Collins at a suitable rate and time period. The Lake Canal superintendent and the Water Commissioner will coordinate to accomplish this exchange of supplies.

During the negotiations between the Water Borrowers and the Water Lender, several elements of the discussion were identified as “aspiration elements” of the water transfer. These elements are operational goals that will be pursued to the maximum extent practicable during the execution of the IWSA.

1) An intent of this project is to enhance flows in the Cache La Poudre River in and just downstream of Fort Collins to at least the Greeley #3 river diversion. The enhanced streamflow will be available to downstream water users, which will minimize the potential for injury to other water

rights resulting from the IWSA and will enhance overall water supplies. For example, the City of Greeley is interested in taking delivery of the storage right portion of the consumptive use water to be subsequently stored in one of their to-be-designated storage facilities.

2) The flow rate that might be suitable for a release from storage was discussed between Water Borrowers and the Water Loaner. A desirable flow rate may be influenced by the hydrologic period of the river, base flow rate in the river, and other subjective factors that may exist at the time the release is initiated. With all this in mind, it is desirable for a mutually agreed upon flow rate to be determined at the time of the release. This mutually advantageous flow rate is thought to range from 2 cfs to 10 cfs.
3) Within the farms and fields that have been investigated to date, calculations show the breakout between river decreed water and storage decreed water and the relative consumptive use quantities projected for each. As the irrigation practices are finalized, it will be desirable for as much of the consumptive use water to come from storage as possible. This will allow for a storage release to be made at a time of year and at a rate which will bring about the greatest impact to the base flow in the river at the time of the release.

3.5 Evaporative Losses

When transferrable consumptive use is stored in reservoirs and when subsurface return flow obligations are delivered to temporary recharge pits, some amount of evaporative loss will occur. Evaporative losses will be subtracted from transferrable consumptive use stored in reservoirs and from the amount of water provided to meet subsurface return flow obligations. Evaporative losses will be calculated using the following procedure:

1. Gross pan evaporation will be calculated using information from the nearest weather station by multiplying the standard alfalfa reference crop evapotranspiration by 1.2. Data from the Northern Colorado Water Conservancy District's (NCWCD) Windsor weather station will be used for this calculation. If information is not available from the Windsor station, the NCWCD's Fort Collins East station will be used.
2. The gross pan evaporation will be multiplied by a pan coefficient of 0.7 to calculate pond or reservoir evaporation.
3. The open water surface for temporary recharge pits will be calculated using stage-area-capacity relationships that will be developed for each pit and the daily observed water level in each pit. The open water surface area will be multiplied by the calculated evaporative loss to determine the volume of evaporative loss each day.
4. The open water surface for reservoirs in which transferrable consumptive use is stored will be obtained from existing stage-area-capacity relationships. Open water surface area will be determined based on daily observations of water levels in reservoirs and the stage-area-capacity relationship. The total amount of evaporative loss for the reservoir will be calculated by multiplying the evaporative loss resulting from Step 2 times the open water surface area. The amount of evaporative loss for transferrable consumptive use will be calculated by multiplying the total reservoir evaporative loss by the ratio of stored transferrable consumptive use to total storage in the reservoir.

3.6 Accounting

As described previously, it is intended that all measurements will be collected continuously and downloaded daily for each 24-hour period, ended at midnight. Data will be aggregated on an internet-

accessed server and reports will be generated at suitable reporting intervals (daily or more likely weekly). Prior to beginning operations, reports will be vetted with the State Engineer and the Cache La Poudre River Water Commissioner in consideration of key information needs. Farmers will also receive reports suitable to their identified farming and irrigation scheduling needs.

The accounting form included in the IWSA application provides an example of the type of form that will be used to document saved and transferred consumptive use, delivery of return flow obligations, and other measurements associated with the IWSA.

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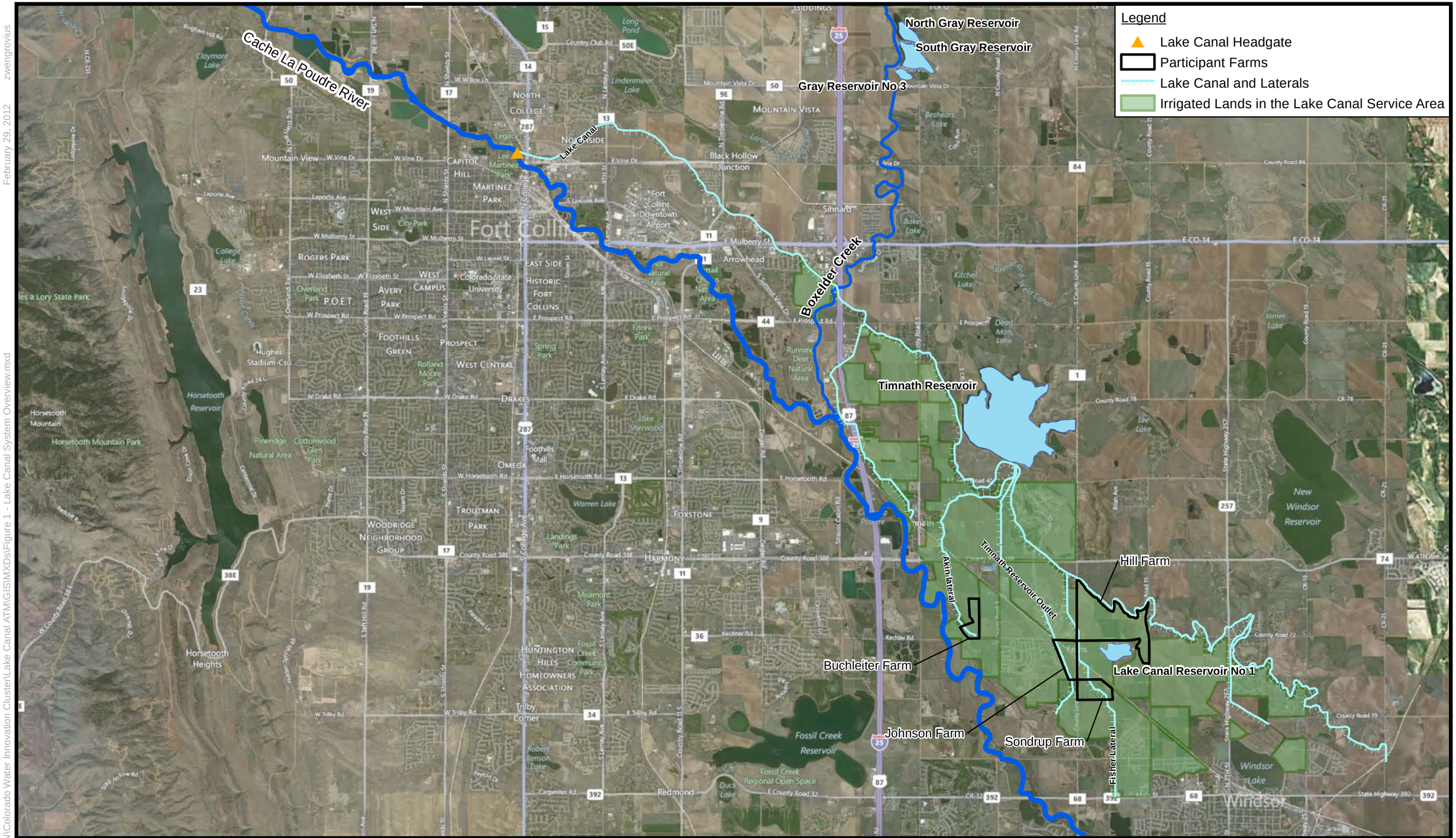
NRCS County Soils mapping for Weld County, Colorado



Brown AND Caldwell	Date: February 2012 Colorado Water Innovation Cluster Project: 142154	0 6,000 12,000 Feet	Notes Projection: Universal Transverse Mercator, Zone 13 North, 1983 North American Datum (meters). Aerial imagery taken from April 2011 through November 2011.

Figure 1

Lake Canal System Overview

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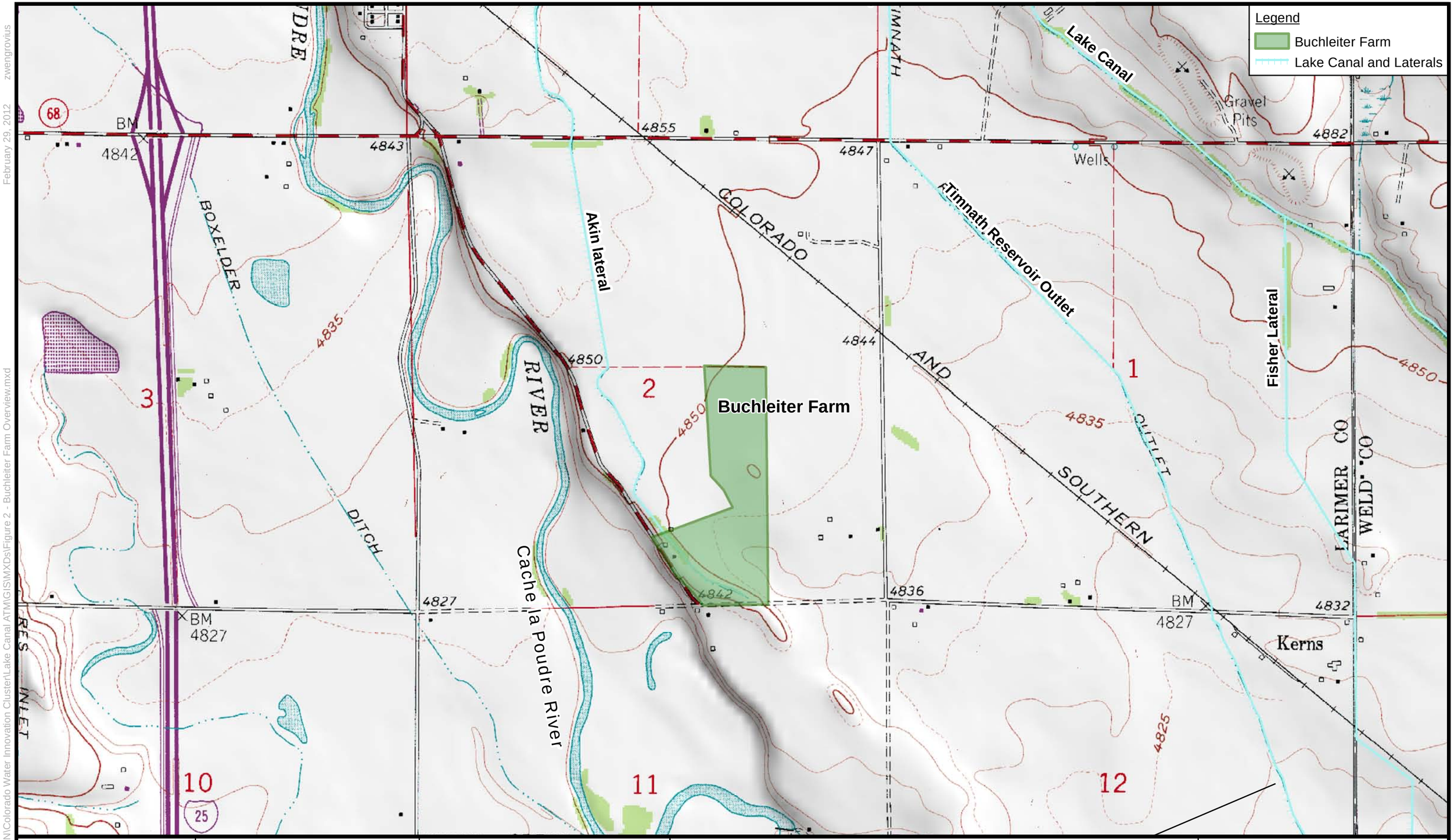

Brown AND Caldwell	Date: February 2012	Figure 2
	Colorado Water Innovation Cluster	Buchleiter Farm Overview
	Project: 142154	

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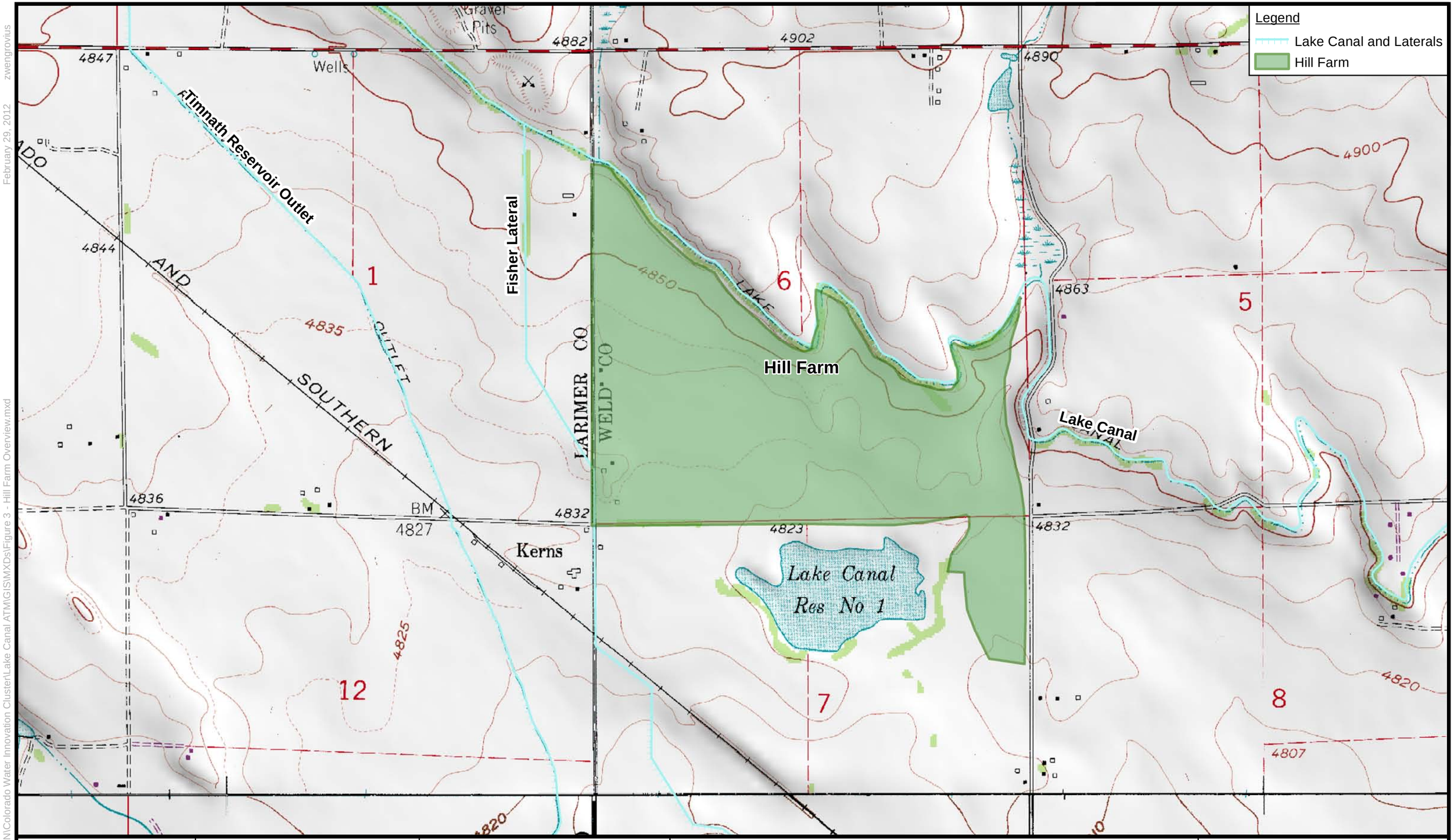
Notes

Projection: Universal Transverse Mercator, Zone 13 North, 1983 North American Datum (meters).



Brown AND Caldwell

Date: February 2012

Colorado Water Innovation Cluster

Project: 142154

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Projection: Universal Transverse Mercator, Zone 13 North, 1983 North American Datum (meters).

Figure 3

Hill Farm Overview

February 29, 2012 zwengrovius

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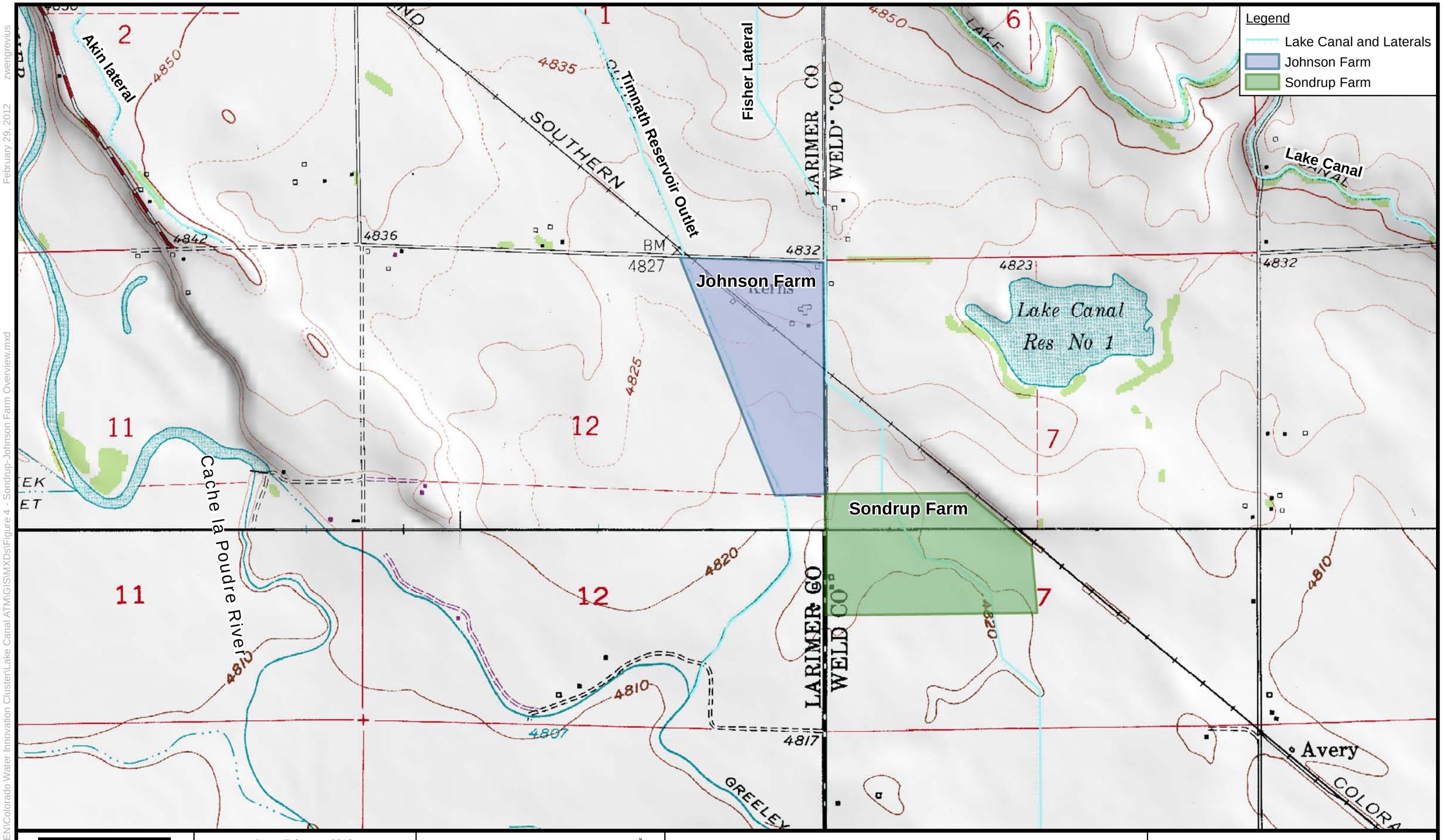

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Date: February 2012

Colorado Water Innovation Cluster

Project: 142154

0 1,000 2,000 Feet

Notes

Projection: Universal Transverse Mercator, Zone 13 North, 1983 North American Datum (meters).

Figure 4

Sondrup and Johnson Farm Overview

Appendix A – Additional Data Tables

Appendix A - Table Index

Table A-1. Lake Canal Company Diversions
(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0	0	0	0	2,138	3,203	5,980	22	0	0	0	0	11,344
1976	0	0	0	0	2,051	5,492	230	518	34	0	0	0	8,325
1977	0	0	0	0	809	3,229	0	0	0	0	0	0	4,038
1978	0	0	0	0	1,247	5,494	4,171	0	13	0	0	0	10,925
1979	0	0	0	0	319	2,895	5,049	457	286	0	0	0	9,005
1980	0	0	0	0	0	5,209	3,631	13	215	0	0	0	9,069
1981	0	0	0	0	2,057	2,327	344	129	169	0	0	0	5,025
1982	0	0	0	0	857	2,993	3,759	0	0	0	0	0	7,608
1983	0	0	0	0	0	1,033	6,077	2,076	477	0	0	0	9,663
1984	0	0	0	0	1,402	3,697	291	171	13	0	0	0	5,574
1985	0	0	0	0	2,918	4,951	293	0	0	0	0	0	8,161
1986	0	0	0	0	3,077	5,373	2,824	0	0	0	0	0	11,274
1987	0	0	0	0	1,237	2,491	0	0	0	0	0	0	3,728
1988	0	0	0	0	2,167	6,720	843	0	0	0	0	0	9,730
1989	0	0	0	0	3,327	3,093	0	33	7	0	0	0	6,459
1990	0	0	0	0	2,629	4,580	2,591	21	3	0	0	0	9,823
1991	0	0	0	0	2,168	4,808	683	24	0	0	0	0	7,682
1992	0	0	0	0	3,518	3,425	141	0	0	0	0	0	7,084
1993	0	0	0	0	1,787	3,820	4,897	0	0	0	0	0	10,504
1994	0	0	0	0	3,267	3,084	24	89	0	0	0	0	6,464
1995	0	0	0	0	0	961	5,684	0	6	0	0	0	6,651
1996	0	0	0	0	4,672	5,280	3,727	70	127	0	0	0	13,875
1997	0	0	0	0	2,920	2,963	1,845	923	365	0	0	0	9,017
1998	0	0	0	0	4,183	4,514	3,943	0	96	0	0	0	12,737
1999	0	0	0	0	174	3,490	3,706	0	0	0	0	0	7,370
2000	0	0	0	0	2,714	3,359	0	0	0	0	0	0	6,073
2001	0	0	0	0	1,871	3,108	116	0	0	0	0	0	5,095
2002	0	0	0	0	0	2,161	44	0	0	0	0	0	2,204
2003	0	0	0	0	928	4,800	1,556	0	0	0	0	0	7,285
2004	0	0	143	0	819	4,235	710	0	0	0	0	0	5,908
2005	0	0	0	0	3,065	4,609	1,059	0	0	91	0	0	8,823
2006	0	0	0	0	3,584	3,908	0	0	0	0	0	0	7,492
2007	0	0	0	0	2,539	4,804	0	0	0	164	0	0	7,507
2008	0	0	0	0	1,075	4,653	2,417	96	216	0	0	0	8,457
Average	**0**	**0**	**4**	**0**	**1,927**	**3,846**	**1,960**	**136**	**60**	**8**	**0**	**0**	**7,940**
Min	**0**	**0**	**0**	**0**	**0**	**961**	**0**	**0**	**0**	**0**	**0**	**0**	**2,204**
Max	**0**	**0**	**143**	**0**	**4,672**	**6,720**	**6,077**	**2,076**	**477**	**164**	**0**	**0**	**13,875**

Table A-2. Lake Canal Reservoir Company Diversions
(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0	0	0	0	0	56	0	778	226	0	0	0	1,059
1976	0	0	0	0	0	0	381	0	0	0	0	0	381
1977	0	0	0	0	0	643	714	684	167	0	0	0	2,208
1978	0	0	0	0	0	0	434	998	274	0	0	0	1,705
1979	0	0	0	0	0	0	69	357	154	0	0	0	580
1980	0	0	0	0	0	0	241	153	0	0	0	0	393
1981	0	0	0	0	0	319	577	325	198	0	0	0	1,419
1982	0	0	0	0	0	0	403	736	35	0	0	0	1,173
1983	0	0	0	0	0	0	0	494	338	0	0	0	832
1984	0	0	0	0	0	0	353	477	408	0	0	0	1,238
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	876	107	0	0	0	0	983
2003	0	0	0	0	0	0	183	388	52	0	0	0	623
2004	0	0	0	0	0	110	58	0	0	0	0	0	168
2005	0	0	0	0	0	0	0	41	6	0	0	0	47
2006	0	0	0	0	0	136	0	0	0	0	0	0	136
2007	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	0
Average	**0**	**0**	**0**	**0**	**0**	**37**	**126**	**163**	**55**	**0**	**0**	**0**	**381**
Min	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Max	**0**	**0**	**0**	**0**	**0**	**643**	**876**	**998**	**408**	**0**	**0**	**0**	**2,208**

Table A-3. Cache la Poudre Reservoir Company (aka Timnath Reservoir) Diversions
(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	101	402	0	0	0	0	503
1980	0	0	0	0	0	0	385	575	148	0	0	0	1,108
1981	0	0	0	0	0	49	255	205	278	12	0	0	798
1982	0	0	0	0	0	0	206	347	181	0	0	0	734
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	152	376	88	0	0	0	616
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	255	375	90	0	0	0	720
1987	0	0	0	0	0	184	313	640	71	0	0	0	1,208
1988	0	0	0	0	0	0	322	726	97	0	0	0	1,146
1989	0	0	0	0	0	175	507	579	235	0	0	0	1,496
1990	0	0	0	0	0	0	104	917	231	0	0	0	1,252
1991	0	0	0	0	0	0	796	685	175	0	0	0	1,655
1992	0	0	0	0	0	0	544	513	132	0	0	0	1,189
1993	0	0	0	0	15	0	369	1,436	189	0	0	0	2,009
1994	0	0	0	0	0	0	1,294	187	153	0	0	0	1,634
1995	0	0	0	0	0	0	12	1,297	417	0	0	0	1,727
1996	0	0	0	0	0	0	287	1,383	100	0	0	0	1,770
1997	0	0	0	0	0	0	2,016	369	0	0	0	0	2,385
1998	0	0	0	0	0	0	1,168	2,836	341	0	0	0	4,346
1999	0	0	0	0	0	0	1,501	2,217	209	0	0	0	3,928
2000	0	0	0	0	0	617	2,731	719	0	0	0	0	4,067
2001	0	0	0	0	0	1,183	2,156	1,690	148	0	0	0	5,178
2002	0	0	0	0	0	0	1,914	67	0	0	0	0	1,981
2003	0	0	0	0	0	0	609	406	0	0	0	0	1,014
2004	0	0	0	0	0	72	151	597	207	0	0	0	1,027
2005	0	0	0	0	0	0	632	771	0	0	0	0	1,403
2006	0	0	0	0	0	420	520	655	99	0	0	0	1,694
2007	0	0	0	7	21	0	653	405	195	0	0	0	1,280
2008	0	0	0	40	0	0	484	568	159	115	0	0	1,366
Average	**0**	**0**	**0**	**1**	**1**	**79**	**601**	**645**	**116**	**4**	**0**	**0**	**1,448**
Min	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Max	**0**	**0**	**0**	**40**	**21**	**1,183**	**2,731**	**2,836**	**417**	**115**	**0**	**0**	**5,178**

Table A-4a. Lake Canal Company Farm Headgate Deliveries - Buchleiter

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	22.7	34.0	63.5	0.2	0.0	0.0	0.0	0.0	120.5
1976	0.0	0.0	0.0	0.0	21.8	58.4	2.4	5.5	0.4	0.0	0.0	0.0	88.4
1977	0.0	0.0	0.0	0.0	8.6	34.3	0.0	0.0	0.0	0.0	0.0	0.0	42.9
1978	0.0	0.0	0.0	0.0	13.2	58.4	44.3	0.0	0.1	0.0	0.0	0.0	116.1
1979	0.0	0.0	0.0	0.0	3.4	30.8	53.6	4.9	3.0	0.0	0.0	0.0	95.7
1980	0.0	0.0	0.0	0.0	0.0	55.3	38.6	0.1	2.3	0.0	0.0	0.0	96.4
1981	0.0	0.0	0.0	0.0	21.9	24.7	3.7	1.4	1.8	0.0	0.0	0.0	53.4
1982	0.0	0.0	0.0	0.0	9.1	31.8	39.9	0.0	0.0	0.0	0.0	0.0	80.8
1983	0.0	0.0	0.0	0.0	0.0	11.0	64.6	22.1	5.1	0.0	0.0	0.0	102.7
1984	0.0	0.0	0.0	0.0	14.9	39.3	3.1	1.8	0.1	0.0	0.0	0.0	59.2
1985	0.0	0.0	0.0	0.0	31.0	52.6	3.1	0.0	0.0	0.0	0.0	0.0	86.7
1986	0.0	0.0	0.0	0.0	32.7	57.1	30.0	0.0	0.0	0.0	0.0	0.0	119.8
1987	0.0	0.0	0.0	0.0	13.1	26.5	0.0	0.0	0.0	0.0	0.0	0.0	39.6
1988	0.0	0.0	0.0	0.0	23.0	71.4	9.0	0.0	0.0	0.0	0.0	0.0	103.4
1989	0.0	0.0	0.0	0.0	35.3	32.9	0.0	0.4	0.1	0.0	0.0	0.0	68.6
1990	0.0	0.0	0.0	0.0	27.9	48.7	27.5	0.2	0.0	0.0	0.0	0.0	104.4
1991	0.0	0.0	0.0	0.0	23.0	51.1	7.3	0.3	0.0	0.0	0.0	0.0	81.6
1992	0.0	0.0	0.0	0.0	37.4	36.4	1.5	0.0	0.0	0.0	0.0	0.0	75.3
1993	0.0	0.0	0.0	0.0	19.0	40.6	52.0	0.0	0.0	0.0	0.0	0.0	111.6
1994	0.0	0.0	0.0	0.0	34.7	32.8	0.3	0.9	0.0	0.0	0.0	0.0	68.7
1995	0.0	0.0	0.0	0.0	0.0	10.2	60.4	0.0	0.1	0.0	0.0	0.0	70.7
1996	0.0	0.0	0.0	0.0	49.6	56.1	39.6	0.7	1.3	0.0	0.0	0.0	147.4
1997	0.0	0.0	0.0	0.0	31.0	31.5	19.6	9.8	3.9	0.0	0.0	0.0	95.8
1998	0.0	0.0	0.0	0.0	44.4	48.0	41.9	0.0	1.0	0.0	0.0	0.0	135.3
1999	0.0	0.0	0.0	0.0	1.8	37.1	39.4	0.0	0.0	0.0	0.0	0.0	78.3
2000	0.0	0.0	0.0	0.0	28.8	35.7	0.0	0.0	0.0	0.0	0.0	0.0	64.5
2001	0.0	0.0	0.0	0.0	19.9	33.0	1.2	0.0	0.0	0.0	0.0	0.0	54.1
2002	0.0	0.0	0.0	0.0	0.0	23.0	0.5	0.0	0.0	0.0	0.0	0.0	23.4
2003	0.0	0.0	0.0	0.0	9.9	51.0	16.5	0.0	0.0	0.0	0.0	0.0	77.4
2004	0.0	0.0	1.5	0.0	8.7	45.0	7.5	0.0	0.0	0.0	0.0	0.0	62.8
2005	0.0	0.0	0.0	0.0	32.6	49.0	11.2	0.0	0.0	1.0	0.0	0.0	93.7
2006	0.0	0.0	0.0	0.0	38.1	41.5	0.0	0.0	0.0	0.0	0.0	0.0	79.6
2007	0.0	0.0	0.0	0.0	27.0	51.0	0.0	0.0	0.0	1.7	0.0	0.0	79.8
2008	0.0	0.0	0.0	0.0	11.4	49.4	25.7	1.0	2.3	0.0	0.0	0.0	89.9
Average	**0.0**	**0.0**	**0.0**	**0.0**	**20.5**	**40.9**	**20.8**	**1.5**	**0.6**	**0.1**	**0.0**	**0.0**	**84.4**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**10.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**23.4**
Max	**0.0**	**0.0**	**1.5**	**0.0**	**49.6**	**71.4**	**64.6**	**22.1**	**5.1**	**1.7**	**0.0**	**0.0**	**147.4**

Table A-4b. Lake Canal Company Farm Headgate Deliveries - Hill

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	10.6	15.9	29.7	0.1	0.0	0.0	0.0	0.0	56.4
1976	0.0	0.0	0.0	0.0	10.2	27.3	1.1	2.6	0.2	0.0	0.0	0.0	41.4
1977	0.0	0.0	0.0	0.0	4.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	20.1
1978	0.0	0.0	0.0	0.0	6.2	27.3	20.7	0.0	0.1	0.0	0.0	0.0	54.3
1979	0.0	0.0	0.0	0.0	1.6	14.4	25.1	2.3	1.4	0.0	0.0	0.0	44.7
1980	0.0	0.0	0.0	0.0	0.0	25.9	18.0	0.1	1.1	0.0	0.0	0.0	45.1
1981	0.0	0.0	0.0	0.0	10.2	11.6	1.7	0.6	0.8	0.0	0.0	0.0	25.0
1982	0.0	0.0	0.0	0.0	4.3	14.9	18.7	0.0	0.0	0.0	0.0	0.0	37.8
1983	0.0	0.0	0.0	0.0	0.0	5.1	30.2	10.3	2.4	0.0	0.0	0.0	48.0
1984	0.0	0.0	0.0	0.0	7.0	18.4	1.4	0.8	0.1	0.0	0.0	0.0	27.7
1985	0.0	0.0	0.0	0.0	14.5	24.6	1.5	0.0	0.0	0.0	0.0	0.0	40.6
1986	0.0	0.0	0.0	0.0	15.3	26.7	14.0	0.0	0.0	0.0	0.0	0.0	56.0
1987	0.0	0.0	0.0	0.0	6.1	12.4	0.0	0.0	0.0	0.0	0.0	0.0	18.5
1988	0.0	0.0	0.0	0.0	10.8	33.4	4.2	0.0	0.0	0.0	0.0	0.0	48.3
1989	0.0	0.0	0.0	0.0	16.5	15.4	0.0	0.2	0.0	0.0	0.0	0.0	32.1
1990	0.0	0.0	0.0	0.0	13.1	22.8	12.9	0.1	0.0	0.0	0.0	0.0	48.8
1991	0.0	0.0	0.0	0.0	10.8	23.9	3.4	0.1	0.0	0.0	0.0	0.0	38.2
1992	0.0	0.0	0.0	0.0	17.5	17.0	0.7	0.0	0.0	0.0	0.0	0.0	35.2
1993	0.0	0.0	0.0	0.0	8.9	19.0	24.3	0.0	0.0	0.0	0.0	0.0	52.2
1994	0.0	0.0	0.0	0.0	16.2	15.3	0.1	0.4	0.0	0.0	0.0	0.0	32.1
1995	0.0	0.0	0.0	0.0	0.0	4.8	28.2	0.0	0.0	0.0	0.0	0.0	33.1
1996	0.0	0.0	0.0	0.0	23.2	26.2	18.5	0.3	0.6	0.0	0.0	0.0	68.9
1997	0.0	0.0	0.0	0.0	14.5	14.7	9.2	4.6	1.8	0.0	0.0	0.0	44.8
1998	0.0	0.0	0.0	0.0	20.8	22.4	19.6	0.0	0.5	0.0	0.0	0.0	63.3
1999	0.0	0.0	0.0	0.0	0.9	17.3	18.4	0.0	0.0	0.0	0.0	0.0	36.6
2000	0.0	0.0	0.0	0.0	13.5	16.7	0.0	0.0	0.0	0.0	0.0	0.0	30.2
2001	0.0	0.0	0.0	0.0	9.3	15.4	0.6	0.0	0.0	0.0	0.0	0.0	25.3
2002	0.0	0.0	0.0	0.0	0.0	10.7	0.2	0.0	0.0	0.0	0.0	0.0	11.0
2003	0.0	0.0	0.0	0.0	4.6	23.9	7.7	0.0	0.0	0.0	0.0	0.0	36.2
2004	0.0	0.0	0.7	0.0	4.1	21.0	3.5	0.0	0.0	0.0	0.0	0.0	29.4
2005	0.0	0.0	0.0	0.0	15.2	22.9	5.3	0.0	0.0	0.5	0.0	0.0	43.8
2006	0.0	0.0	0.0	0.0	17.8	19.4	0.0	0.0	0.0	0.0	0.0	0.0	37.2
2007	0.0	0.0	0.0	0.0	12.6	23.9	0.0	0.0	0.0	0.8	0.0	0.0	37.3
2008	0.0	0.0	0.0	0.0	5.3	23.1	12.0	0.5	1.1	0.0	0.0	0.0	42.0
Average	**0.0**	**0.0**	**0.0**	**0.0**	**9.6**	**19.1**	**9.7**	**0.7**	**0.3**	**0.0**	**0.0**	**0.0**	**39.5**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**4.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**11.0**
Max	**0.0**	**0.0**	**0.7**	**0.0**	**23.2**	**33.4**	**30.2**	**10.3**	**2.4**	**0.8**	**0.0**	**0.0**	**68.9**

Table A-4c. Lake Canal Company Farm Headgate Deliveries - Sondrup

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	24.5	36.7	68.4	0.2	0.0	0.0	0.0	0.0	129.8
1976	0.0	0.0	0.0	0.0	23.5	62.8	2.6	5.9	0.4	0.0	0.0	0.0	95.3
1977	0.0	0.0	0.0	0.0	9.3	36.9	0.0	0.0	0.0	0.0	0.0	0.0	46.2
1978	0.0	0.0	0.0	0.0	14.3	62.9	47.7	0.0	0.1	0.0	0.0	0.0	125.0
1979	0.0	0.0	0.0	0.0	3.6	33.1	57.8	5.2	3.3	0.0	0.0	0.0	103.0
1980	0.0	0.0	0.0	0.0	0.0	59.6	41.6	0.1	2.5	0.0	0.0	0.0	103.8
1981	0.0	0.0	0.0	0.0	23.5	26.6	3.9	1.5	1.9	0.0	0.0	0.0	57.5
1982	0.0	0.0	0.0	0.0	9.8	34.2	43.0	0.0	0.0	0.0	0.0	0.0	87.1
1983	0.0	0.0	0.0	0.0	0.0	11.8	69.5	23.8	5.5	0.0	0.0	0.0	110.6
1984	0.0	0.0	0.0	0.0	16.0	42.3	3.3	2.0	0.1	0.0	0.0	0.0	63.8
1985	0.0	0.0	0.0	0.0	33.4	56.6	3.3	0.0	0.0	0.0	0.0	0.0	93.4
1986	0.0	0.0	0.0	0.0	35.2	61.5	32.3	0.0	0.0	0.0	0.0	0.0	129.0
1987	0.0	0.0	0.0	0.0	14.2	28.5	0.0	0.0	0.0	0.0	0.0	0.0	42.7
1988	0.0	0.0	0.0	0.0	24.8	76.9	9.6	0.0	0.0	0.0	0.0	0.0	111.3
1989	0.0	0.0	0.0	0.0	38.1	35.4	0.0	0.4	0.1	0.0	0.0	0.0	73.9
1990	0.0	0.0	0.0	0.0	30.1	52.4	29.6	0.2	0.0	0.0	0.0	0.0	112.4
1991	0.0	0.0	0.0	0.0	24.8	55.0	7.8	0.3	0.0	0.0	0.0	0.0	87.9
1992	0.0	0.0	0.0	0.0	40.3	39.2	1.6	0.0	0.0	0.0	0.0	0.0	81.1
1993	0.0	0.0	0.0	0.0	20.4	43.7	56.0	0.0	0.0	0.0	0.0	0.0	120.2
1994	0.0	0.0	0.0	0.0	37.4	35.3	0.3	1.0	0.0	0.0	0.0	0.0	74.0
1995	0.0	0.0	0.0	0.0	0.0	11.0	65.0	0.0	0.1	0.0	0.0	0.0	76.1
1996	0.0	0.0	0.0	0.0	53.5	60.4	42.6	0.8	1.5	0.0	0.0	0.0	158.8
1997	0.0	0.0	0.0	0.0	33.4	33.9	21.1	10.6	4.2	0.0	0.0	0.0	103.2
1998	0.0	0.0	0.0	0.0	47.9	51.7	45.1	0.0	1.1	0.0	0.0	0.0	145.7
1999	0.0	0.0	0.0	0.0	2.0	39.9	42.4	0.0	0.0	0.0	0.0	0.0	84.3
2000	0.0	0.0	0.0	0.0	31.1	38.4	0.0	0.0	0.0	0.0	0.0	0.0	69.5
2001	0.0	0.0	0.0	0.0	21.4	35.6	1.3	0.0	0.0	0.0	0.0	0.0	58.3
2002	0.0	0.0	0.0	0.0	0.0	24.7	0.5	0.0	0.0	0.0	0.0	0.0	25.2
2003	0.0	0.0	0.0	0.0	10.6	54.9	17.8	0.0	0.0	0.0	0.0	0.0	83.4
2004	0.0	0.0	1.6	0.0	9.4	48.5	8.1	0.0	0.0	0.0	0.0	0.0	67.6
2005	0.0	0.0	0.0	0.0	35.1	52.7	12.1	0.0	0.0	1.0	0.0	0.0	101.0
2006	0.0	0.0	0.0	0.0	41.0	44.7	0.0	0.0	0.0	0.0	0.0	0.0	85.7
2007	0.0	0.0	0.0	0.0	29.1	55.0	0.0	0.0	0.0	1.9	0.0	0.0	85.9
2008	0.0	0.0	0.0	0.0	12.3	53.2	27.7	1.1	2.5	0.0	0.0	0.0	96.8
Average	**0.0**	**0.0**	**0.0**	**0.0**	**22.0**	**44.0**	**22.4**	**1.6**	**0.7**	**0.1**	**0.0**	**0.0**	**90.9**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**11.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**25.2**
Max	**0.0**	**0.0**	**1.6**	**0.0**	**53.5**	**76.9**	**69.5**	**23.8**	**5.5**	**1.9**	**0.0**	**0.0**	**158.8**

Table A-4d. Lake Canal Company Farm Headgate Deliveries - Johnson

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	14.0	20.9	39.1	0.1	0.0	0.0	0.0	0.0	74.2
1976	0.0	0.0	0.0	0.0	13.4	35.9	1.5	3.4	0.2	0.0	0.0	0.0	54.4
1977	0.0	0.0	0.0	0.0	5.3	21.1	0.0	0.0	0.0	0.0	0.0	0.0	26.4
1978	0.0	0.0	0.0	0.0	8.2	35.9	27.3	0.0	0.1	0.0	0.0	0.0	71.4
1979	0.0	0.0	0.0	0.0	2.1	18.9	33.0	3.0	1.9	0.0	0.0	0.0	58.9
1980	0.0	0.0	0.0	0.0	0.0	34.1	23.7	0.1	1.4	0.0	0.0	0.0	59.3
1981	0.0	0.0	0.0	0.0	13.4	15.2	2.3	0.8	1.1	0.0	0.0	0.0	32.9
1982	0.0	0.0	0.0	0.0	5.6	19.6	24.6	0.0	0.0	0.0	0.0	0.0	49.7
1983	0.0	0.0	0.0	0.0	0.0	6.8	39.7	13.6	3.1	0.0	0.0	0.0	63.2
1984	0.0	0.0	0.0	0.0	9.2	24.2	1.9	1.1	0.1	0.0	0.0	0.0	36.4
1985	0.0	0.0	0.0	0.0	19.1	32.4	1.9	0.0	0.0	0.0	0.0	0.0	53.4
1986	0.0	0.0	0.0	0.0	20.1	35.1	18.5	0.0	0.0	0.0	0.0	0.0	73.7
1987	0.0	0.0	0.0	0.0	8.1	16.3	0.0	0.0	0.0	0.0	0.0	0.0	24.4
1988	0.0	0.0	0.0	0.0	14.2	43.9	5.5	0.0	0.0	0.0	0.0	0.0	63.6
1989	0.0	0.0	0.0	0.0	21.8	20.2	0.0	0.2	0.0	0.0	0.0	0.0	42.2
1990	0.0	0.0	0.0	0.0	17.2	29.9	16.9	0.1	0.0	0.0	0.0	0.0	64.2
1991	0.0	0.0	0.0	0.0	14.2	31.4	4.5	0.2	0.0	0.0	0.0	0.0	50.2
1992	0.0	0.0	0.0	0.0	23.0	22.4	0.9	0.0	0.0	0.0	0.0	0.0	46.3
1993	0.0	0.0	0.0	0.0	11.7	25.0	32.0	0.0	0.0	0.0	0.0	0.0	68.7
1994	0.0	0.0	0.0	0.0	21.4	20.2	0.2	0.6	0.0	0.0	0.0	0.0	42.3
1995	0.0	0.0	0.0	0.0	0.0	6.3	37.2	0.0	0.0	0.0	0.0	0.0	43.5
1996	0.0	0.0	0.0	0.0	30.5	34.5	24.4	0.5	0.8	0.0	0.0	0.0	90.7
1997	0.0	0.0	0.0	0.0	19.1	19.4	12.1	6.0	2.4	0.0	0.0	0.0	59.0
1998	0.0	0.0	0.0	0.0	27.4	29.5	25.8	0.0	0.6	0.0	0.0	0.0	83.3
1999	0.0	0.0	0.0	0.0	1.1	22.8	24.2	0.0	0.0	0.0	0.0	0.0	48.2
2000	0.0	0.0	0.0	0.0	17.7	22.0	0.0	0.0	0.0	0.0	0.0	0.0	39.7
2001	0.0	0.0	0.0	0.0	12.2	20.3	0.8	0.0	0.0	0.0	0.0	0.0	33.3
2002	0.0	0.0	0.0	0.0	0.0	14.1	0.3	0.0	0.0	0.0	0.0	0.0	14.4
2003	0.0	0.0	0.0	0.0	6.1	31.4	10.2	0.0	0.0	0.0	0.0	0.0	47.6
2004	0.0	0.0	0.9	0.0	5.4	27.7	4.6	0.0	0.0	0.0	0.0	0.0	38.6
2005	0.0	0.0	0.0	0.0	20.0	30.1	6.9	0.0	0.0	0.6	0.0	0.0	57.7
2006	0.0	0.0	0.0	0.0	23.4	25.5	0.0	0.0	0.0	0.0	0.0	0.0	49.0
2007	0.0	0.0	0.0	0.0	16.6	31.4	0.0	0.0	0.0	1.1	0.0	0.0	49.1
2008	0.0	0.0	0.0	0.0	7.0	30.4	15.8	0.6	1.4	0.0	0.0	0.0	55.3
Average	**0.0**	**0.0**	**0.0**	**0.0**	**12.6**	**25.1**	**12.8**	**0.9**	**0.4**	**0.0**	**0.0**	**0.0**	**51.9**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**6.3**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**14.4**
Max	**0.0**	**0.0**	**0.9**	**0.0**	**30.5**	**43.9**	**39.7**	**13.6**	**3.1**	**1.1**	**0.0**	**0.0**	**90.7**

Table A-5a. Lake Canal Reservoir Company Farm Headgate Deliveries - Hill

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	0.0	0.4	0.0	5.5	1.6	0.0	0.0	0.0	7.5
1976	0.0	0.0	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	2.7
1977	0.0	0.0	0.0	0.0	0.0	4.5	5.0	4.8	1.2	0.0	0.0	0.0	15.6
1978	0.0	0.0	0.0	0.0	0.0	0.0	3.1	7.0	1.9	0.0	0.0	0.0	12.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.5	2.5	1.1	0.0	0.0	0.0	4.1
1980	0.0	0.0	0.0	0.0	0.0	0.0	1.7	1.1	0.0	0.0	0.0	0.0	2.8
1981	0.0	0.0	0.0	0.0	0.0	2.2	4.1	2.3	1.4	0.0	0.0	0.0	10.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	2.8	5.2	0.2	0.0	0.0	0.0	8.3
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	2.4	0.0	0.0	0.0	5.9
1984	0.0	0.0	0.0	0.0	0.0	0.0	2.5	3.4	2.9	0.0	0.0	0.0	8.7
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.8	0.0	0.0	0.0	0.0	6.9
2003	0.0	0.0	0.0	0.0	0.0	0.0	1.3	2.7	0.4	0.0	0.0	0.0	4.4
2004	0.0	0.0	0.0	0.0	0.0	0.8	0.4	0.0	0.0	0.0	0.0	0.0	1.2
2005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.3
2006	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
2007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	**0.9**	**1.1**	**0.4**	**0.0**	**0.0**	**0.0**	**2.7**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Max	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**4.5**	**6.2**	**7.0**	**2.9**	**0.0**	**0.0**	**0.0**	**15.6**

Table A-5b. Lake Canal Reservoir Company Farm Headgate Deliveries - Johnson

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	0.0	3.1	0.0	43.2	12.6	0.0	0.0	0.0	58.9
1976	0.0	0.0	0.0	0.0	0.0	0.0	21.2	0.0	0.0	0.0	0.0	0.0	21.2
1977	0.0	0.0	0.0	0.0	0.0	35.7	39.7	38.1	9.3	0.0	0.0	0.0	122.8
1978	0.0	0.0	0.0	0.0	0.0	0.0	24.2	55.5	15.2	0.0	0.0	0.0	94.9
1979	0.0	0.0	0.0	0.0	0.0	0.0	3.9	19.9	8.5	0.0	0.0	0.0	32.3
1980	0.0	0.0	0.0	0.0	0.0	0.0	13.4	8.5	0.0	0.0	0.0	0.0	21.9
1981	0.0	0.0	0.0	0.0	0.0	17.7	32.1	18.1	11.0	0.0	0.0	0.0	78.9
1982	0.0	0.0	0.0	0.0	0.0	0.0	22.4	40.9	1.9	0.0	0.0	0.0	65.3
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.5	18.8	0.0	0.0	0.0	46.3
1984	0.0	0.0	0.0	0.0	0.0	0.0	19.6	26.5	22.7	0.0	0.0	0.0	68.8
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0	0.0	0.0	48.7	5.9	0.0	0.0	0.0	0.0	54.7
2003	0.0	0.0	0.0	0.0	0.0	0.0	10.2	21.6	2.9	0.0	0.0	0.0	34.7
2004	0.0	0.0	0.0	0.0	0.0	6.1	3.2	0.0	0.0	0.0	0.0	0.0	9.3
2005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.3	0.0	0.0	0.0	2.6
2006	0.0	0.0	0.0	0.0	0.0	7.6	0.0	0.0	0.0	0.0	0.0	0.0	7.6
2007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.1**	**7.0**	**9.1**	**3.0**	**0.0**	**0.0**	**0.0**	**21.2**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Max	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**35.7**	**48.7**	**55.5**	**22.7**	**0.0**	**0.0**	**0.0**	**122.8**

Table A-6a. Cache la Poudre Reservoir Company Farm Headgate Deliveries - Buchleiter

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	2.4	9.7	0.0	0.0	0.0	0.0	12.1
1980	0.0	0.0	0.0	0.0	0.0	0.0	9.3	13.9	3.6	0.0	0.0	0.0	26.7
1981	0.0	0.0	0.0	0.0	0.0	1.2	6.1	4.9	6.7	0.3	0.0	0.0	19.2
1982	0.0	0.0	0.0	0.0	0.0	0.0	5.0	8.4	4.4	0.0	0.0	0.0	17.7
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	3.7	9.1	2.1	0.0	0.0	0.0	14.8
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	6.1	9.0	2.2	0.0	0.0	0.0	17.4
1987	0.0	0.0	0.0	0.0	0.0	4.4	7.6	15.4	1.7	0.0	0.0	0.0	29.1
1988	0.0	0.0	0.0	0.0	0.0	0.0	7.8	17.5	2.3	0.0	0.0	0.0	27.6
1989	0.0	0.0	0.0	0.0	0.0	4.2	12.2	14.0	5.7	0.0	0.0	0.0	36.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	2.5	22.1	5.6	0.0	0.0	0.0	30.2
1991	0.0	0.0	0.0	0.0	0.0	0.0	19.2	16.5	4.2	0.0	0.0	0.0	39.9
1992	0.0	0.0	0.0	0.0	0.0	0.0	13.1	12.4	3.2	0.0	0.0	0.0	28.7
1993	0.0	0.0	0.0	0.0	0.4	0.0	8.9	34.6	4.6	0.0	0.0	0.0	48.4
1994	0.0	0.0	0.0	0.0	0.0	0.0	31.2	4.5	3.7	0.0	0.0	0.0	39.4
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.3	31.3	10.1	0.0	0.0	0.0	41.6
1996	0.0	0.0	0.0	0.0	0.0	0.0	6.9	33.3	2.4	0.0	0.0	0.0	42.7
1997	0.0	0.0	0.0	0.0	0.0	0.0	48.6	8.9	0.0	0.0	0.0	0.0	57.5
1998	0.0	0.0	0.0	0.0	0.0	0.0	28.2	68.4	8.2	0.0	0.0	0.0	104.7
1999	0.0	0.0	0.0	0.0	0.0	0.0	36.2	53.4	5.0	0.0	0.0	0.0	94.7
2000	0.0	0.0	0.0	0.0	0.0	14.9	65.8	17.3	0.0	0.0	0.0	0.0	98.0
2001	0.0	0.0	0.0	0.0	0.0	28.5	52.0	40.7	3.6	0.0	0.0	0.0	124.8
2002	0.0	0.0	0.0	0.0	0.0	0.0	46.1	1.6	0.0	0.0	0.0	0.0	47.7
2003	0.0	0.0	0.0	0.0	0.0	0.0	14.7	9.8	0.0	0.0	0.0	0.0	24.4
2004	0.0	0.0	0.0	0.0	0.0	1.7	3.6	14.4	5.0	0.0	0.0	0.0	24.8
2005	0.0	0.0	0.0	0.0	0.0	0.0	15.2	18.6	0.0	0.0	0.0	0.0	33.8
2006	0.0	0.0	0.0	0.0	0.0	10.1	12.5	15.8	2.4	0.0	0.0	0.0	40.8
2007	0.0	0.0	0.0	0.2	0.5	0.0	15.7	9.8	4.7	0.0	0.0	0.0	30.9
2008	0.0	0.0	0.0	1.0	0.0	0.0	11.7	13.7	3.8	2.8	0.0	0.0	32.9
Average	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.9**	**14.5**	**15.6**	**2.8**	**0.1**	**0.0**	**0.0**	**34.9**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Max	**0.0**	**0.0**	**0.0**	**1.0**	**0.5**	**28.5**	**65.8**	**68.4**	**10.1**	**2.8**	**0.0**	**0.0**	**124.8**

Table A-6b. Cache la Poudre Reservoir Company Farm Headgate Deliveries - Hill

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	1.4	5.5	0.0	0.0	0.0	0.0	6.8
1980	0.0	0.0	0.0	0.0	0.0	0.0	5.2	7.8	2.0	0.0	0.0	0.0	15.0
1981	0.0	0.0	0.0	0.0	0.0	0.7	3.5	2.8	3.8	0.2	0.0	0.0	10.8
1982	0.0	0.0	0.0	0.0	0.0	0.0	2.8	4.7	2.4	0.0	0.0	0.0	10.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	2.1	5.1	1.2	0.0	0.0	0.0	8.4
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	3.5	5.1	1.2	0.0	0.0	0.0	9.8
1987	0.0	0.0	0.0	0.0	0.0	2.5	4.3	8.7	1.0	0.0	0.0	0.0	16.4
1988	0.0	0.0	0.0	0.0	0.0	0.0	4.4	9.9	1.3	0.0	0.0	0.0	15.5
1989	0.0	0.0	0.0	0.0	0.0	2.4	6.9	7.9	3.2	0.0	0.0	0.0	20.3
1990	0.0	0.0	0.0	0.0	0.0	0.0	1.4	12.4	3.1	0.0	0.0	0.0	17.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	10.8	9.3	2.4	0.0	0.0	0.0	22.5
1992	0.0	0.0	0.0	0.0	0.0	0.0	7.4	7.0	1.8	0.0	0.0	0.0	16.1
1993	0.0	0.0	0.0	0.0	0.2	0.0	5.0	19.5	2.6	0.0	0.0	0.0	27.3
1994	0.0	0.0	0.0	0.0	0.0	0.0	17.6	2.5	2.1	0.0	0.0	0.0	22.2
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.2	17.6	5.7	0.0	0.0	0.0	23.4
1996	0.0	0.0	0.0	0.0	0.0	0.0	3.9	18.8	1.4	0.0	0.0	0.0	24.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	27.3	5.0	0.0	0.0	0.0	0.0	32.4
1998	0.0	0.0	0.0	0.0	0.0	0.0	15.9	38.5	4.6	0.0	0.0	0.0	59.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	20.4	30.1	2.8	0.0	0.0	0.0	53.3
2000	0.0	0.0	0.0	0.0	0.0	8.4	37.0	9.8	0.0	0.0	0.0	0.0	55.2
2001	0.0	0.0	0.0	0.0	0.0	16.0	29.3	22.9	2.0	0.0	0.0	0.0	70.2
2002	0.0	0.0	0.0	0.0	0.0	0.0	26.0	0.9	0.0	0.0	0.0	0.0	26.9
2003	0.0	0.0	0.0	0.0	0.0	0.0	8.3	5.5	0.0	0.0	0.0	0.0	13.8
2004	0.0	0.0	0.0	0.0	0.0	1.0	2.0	8.1	2.8	0.0	0.0	0.0	13.9
2005	0.0	0.0	0.0	0.0	0.0	0.0	8.6	10.5	0.0	0.0	0.0	0.0	19.0
2006	0.0	0.0	0.0	0.0	0.0	5.7	7.1	8.9	1.3	0.0	0.0	0.0	23.0
2007	0.0	0.0	0.0	0.1	0.3	0.0	8.9	5.5	2.6	0.0	0.0	0.0	17.4
2008	0.0	0.0	0.0	0.5	0.0	0.0	6.6	7.7	2.2	1.6	0.0	0.0	18.5
Average	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.1**	**8.2**	**8.8**	**1.6**	**0.1**	**0.0**	**0.0**	**19.6**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Max	**0.0**	**0.0**	**0.0**	**0.5**	**0.3**	**16.0**	**37.0**	**38.5**	**5.7**	**1.6**	**0.0**	**0.0**	**70.2**

Table A-6c. Cache la Poudre Reservoir Company Farm Headgate Deliveries - Sondrup

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	2.2	8.6	0.0	0.0	0.0	0.0	10.8
1980	0.0	0.0	0.0	0.0	0.0	0.0	8.2	12.3	3.2	0.0	0.0	0.0	23.7
1981	0.0	0.0	0.0	0.0	0.0	1.0	5.5	4.4	5.9	0.3	0.0	0.0	17.1
1982	0.0	0.0	0.0	0.0	0.0	0.0	4.4	7.4	3.9	0.0	0.0	0.0	15.7
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	3.2	8.1	1.9	0.0	0.0	0.0	13.2
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	5.5	8.0	1.9	0.0	0.0	0.0	15.4
1987	0.0	0.0	0.0	0.0	0.0	3.9	6.7	13.7	1.5	0.0	0.0	0.0	25.9
1988	0.0	0.0	0.0	0.0	0.0	0.0	6.9	15.6	2.1	0.0	0.0	0.0	24.5
1989	0.0	0.0	0.0	0.0	0.0	3.7	10.9	12.4	5.0	0.0	0.0	0.0	32.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	2.2	19.6	5.0	0.0	0.0	0.0	26.8
1991	0.0	0.0	0.0	0.0	0.0	0.0	17.0	14.7	3.7	0.0	0.0	0.0	35.5
1992	0.0	0.0	0.0	0.0	0.0	0.0	11.7	11.0	2.8	0.0	0.0	0.0	25.5
1993	0.0	0.0	0.0	0.0	0.3	0.0	7.9	30.8	4.1	0.0	0.0	0.0	43.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	27.7	4.0	3.3	0.0	0.0	0.0	35.0
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.3	27.8	8.9	0.0	0.0	0.0	37.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	6.2	29.6	2.1	0.0	0.0	0.0	37.9
1997	0.0	0.0	0.0	0.0	0.0	0.0	43.2	7.9	0.0	0.0	0.0	0.0	51.1
1998	0.0	0.0	0.0	0.0	0.0	0.0	25.0	60.8	7.3	0.0	0.0	0.0	93.1
1999	0.0	0.0	0.0	0.0	0.0	0.0	32.2	47.5	4.5	0.0	0.0	0.0	84.1
2000	0.0	0.0	0.0	0.0	0.0	13.2	58.5	15.4	0.0	0.0	0.0	0.0	87.1
2001	0.0	0.0	0.0	0.0	0.0	25.3	46.2	36.2	3.2	0.0	0.0	0.0	110.9
2002	0.0	0.0	0.0	0.0	0.0	0.0	41.0	1.4	0.0	0.0	0.0	0.0	42.4
2003	0.0	0.0	0.0	0.0	0.0	0.0	13.0	8.7	0.0	0.0	0.0	0.0	21.7
2004	0.0	0.0	0.0	0.0	0.0	1.6	3.2	12.8	4.4	0.0	0.0	0.0	22.0
2005	0.0	0.0	0.0	0.0	0.0	0.0	13.5	16.5	0.0	0.0	0.0	0.0	30.1
2006	0.0	0.0	0.0	0.0	0.0	9.0	11.1	14.0	2.1	0.0	0.0	0.0	36.3
2007	0.0	0.0	0.0	0.1	0.4	0.0	14.0	8.7	4.2	0.0	0.0	0.0	27.4
2008	0.0	0.0	0.0	0.9	0.0	0.0	10.4	12.2	3.4	2.5	0.0	0.0	29.3
Average	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.7**	**12.9**	**13.8**	**2.5**	**0.1**	**0.0**	**0.0**	**31.0**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Max	**0.0**	**0.0**	**0.0**	**0.9**	**0.4**	**25.3**	**58.5**	**60.8**	**8.9**	**2.5**	**0.0**	**0.0**	**110.9**

Table A-7. Irrigation Water Requirement - Buchleiter

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	0.0	2.4	15.0	12.1	11.3	0.0	0.0	0.0	40.9
1976	0.0	0.0	0.0	0.0	0.9	5.4	16.2	14.0	8.5	0.0	0.0	0.0	45.0
1977	0.0	0.0	0.0	0.0	1.8	11.8	9.3	16.3	5.9	0.0	0.0	0.0	45.1
1978	0.0	0.0	0.0	0.0	0.0	4.2	16.2	15.9	8.8	0.0	0.0	0.0	45.0
1979	0.0	0.0	0.0	0.0	0.0	1.3	15.1	10.7	13.0	0.3	0.0	0.0	40.4
1980	0.0	0.0	0.0	0.0	0.0	6.2	16.1	16.1	12.6	0.1	0.0	0.0	51.0
1981	0.0	0.0	0.0	0.0	0.0	5.6	13.8	14.1	12.8	0.1	0.0	0.0	46.4
1982	0.0	0.0	0.0	0.0	0.0	0.2	9.1	18.1	7.0	0.0	0.0	0.0	34.4
1983	0.0	0.0	0.0	0.0	0.0	0.5	14.6	19.1	9.3	0.0	0.0	0.0	43.4
1984	0.0	0.0	0.0	0.0	0.6	4.5	14.6	18.2	8.8	0.0	0.0	0.0	46.8
1985	0.0	0.0	0.0	0.0	2.1	7.6	11.9	19.7	2.6	0.0	0.0	0.0	43.8
1986	0.0	0.0	0.0	0.0	0.7	5.9	15.6	15.7	9.3	0.0	0.0	0.0	47.2
1987	0.0	0.0	0.0	0.0	0.0	7.2	16.7	17.0	5.7	0.0	0.0	0.0	46.6
1988	0.0	0.0	0.0	0.0	0.0	8.0	15.9	16.0	5.2	0.0	0.0	0.0	45.1
1989	0.0	0.0	0.0	0.0	0.2	6.2	17.1	16.2	4.5	0.0	0.0	0.0	44.0
1990	0.0	0.0	0.0	0.0	0.0	5.9	13.3	14.2	12.4	0.0	0.0	0.0	45.8
1991	0.0	0.0	0.0	0.0	0.3	4.2	14.9	14.9	6.4	0.0	0.0	0.0	40.7
1992	0.0	0.0	0.0	0.1	1.4	3.4	13.0	13.0	3.5	0.0	0.0	0.0	34.3
1993	0.0	0.0	0.0	0.0	1.2	5.5	14.5	15.9	2.5	0.0	0.0	0.0	39.6
1994	0.0	0.0	0.0	0.0	2.1	8.9	13.1	16.4	5.4	0.0	0.0	0.0	45.9
1995	0.0	0.0	0.0	0.0	0.0	0.2	14.5	19.5	6.0	0.0	0.0	0.0	40.2
1996	0.0	0.0	0.0	0.0	0.0	6.2	15.3	17.6	5.7	0.0	0.0	0.0	44.7
1997	0.0	0.0	0.0	0.0	0.9	3.5	7.2	9.5	9.2	0.0	0.0	0.0	30.3
1998	0.0	0.0	0.0	0.0	0.9	6.4	14.5	19.0	7.7	0.0	0.0	0.0	48.4
1999	0.0	0.0	0.0	0.0	0.3	2.9	16.6	14.5	7.3	0.0	0.0	0.0	41.6
2000	0.0	0.0	0.0	0.2	2.3	10.4	19.3	19.5	1.6	0.0	0.0	0.0	53.3
2001	0.0	0.0	0.0	0.0	0.0	9.0	18.1	18.4	7.3	0.0	0.0	0.0	52.8
2002	0.0	0.0	0.0	0.0	0.4	8.9	20.6	17.8	7.7	0.0	0.0	0.0	55.3
2003	0.0	0.0	0.0	0.0	0.4	7.2	20.6	15.1	6.2	0.0	0.0	0.0	49.6
2004	0.0	0.0	0.0	0.0	1.4	6.2	13.9	12.2	3.1	0.0	0.0	0.0	36.8
2005	0.0	0.0	0.0	0.0	0.0	4.0	19.5	16.9	9.6	0.0	0.0	0.0	49.9
2006	0.0	0.0	0.0	0.5	2.7	15.3	19.5	18.7	1.3	0.0	0.0	0.0	58.0
2007	0.0	0.0	0.0	0.0	1.3	9.2	18.9	14.6	7.0	0.0	0.0	0.0	51.0
2008	0.0	0.0	0.0	0.0	0.0	4.7	17.3	11.3	8.5	0.0	0.0	0.0	41.9
Average	**0.0**	**0.0**	**0.0**	**0.0**	**0.6**	**5.9**	**15.3**	**15.8**	**7.2**	**0.0**	**0.0**	**0.0**	**44.9**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.2**	**7.2**	**9.5**	**1.3**	**0.0**	**0.0**	**0.0**	**30.3**
Max	**0.0**	**0.0**	**0.0**	**0.5**	**2.7**	**15.3**	**20.6**	**19.7**	**13.0**	**0.3**	**0.0**	**0.0**	**58.0**

Table A-8. Irrigation Water Requirement - Hill
(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	11.5	0.0	0.0	16.9
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	10.2	0.0	0.0	13.3
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	14.3	0.2	0.0	21.4
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.3	9.2	0.0	0.0	16.5
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	12.5	0.0	0.0	17.9
1980	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5	11.3	0.0	0.0	16.8
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	8.5	1.3	0.0	14.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6	0.0	0.0	9.6
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5	13.6	0.0	0.0	20.1
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	4.8	0.0	0.0	10.6
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	8.5	0.0	0.0	12.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	8.6	0.0	0.0	13.3
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	12.5	0.0	0.0	17.4
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	13.0	1.0	0.0	15.8
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	10.5	0.5	0.0	12.3
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	10.3	0.5	0.0	14.9
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	11.3	0.0	0.0	16.2
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1	14.7	0.0	0.0	21.7
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	6.5	0.0	0.0	7.8
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2	9.9	0.0	0.0	16.1
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	10.8	0.6	0.0	11.7
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	12.9	0.0	0.0	16.2
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	10.2	0.0	0.0	13.1
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	5.0	0.7	0.0	11.3
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	6.2	2.8	0.0	9.3
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	10.7	0.0	0.0	12.7
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.8	10.8	0.8	0.0	16.4
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	6.6	0.0	0.0	11.9
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	15.4	0.5	0.0	21.3
2004	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	11.8	0.0	0.0	12.8
2005	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	4.2	1.7	0.0	11.9
2006	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	7.4	0.0	0.0	11.8
2007	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	8.0	1.2	0.0	13.5
2008	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	6.7	3.0	0.0	12.5
Average	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**4.1**	**9.9**	**0.4**	**0.0**	**14.4**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**4.2**	**0.0**	**0.0**	**7.8**
Max	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**7.3**	**15.4**	**3.0**	**0.0**	**21.7**

Table A-9. Irrigation Water Requirement - Sondrup
(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	5.9	11.4	35.1	47.9	29.9	29.3	25.4	0.0	0.0	185.0
1976	0.0	0.0	0.0	16.6	27.7	41.2	48.8	33.1	23.9	17.7	0.0	0.0	209.0
1977	0.0	0.0	0.0	16.9	32.8	56.0	26.7	36.0	37.8	32.3	0.5	0.0	238.9
1978	0.0	0.0	0.1	22.0	6.8	41.4	48.7	37.9	36.0	19.6	0.0	0.0	212.5
1979	0.0	0.0	0.0	19.6	10.1	31.0	48.1	26.2	32.0	26.1	0.0	0.0	193.2
1980	0.0	0.0	0.0	8.3	16.0	53.8	50.0	40.5	32.0	22.7	0.0	0.0	223.3
1981	0.0	0.0	0.0	29.3	14.0	51.0	43.0	35.1	32.2	25.3	2.4	0.0	232.2
1982	0.0	0.0	0.0	20.4	12.0	22.2	28.5	45.1	16.9	18.2	0.0	0.0	163.3
1983	0.0	0.0	0.0	1.1	14.9	26.1	44.7	45.0	34.3	29.3	0.0	0.0	195.2
1984	0.0	0.0	0.0	4.5	28.5	34.1	43.7	43.0	27.8	7.6	0.0	0.0	189.3
1985	0.0	0.0	0.2	21.8	33.4	34.4	33.8	43.2	22.9	15.3	0.0	0.0	204.9
1986	0.0	0.0	0.0	18.4	26.5	45.7	46.7	37.5	27.0	17.4	0.0	0.0	219.2
1987	0.0	0.0	0.0	26.0	22.4	39.3	48.7	38.2	29.3	26.2	0.0	0.0	230.1
1988	0.0	0.0	0.0	19.9	24.4	47.4	46.6	35.9	23.4	34.6	1.9	0.0	234.1
1989	0.0	0.0	0.2	22.9	24.8	35.9	49.9	36.5	22.0	26.6	0.9	0.0	219.8
1990	0.0	0.0	0.0	18.4	19.4	51.3	41.3	34.8	31.8	27.2	1.1	0.0	225.3
1991	0.0	0.0	0.1	20.5	25.8	31.0	43.8	33.3	29.1	22.2	0.0	0.0	205.8
1992	0.0	0.0	0.0	26.9	29.5	19.6	36.7	26.6	35.5	29.1	0.0	0.0	203.9
1993	0.0	0.0	0.0	15.6	29.8	33.4	42.4	35.1	18.6	11.7	0.0	0.0	186.5
1994	0.0	0.0	0.1	18.4	35.1	44.9	38.1	35.5	34.0	20.2	0.0	0.0	226.2
1995	0.0	0.0	0.0	5.4	0.0	26.3	45.8	47.8	19.9	28.0	1.3	0.0	174.4
1996	0.0	0.0	0.0	21.0	17.7	39.0	44.8	40.7	25.6	27.0	0.0	0.0	215.8
1997	0.0	0.0	0.0	5.0	29.0	35.0	21.5	20.7	26.7	20.8	0.0	0.0	158.7
1998	0.0	0.0	0.0	14.4	29.4	36.2	42.5	43.4	36.8	17.7	1.4	0.0	221.8
1999	0.0	0.0	0.0	0.0	24.3	33.8	50.2	34.6	19.5	26.5	4.1	0.0	193.0
2000	0.0	0.0	0.0	27.7	35.0	42.9	54.5	40.7	23.2	20.2	0.0	0.0	244.3
2001	0.0	0.0	0.0	18.7	19.7	50.3	53.2	41.8	33.1	29.2	1.5	0.0	247.5
2002	0.0	0.0	0.0	28.9	24.2	53.5	61.1	42.0	28.7	10.5	0.0	0.0	249.1
2003	0.0	0.0	0.0	16.3	26.0	38.0	60.2	32.2	30.5	37.8	0.9	0.0	241.9
2004	0.0	0.0	1.3	18.6	32.0	31.6	40.2	25.5	21.9	25.0	0.0	0.0	196.1
2005	0.0	0.0	0.0	15.0	22.3	31.6	57.9	39.3	36.2	18.6	2.9	0.0	223.8
2006	0.0	0.0	0.0	32.4	35.4	58.2	54.3	39.4	26.7	17.3	0.0	0.0	263.7
2007	0.0	0.0	0.0	21.5	30.5	51.1	55.6	31.9	31.6	25.4	2.2	0.0	249.9
2008	0.0	0.0	0.0	19.5	22.8	37.7	51.7	25.2	26.3	26.9	4.6	0.0	214.7
Average	**0.0**	**0.0**	**0.1**	**17.6**	**23.3**	**39.4**	**45.6**	**36.3**	**28.3**	**23.1**	**0.8**	**0.0**	**214.5**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**19.6**	**21.5**	**20.7**	**16.9**	**7.6**	**0.0**	**0.0**	**158.7**
Max	**0.0**	**0.0**	**1.3**	**32.4**	**35.4**	**58.2**	**61.1**	**47.8**	**37.8**	**37.8**	**4.6**	**0.0**	**263.7**

Table A-10. Irrigation Water Requirement - Johnson
(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	0.0	3.9	23.8	19.3	18.0	0.0	0.0	0.0	65.0
1976	0.0	0.0	0.0	0.0	1.4	8.6	25.8	22.3	13.5	0.0	0.0	0.0	71.5
1977	0.0	0.0	0.0	0.0	2.9	18.7	14.8	26.0	9.4	0.0	0.0	0.0	71.8
1978	0.0	0.0	0.0	0.0	0.0	6.6	25.7	25.3	13.9	0.0	0.0	0.0	71.6
1979	0.0	0.0	0.0	0.0	0.0	2.1	24.0	17.1	20.6	0.5	0.0	0.0	64.2
1980	0.0	0.0	0.0	0.0	0.0	9.8	25.6	25.5	20.1	0.1	0.0	0.0	81.1
1981	0.0	0.0	0.0	0.0	0.0	8.9	22.0	22.4	20.4	0.1	0.0	0.0	73.8
1982	0.0	0.0	0.0	0.0	0.0	0.4	14.5	28.7	11.1	0.0	0.0	0.0	54.7
1983	0.0	0.0	0.0	0.0	0.0	0.7	23.2	30.4	14.7	0.0	0.0	0.0	69.1
1984	0.0	0.0	0.0	0.0	1.0	7.1	23.3	29.0	14.0	0.0	0.0	0.0	74.5
1985	0.0	0.0	0.0	0.0	3.4	12.1	18.9	31.3	4.1	0.0	0.0	0.0	69.7
1986	0.0	0.0	0.0	0.0	1.2	9.4	24.8	25.0	14.7	0.0	0.0	0.0	75.1
1987	0.0	0.0	0.0	0.0	0.0	11.4	26.6	27.0	9.1	0.0	0.0	0.0	74.1
1988	0.0	0.0	0.0	0.0	0.0	12.7	25.2	25.5	8.3	0.0	0.0	0.0	71.8
1989	0.0	0.0	0.0	0.0	0.2	9.9	27.1	25.8	7.1	0.0	0.0	0.0	70.1
1990	0.0	0.0	0.0	0.0	0.0	9.4	21.1	22.6	19.7	0.0	0.0	0.0	72.9
1991	0.0	0.0	0.0	0.0	0.4	6.7	23.7	23.7	10.2	0.0	0.0	0.0	64.7
1992	0.0	0.0	0.0	0.1	2.2	5.5	20.6	20.6	5.5	0.0	0.0	0.0	54.6
1993	0.0	0.0	0.0	0.0	1.8	8.7	23.1	25.3	4.0	0.0	0.0	0.0	63.0
1994	0.0	0.0	0.0	0.0	3.3	14.2	20.8	26.1	8.7	0.0	0.0	0.0	73.0
1995	0.0	0.0	0.0	0.0	0.0	0.3	23.1	31.0	9.5	0.0	0.0	0.0	64.0
1996	0.0	0.0	0.0	0.0	0.0	9.9	24.3	28.0	9.0	0.0	0.0	0.0	71.2
1997	0.0	0.0	0.0	0.0	1.4	5.5	11.5	15.2	14.6	0.0	0.0	0.0	48.2
1998	0.0	0.0	0.0	0.0	1.4	10.2	23.0	30.2	12.2	0.0	0.0	0.0	77.0
1999	0.0	0.0	0.0	0.0	0.4	4.6	26.4	23.1	11.7	0.0	0.0	0.0	66.2
2000	0.0	0.0	0.0	0.4	3.6	16.6	30.7	31.1	2.6	0.0	0.0	0.0	84.9
2001	0.0	0.0	0.0	0.0	0.0	14.3	28.8	29.2	11.6	0.0	0.0	0.0	83.9
2002	0.0	0.0	0.0	0.0	0.6	14.1	32.7	28.4	12.3	0.0	0.0	0.0	88.0
2003	0.0	0.0	0.0	0.0	0.6	11.5	32.8	24.1	9.9	0.0	0.0	0.0	78.9
2004	0.0	0.0	0.0	0.0	2.3	9.8	22.1	19.4	5.0	0.0	0.0	0.0	58.6
2005	0.0	0.0	0.0	0.0	0.0	6.3	31.0	26.8	15.2	0.0	0.0	0.0	79.4
2006	0.0	0.0	0.0	0.8	4.3	24.3	31.0	29.8	2.0	0.0	0.0	0.0	92.3
2007	0.0	0.0	0.0	0.0	2.1	14.6	30.1	23.2	11.2	0.0	0.0	0.0	81.2
2008	0.0	0.0	0.0	0.0	0.0	7.5	27.6	18.0	13.5	0.0	0.0	0.0	66.6
Average	**0.0**	**0.0**	**0.0**	**0.0**	**1.0**	**9.3**	**24.4**	**25.2**	**11.4**	**0.0**	**0.0**	**0.0**	**71.4**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.3**	**11.5**	**15.2**	**2.0**	**0.0**	**0.0**	**0.0**	**48.2**
Max	**0.0**	**0.0**	**0.0**	**0.8**	**4.3**	**24.3**	**32.8**	**31.3**	**20.6**	**0.5**	**0.0**	**0.0**	**92.3**

Table A-11. Consumptive Use of All Water Supplies - Buchleiter

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	7.1	2.4	15.0	0.1	0.0	0.0	0.0	0.0	24.7
1976	0.0	0.0	0.0	0.0	10.2	5.4	1.5	3.3	0.2	0.0	0.0	0.0	20.5
1977	0.0	0.0	0.0	0.0	5.2	17.0	0.0	0.0	0.0	0.0	0.0	0.0	22.2
1978	0.0	0.0	0.0	0.0	7.9	4.9	16.2	0.0	0.1	0.0	0.0	0.0	29.1
1979	0.0	0.0	0.0	0.0	2.0	8.1	15.1	8.7	1.8	0.0	0.0	0.0	35.8
1980	0.0	0.0	0.0	0.0	0.0	11.4	16.1	8.4	3.5	0.0	0.0	0.0	39.4
1981	0.0	0.0	0.0	0.0	10.2	5.6	5.9	3.8	5.1	0.1	0.0	0.0	30.6
1982	0.0	0.0	0.0	0.0	5.5	4.7	9.1	5.0	2.6	0.0	0.0	0.0	26.9
1983	0.0	0.0	0.0	0.0	0.0	6.6	15.0	13.2	3.0	0.0	0.0	0.0	37.8
1984	0.0	0.0	0.0	0.0	8.9	4.5	4.0	6.5	1.4	0.0	0.0	0.0	25.4
1985	0.0	0.0	0.0	0.0	10.4	7.6	1.9	0.0	0.0	0.0	0.0	0.0	19.8
1986	0.0	0.0	0.0	0.0	10.2	5.9	15.6	5.4	1.3	0.0	0.0	0.0	38.4
1987	0.0	0.0	0.0	0.0	7.9	7.2	4.5	9.3	1.0	0.0	0.0	0.0	29.9
1988	0.0	0.0	0.0	0.0	10.2	8.0	10.0	10.5	1.4	0.0	0.0	0.0	40.1
1989	0.0	0.0	0.0	0.0	10.2	6.2	7.3	8.6	3.4	0.0	0.0	0.0	35.7
1990	0.0	0.0	0.0	0.0	10.2	5.9	13.3	13.4	3.4	0.0	0.0	0.0	46.1
1991	0.0	0.0	0.0	0.0	9.9	4.2	14.9	10.1	2.5	0.0	0.0	0.0	41.5
1992	0.0	0.0	0.0	0.0	8.7	3.4	8.8	7.4	1.9	0.0	0.0	0.0	30.3
1993	0.0	0.0	0.0	0.0	10.2	5.5	14.5	15.9	2.5	0.0	0.0	0.0	48.6
1994	0.0	0.0	0.0	0.0	2.1	8.9	13.1	3.3	2.2	0.0	0.0	0.0	29.5
1995	0.0	0.0	0.0	0.0	0.0	6.1	15.8	18.8	6.0	0.0	0.0	0.0	46.6
1996	0.0	0.0	0.0	0.0	0.7	6.2	15.3	17.6	2.3	0.0	0.0	0.0	42.1
1997	0.0	0.0	0.0	0.0	3.4	3.5	7.2	9.5	2.3	0.0	0.0	0.0	26.0
1998	0.0	0.0	0.0	0.0	6.9	6.4	14.5	19.0	5.5	0.0	0.0	0.0	52.3
1999	0.0	0.0	0.0	0.0	1.1	2.9	16.6	14.5	3.0	0.0	0.0	0.0	38.1
2000	0.0	0.0	0.0	0.0	5.3	10.4	19.3	10.4	0.0	0.0	0.0	0.0	45.4
2001	0.0	0.0	0.0	0.0	10.2	9.0	18.1	18.4	2.1	0.0	0.0	0.0	57.8
2002	0.0	0.0	0.0	0.0	0.0	12.7	20.6	1.0	0.0	0.0	0.0	0.0	34.2
2003	0.0	0.0	0.0	0.0	5.9	7.2	18.7	5.9	0.0	0.0	0.0	0.0	37.7
2004	0.0	0.0	0.9	0.0	5.2	10.6	6.7	8.6	3.0	0.0	0.0	0.0	35.1
2005	0.0	0.0	0.0	0.0	10.2	4.0	15.9	11.2	0.0	0.6	0.0	0.0	41.8
2006	0.0	0.0	0.0	0.0	10.3	15.3	7.5	9.5	1.4	0.0	0.0	0.0	44.0
2007	0.0	0.0	0.0	0.0	10.0	9.2	9.4	5.9	2.8	1.0	0.0	0.0	38.4
2008	0.0	0.0	0.0	0.6	6.9	4.7	17.3	8.8	3.7	1.7	0.0	0.0	43.7
Average	**0.0**	**0.0**	**0.0**	**0.0**	**6.5**	**7.1**	**11.9**	**8.6**	**2.0**	**0.1**	**0.0**	**0.0**	**36.3**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**19.8**
Max	**0.0**	**0.0**	**0.9**	**0.6**	**10.4**	**17.0**	**20.6**	**19.0**	**6.0**	**1.7**	**0.0**	**0.0**	**57.8**

Table A-12. Consumptive Use of All Water Supplies - Hill
(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	6.4	9.8	2.5	0.0	1.0	0.0	0.0	0.0	19.6
1976	0.0	0.0	0.0	0.0	6.1	9.9	0.0	0.0	0.1	0.0	0.0	0.0	16.1
1977	0.0	0.0	0.0	0.0	2.4	10.8	0.0	0.0	0.7	0.0	0.0	0.0	13.9
1978	0.0	0.0	0.0	0.0	3.7	16.4	0.6	0.0	1.2	0.0	0.0	0.0	21.9
1979	0.0	0.0	0.0	0.0	1.0	8.6	5.7	0.0	1.5	0.0	0.0	0.0	16.8
1980	0.0	0.0	0.0	0.0	0.0	15.5	0.8	0.0	1.8	0.0	0.0	0.0	18.2
1981	0.0	0.0	0.0	0.0	6.1	8.7	0.2	0.0	3.6	0.1	0.0	0.0	18.7
1982	0.0	0.0	0.0	0.0	2.6	7.8	0.0	0.0	0.0	0.0	0.0	0.0	10.3
1983	0.0	0.0	0.0	0.0	0.0	3.1	6.6	0.0	2.9	0.0	0.0	0.0	12.5
1984	0.0	0.0	0.0	0.0	4.2	11.0	2.0	0.0	2.5	0.0	0.0	0.0	19.7
1985	0.0	0.0	0.0	0.0	8.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.2
1986	0.0	0.0	0.0	0.0	9.2	2.9	0.0	0.0	0.7	0.0	0.0	0.0	12.8
1987	0.0	0.0	0.0	0.0	3.7	8.9	0.0	0.0	0.6	0.0	0.0	0.0	13.1
1988	0.0	0.0	0.0	0.0	6.5	10.3	0.0	0.0	0.8	0.0	0.0	0.0	17.6
1989	0.0	0.0	0.0	0.0	9.9	5.1	0.0	0.0	1.4	0.0	0.0	0.0	16.4
1990	0.0	0.0	0.0	0.0	7.8	3.1	0.0	0.0	1.9	0.0	0.0	0.0	12.9
1991	0.0	0.0	0.0	0.0	6.5	6.5	0.0	0.0	1.4	0.0	0.0	0.0	14.4
1992	0.0	0.0	0.0	0.0	10.5	4.3	0.0	0.0	1.1	0.0	0.0	0.0	15.8
1993	0.0	0.0	0.0	0.0	5.4	11.4	3.8	0.0	1.3	0.0	0.0	0.0	22.0
1994	0.0	0.0	0.0	0.0	6.5	0.0	0.0	0.0	1.2	0.0	0.0	0.0	7.7
1995	0.0	0.0	0.0	0.0	0.0	2.9	12.0	0.0	0.2	0.0	0.0	0.0	15.1
1996	0.0	0.0	0.0	0.0	11.5	0.0	0.0	0.0	1.2	0.0	0.0	0.0	12.7
1997	0.0	0.0	0.0	0.0	8.7	6.3	0.0	0.0	1.1	0.0	0.0	0.0	16.1
1998	0.0	0.0	0.0	0.0	12.1	0.0	0.0	0.0	3.1	0.0	0.0	0.0	15.1
1999	0.0	0.0	0.0	0.0	0.5	7.7	0.0	0.0	0.2	0.0	0.0	0.0	8.5
2000	0.0	0.0	0.0	0.0	8.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1
2001	0.0	0.0	0.0	0.0	5.6	7.1	0.0	0.0	1.2	0.0	0.0	0.0	13.9
2002	0.0	0.0	0.0	0.0	0.0	6.4	8.7	0.0	0.0	0.0	0.0	0.0	15.2
2003	0.0	0.0	0.0	0.0	2.8	9.1	0.0	0.0	0.2	0.0	0.0	0.0	12.1
2004	0.0	0.0	0.4	0.0	2.4	13.7	3.6	0.9	1.0	0.0	0.0	0.0	22.1
2005	0.0	0.0	0.0	0.0	9.1	2.6	0.0	0.0	0.0	0.3	0.0	0.0	12.1
2006	0.0	0.0	0.0	0.0	10.7	0.9	0.0	0.0	0.8	0.0	0.0	0.0	12.4
2007	0.0	0.0	0.0	0.0	7.7	3.3	0.0	0.0	1.6	0.5	0.0	0.0	13.1
2008	0.0	0.0	0.0	0.3	3.2	7.9	0.0	0.0	1.9	0.9	0.0	0.0	14.3
Average	**0.0**	**0.0**	**0.0**	**0.0**	**5.6**	**6.6**	**1.4**	**0.0**	**1.1**	**0.1**	**0.0**	**0.0**	**14.7**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**7.7**
Max	**0.0**	**0.0**	**0.4**	**0.3**	**12.1**	**16.4**	**12.0**	**0.9**	**3.6**	**0.9**	**0.0**	**0.0**	**22.1**

Table A-13. Consumptive Use of All Water Supplies - Sondrup
(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	14.7	22.0	41.1	0.1	0.0	0.0	0.0	0.0	77.9
1976	0.0	0.0	0.0	0.0	14.1	37.7	1.6	3.6	0.2	0.0	0.0	0.0	57.2
1977	0.0	0.0	0.0	0.0	5.6	22.2	0.0	0.0	0.0	0.0	0.0	0.0	27.7
1978	0.0	0.0	0.0	0.0	8.6	37.7	28.6	0.0	0.1	0.0	0.0	0.0	75.0
1979	0.0	0.0	0.0	0.0	2.2	19.9	36.0	8.3	2.0	0.0	0.0	0.0	68.3
1980	0.0	0.0	0.0	0.0	0.0	35.8	29.9	7.5	3.4	0.0	0.0	0.0	76.5
1981	0.0	0.0	0.0	0.0	14.0	16.6	5.6	3.5	4.7	0.2	0.0	0.0	44.7
1982	0.0	0.0	0.0	0.0	5.9	20.5	28.5	4.5	2.3	0.0	0.0	0.0	61.7
1983	0.0	0.0	0.0	0.0	0.0	7.1	41.7	14.3	3.3	0.0	0.0	0.0	66.3
1984	0.0	0.0	0.0	0.0	9.6	25.4	3.9	6.0	1.2	0.0	0.0	0.0	46.2
1985	0.0	0.0	0.0	0.0	20.0	34.0	2.0	0.0	0.0	0.0	0.0	0.0	56.0
1986	0.0	0.0	0.0	0.0	21.1	36.9	22.7	4.8	1.2	0.0	0.0	0.0	86.7
1987	0.0	0.0	0.0	0.0	8.5	19.5	4.0	8.2	0.9	0.0	0.0	0.0	41.1
1988	0.0	0.0	0.0	0.0	14.9	46.1	9.9	9.3	1.2	0.0	0.0	0.0	81.5
1989	0.0	0.0	0.0	0.0	22.8	23.5	6.5	7.7	3.1	0.0	0.0	0.0	63.6
1990	0.0	0.0	0.0	0.0	18.0	31.4	19.1	11.9	3.0	0.0	0.0	0.0	83.5
1991	0.0	0.0	0.0	0.0	14.9	33.0	14.9	9.0	2.2	0.0	0.0	0.0	74.0
1992	0.0	0.0	0.0	0.0	24.2	23.5	8.0	6.6	1.7	0.0	0.0	0.0	63.9
1993	0.0	0.0	0.0	0.0	12.5	26.2	38.4	18.5	2.4	0.0	0.0	0.0	97.9
1994	0.0	0.0	0.0	0.0	22.4	21.2	16.8	3.0	2.0	0.0	0.0	0.0	65.4
1995	0.0	0.0	0.0	0.0	0.0	6.6	39.2	16.7	5.4	0.0	0.0	0.0	67.9
1996	0.0	0.0	0.0	0.0	32.1	36.3	29.3	18.3	2.2	0.0	0.0	0.0	118.0
1997	0.0	0.0	0.0	0.0	20.0	20.3	38.6	11.1	2.5	0.0	0.0	0.0	92.6
1998	0.0	0.0	0.0	0.0	28.7	31.0	42.1	36.5	5.0	0.0	0.0	0.0	143.3
1999	0.0	0.0	0.0	0.0	1.2	24.0	44.7	28.5	2.7	0.0	0.0	0.0	101.1
2000	0.0	0.0	0.0	0.0	18.6	31.0	35.1	9.2	0.0	0.0	0.0	0.0	94.0
2001	0.0	0.0	0.0	0.0	12.8	36.5	28.5	21.7	1.9	0.0	0.0	0.0	101.5
2002	0.0	0.0	0.0	0.0	0.0	14.8	24.9	0.9	0.0	0.0	0.0	0.0	40.6
2003	0.0	0.0	0.0	0.0	6.4	33.0	18.5	5.2	0.0	0.0	0.0	0.0	63.0
2004	0.0	0.0	1.0	0.0	5.6	30.0	6.8	7.7	2.7	0.0	0.0	0.0	53.8
2005	0.0	0.0	0.0	0.0	21.0	31.6	15.4	9.9	0.0	0.6	0.0	0.0	78.6
2006	0.0	0.0	0.0	0.0	24.6	32.2	6.7	8.4	1.3	0.0	0.0	0.0	73.2
2007	0.0	0.0	0.0	0.1	17.7	33.0	8.4	5.2	2.5	1.1	0.0	0.0	68.0
2008	0.0	0.0	0.0	0.5	7.4	31.9	22.8	8.0	3.5	1.5	0.0	0.0	75.6
Average	**0.0**	**0.0**	**0.0**	**0.0**	**13.2**	**27.4**	**21.2**	**9.2**	**1.9**	**0.1**	**0.0**	**0.0**	**73.1**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**6.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**27.7**
Max	**0.0**	**0.0**	**1.0**	**0.5**	**32.1**	**46.1**	**44.7**	**36.5**	**5.4**	**1.5**	**0.0**	**0.0**	**143.3**

Table A-14. Consumptive Use of All Water Supplies - Johnson

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	8.4	4.1	23.5	19.7	7.5	0.0	0.0	0.0	63.2
1976	0.0	0.0	0.0	0.0	8.0	8.6	13.6	2.0	0.1	0.0	0.0	0.0	32.4
1977	0.0	0.0	0.0	0.0	3.2	32.1	14.8	22.8	5.6	0.0	0.0	0.0	78.5
1978	0.0	0.0	0.0	0.0	4.9	6.6	25.7	25.3	9.2	0.0	0.0	0.0	71.7
1979	0.0	0.0	0.0	0.0	1.3	3.5	22.1	13.7	6.3	0.0	0.0	0.0	46.8
1980	0.0	0.0	0.0	0.0	0.0	18.2	22.3	5.1	0.8	0.0	0.0	0.0	46.4
1981	0.0	0.0	0.0	0.0	8.1	14.2	20.6	11.3	7.3	0.0	0.0	0.0	61.4
1982	0.0	0.0	0.0	0.0	3.4	11.7	14.5	24.6	1.2	0.0	0.0	0.0	55.3
1983	0.0	0.0	0.0	0.0	0.0	4.1	23.8	24.6	13.2	0.0	0.0	0.0	65.7
1984	0.0	0.0	0.0	0.0	5.5	8.1	12.9	16.6	13.7	0.0	0.0	0.0	56.8
1985	0.0	0.0	0.0	0.0	11.4	17.1	1.1	0.0	0.0	0.0	0.0	0.0	29.7
1986	0.0	0.0	0.0	0.0	12.1	9.4	11.1	0.0	0.0	0.0	0.0	0.0	32.6
1987	0.0	0.0	0.0	0.0	4.9	9.8	0.0	0.0	0.0	0.0	0.0	0.0	14.6
1988	0.0	0.0	0.0	0.0	8.5	15.0	3.3	0.0	0.0	0.0	0.0	0.0	26.8
1989	0.0	0.0	0.0	0.0	13.1	10.0	0.0	0.1	0.0	0.0	0.0	0.0	23.2
1990	0.0	0.0	0.0	0.0	10.3	9.4	10.2	0.1	0.0	0.0	0.0	0.0	30.0
1991	0.0	0.0	0.0	0.0	8.5	12.8	2.7	0.1	0.0	0.0	0.0	0.0	24.1
1992	0.0	0.0	0.0	0.0	13.8	5.5	0.6	0.0	0.0	0.0	0.0	0.0	19.8
1993	0.0	0.0	0.0	0.0	7.0	14.4	19.2	0.0	0.0	0.0	0.0	0.0	40.6
1994	0.0	0.0	0.0	0.0	12.8	12.1	0.1	0.3	0.0	0.0	0.0	0.0	25.4
1995	0.0	0.0	0.0	0.0	0.0	3.8	22.3	0.0	0.0	0.0	0.0	0.0	26.1
1996	0.0	0.0	0.0	0.0	16.2	9.9	14.6	0.3	0.5	0.0	0.0	0.0	41.5
1997	0.0	0.0	0.0	0.0	11.5	7.5	7.2	3.6	1.4	0.0	0.0	0.0	31.2
1998	0.0	0.0	0.0	0.0	16.2	10.2	15.5	0.0	0.4	0.0	0.0	0.0	42.2
1999	0.0	0.0	0.0	0.0	0.7	13.7	14.5	0.0	0.0	0.0	0.0	0.0	28.9
2000	0.0	0.0	0.0	0.0	10.6	13.2	0.0	0.0	0.0	0.0	0.0	0.0	23.8
2001	0.0	0.0	0.0	0.0	7.3	12.2	0.5	0.0	0.0	0.0	0.0	0.0	20.0
2002	0.0	0.0	0.0	0.0	0.0	8.5	29.4	3.6	0.0	0.0	0.0	0.0	41.4
2003	0.0	0.0	0.0	0.0	3.6	16.2	12.2	13.0	1.7	0.0	0.0	0.0	46.7
2004	0.0	0.0	0.6	0.0	3.2	20.3	4.7	0.0	0.0	0.0	0.0	0.0	28.8
2005	0.0	0.0	0.0	0.0	12.0	6.3	4.2	1.4	0.2	0.4	0.0	0.0	24.4
2006	0.0	0.0	0.0	0.0	14.1	19.9	0.0	0.0	0.0	0.0	0.0	0.0	33.9
2007	0.0	0.0	0.0	0.0	10.0	16.4	0.0	0.0	0.0	0.6	0.0	0.0	27.0
2008	0.0	0.0	0.0	0.0	4.2	15.0	9.5	0.4	0.8	0.0	0.0	0.0	29.9
Average	**0.0**	**0.0**	**0.0**	**0.0**	**7.5**	**11.8**	**11.1**	**5.5**	**2.1**	**0.0**	**0.0**	**0.0**	**38.0**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**14.6**
Max	**0.0**	**0.0**	**0.6**	**0.0**	**16.2**	**32.1**	**29.4**	**25.3**	**13.7**	**0.6**	**0.0**	**0.0**	**78.5**

Table A-15. Consumptive Use of Lake Canal Company Supplies - Buchleiter

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	7.1	2.4	15.0	0.1	0.0	0.0	0.0	0.0	24.7
1976	0.0	0.0	0.0	0.0	10.2	5.4	1.5	3.3	0.2	0.0	0.0	0.0	20.5
1977	0.0	0.0	0.0	0.0	5.2	17.0	0.0	0.0	0.0	0.0	0.0	0.0	22.2
1978	0.0	0.0	0.0	0.0	7.9	4.9	16.2	0.0	0.1	0.0	0.0	0.0	29.1
1979	0.0	0.0	0.0	0.0	2.0	8.1	15.1	2.9	1.8	0.0	0.0	0.0	30.0
1980	0.0	0.0	0.0	0.0	0.0	11.4	16.1	0.1	1.4	0.0	0.0	0.0	28.9
1981	0.0	0.0	0.0	0.0	10.2	5.6	2.2	0.8	1.1	0.0	0.0	0.0	19.9
1982	0.0	0.0	0.0	0.0	5.5	4.7	9.1	0.0	0.0	0.0	0.0	0.0	19.3
1983	0.0	0.0	0.0	0.0	0.0	6.6	15.0	13.2	3.0	0.0	0.0	0.0	37.8
1984	0.0	0.0	0.0	0.0	8.9	4.5	1.9	1.1	0.1	0.0	0.0	0.0	16.5
1985	0.0	0.0	0.0	0.0	10.4	7.6	1.9	0.0	0.0	0.0	0.0	0.0	19.8
1986	0.0	0.0	0.0	0.0	10.2	5.9	15.6	0.0	0.0	0.0	0.0	0.0	31.7
1987	0.0	0.0	0.0	0.0	7.9	7.2	0.0	0.0	0.0	0.0	0.0	0.0	15.1
1988	0.0	0.0	0.0	0.0	10.2	8.0	5.4	0.0	0.0	0.0	0.0	0.0	23.5
1989	0.0	0.0	0.0	0.0	10.2	6.2	0.0	0.2	0.0	0.0	0.0	0.0	16.6
1990	0.0	0.0	0.0	0.0	10.2	5.9	13.3	0.1	0.0	0.0	0.0	0.0	29.5
1991	0.0	0.0	0.0	0.0	10.2	4.2	4.4	0.2	0.0	0.0	0.0	0.0	18.9
1992	0.0	0.0	0.0	0.0	10.2	3.4	0.9	0.0	0.0	0.0	0.0	0.0	14.5
1993	0.0	0.0	0.0	0.0	10.2	5.5	14.5	0.0	0.0	0.0	0.0	0.0	30.2
1994	0.0	0.0	0.0	0.0	10.2	8.9	0.2	0.6	0.0	0.0	0.0	0.0	19.8
1995	0.0	0.0	0.0	0.0	0.0	6.1	15.8	0.0	0.0	0.0	0.0	0.0	21.9
1996	0.0	0.0	0.0	0.0	10.2	6.2	15.3	0.4	0.8	0.0	0.0	0.0	32.9
1997	0.0	0.0	0.0	0.0	10.2	3.5	7.2	5.9	2.3	0.0	0.0	0.0	29.1
1998	0.0	0.0	0.0	0.0	10.2	6.4	14.5	0.0	0.6	0.0	0.0	0.0	31.6
1999	0.0	0.0	0.0	0.0	1.1	9.1	16.6	0.0	0.0	0.0	0.0	0.0	26.8
2000	0.0	0.0	0.0	0.0	11.1	10.4	0.0	0.0	0.0	0.0	0.0	0.0	21.5
2001	0.0	0.0	0.0	0.0	10.2	9.0	0.7	0.0	0.0	0.0	0.0	0.0	19.9
2002	0.0	0.0	0.0	0.0	0.0	13.8	0.3	0.0	0.0	0.0	0.0	0.0	14.1
2003	0.0	0.0	0.0	0.0	5.9	7.2	9.9	0.0	0.0	0.0	0.0	0.0	23.1
2004	0.0	0.0	0.9	0.0	5.2	10.6	4.5	0.0	0.0	0.0	0.0	0.0	21.3
2005	0.0	0.0	0.0	0.0	10.2	4.0	6.7	0.0	0.0	0.6	0.0	0.0	21.5
2006	0.0	0.0	0.0	0.0	10.3	15.3	0.0	0.0	0.0	0.0	0.0	0.0	25.6
2007	0.0	0.0	0.0	0.0	10.2	9.2	0.0	0.0	0.0	1.0	0.0	0.0	20.4
2008	0.0	0.0	0.0	0.0	6.9	4.7	15.4	0.6	1.4	0.0	0.0	0.0	29.0
Average	**0.0**	**0.0**	**0.0**	**0.0**	**7.6**	**7.3**	**7.5**	**0.9**	**0.4**	**0.0**	**0.0**	**0.0**	**23.7**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**2.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**14.1**
Max	**0.0**	**0.0**	**0.9**	**0.0**	**11.1**	**17.0**	**16.6**	**13.2**	**3.0**	**1.0**	**0.0**	**0.0**	**37.8**

Table A-16. Consumptive Use of Lake Canal Company Supplies - Hill

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	6.4	9.6	2.7	0.0	0.0	0.0	0.0	0.0	18.7
1976	0.0	0.0	0.0	0.0	6.1	10.8	0.0	0.0	0.1	0.0	0.0	0.0	17.0
1977	0.0	0.0	0.0	0.0	2.4	9.6	0.0	0.0	0.0	0.0	0.0	0.0	12.0
1978	0.0	0.0	0.0	0.0	3.7	16.4	1.3	0.0	0.0	0.0	0.0	0.0	21.5
1979	0.0	0.0	0.0	0.0	1.0	8.6	6.8	0.0	0.9	0.0	0.0	0.0	17.3
1980	0.0	0.0	0.0	0.0	0.0	15.5	1.5	0.0	0.6	0.0	0.0	0.0	17.6
1981	0.0	0.0	0.0	0.0	6.1	6.9	1.0	0.4	0.5	0.0	0.0	0.0	15.0
1982	0.0	0.0	0.0	0.0	2.6	8.9	2.1	0.0	0.0	0.0	0.0	0.0	13.5
1983	0.0	0.0	0.0	0.0	0.0	3.1	6.6	0.0	1.4	0.0	0.0	0.0	11.1
1984	0.0	0.0	0.0	0.0	4.2	11.0	0.9	0.5	0.0	0.0	0.0	0.0	16.6
1985	0.0	0.0	0.0	0.0	8.7	1.9	0.0	0.0	0.0	0.0	0.0	0.0	10.6
1986	0.0	0.0	0.0	0.0	9.2	2.9	0.0	0.0	0.0	0.0	0.0	0.0	12.0
1987	0.0	0.0	0.0	0.0	3.7	7.4	0.0	0.0	0.0	0.0	0.0	0.0	11.1
1988	0.0	0.0	0.0	0.0	6.5	10.9	0.0	0.0	0.0	0.0	0.0	0.0	17.4
1989	0.0	0.0	0.0	0.0	9.9	5.9	0.0	0.0	0.0	0.0	0.0	0.0	15.9
1990	0.0	0.0	0.0	0.0	7.8	4.5	0.0	0.0	0.0	0.0	0.0	0.0	12.3
1991	0.0	0.0	0.0	0.0	6.5	8.4	0.0	0.0	0.0	0.0	0.0	0.0	14.9
1992	0.0	0.0	0.0	0.0	10.5	5.7	0.0	0.0	0.0	0.0	0.0	0.0	16.2
1993	0.0	0.0	0.0	0.0	5.3	11.4	5.0	0.0	0.0	0.0	0.0	0.0	21.7
1994	0.0	0.0	0.0	0.0	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.8
1995	0.0	0.0	0.0	0.0	0.0	2.9	13.2	0.0	0.0	0.0	0.0	0.0	16.1
1996	0.0	0.0	0.0	0.0	11.7	0.0	0.0	0.0	0.4	0.0	0.0	0.0	12.0
1997	0.0	0.0	0.0	0.0	8.7	7.1	0.0	0.0	1.1	0.0	0.0	0.0	16.9
1998	0.0	0.0	0.0	0.0	12.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	12.3
1999	0.0	0.0	0.0	0.0	0.5	10.4	0.1	0.0	0.0	0.0	0.0	0.0	11.0
2000	0.0	0.0	0.0	0.0	8.1	1.2	0.0	0.0	0.0	0.0	0.0	0.0	9.3
2001	0.0	0.0	0.0	0.0	5.6	7.1	0.0	0.0	0.0	0.0	0.0	0.0	12.7
2002	0.0	0.0	0.0	0.0	0.0	6.4	0.1	0.0	0.0	0.0	0.0	0.0	6.6
2003	0.0	0.0	0.0	0.0	2.8	14.3	0.0	0.0	0.0	0.0	0.0	0.0	17.0
2004	0.0	0.0	0.4	0.0	2.4	12.6	2.1	0.0	0.0	0.0	0.0	0.0	17.6
2005	0.0	0.0	0.0	0.0	9.1	3.7	0.0	0.0	0.0	0.3	0.0	0.0	13.1
2006	0.0	0.0	0.0	0.0	10.7	1.0	0.0	0.0	0.0	0.0	0.0	0.0	11.7
2007	0.0	0.0	0.0	0.0	7.6	4.3	0.0	0.0	0.0	0.5	0.0	0.0	12.3
2008	0.0	0.0	0.0	0.0	3.2	9.8	0.0	0.0	0.6	0.0	0.0	0.0	13.7
Average	**0.0**	**0.0**	**0.0**	**0.0**	**5.6**	**7.1**	**1.3**	**0.0**	**0.2**	**0.0**	**0.0**	**0.0**	**14.2**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**6.6**
Max	**0.0**	**0.0**	**0.4**	**0.0**	**12.1**	**16.4**	**13.2**	**0.5**	**1.4**	**0.5**	**0.0**	**0.0**	**21.7**

Table A-17. Consumptive Use of Lake Canal Company Supplies - Sondrup

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	14.7	22.0	41.1	0.1	0.0	0.0	0.0	0.0	77.9
1976	0.0	0.0	0.0	0.0	14.1	37.7	1.6	3.6	0.2	0.0	0.0	0.0	57.2
1977	0.0	0.0	0.0	0.0	5.6	22.2	0.0	0.0	0.0	0.0	0.0	0.0	27.7
1978	0.0	0.0	0.0	0.0	8.6	37.7	28.6	0.0	0.1	0.0	0.0	0.0	75.0
1979	0.0	0.0	0.0	0.0	2.2	19.9	34.7	3.1	2.0	0.0	0.0	0.0	61.8
1980	0.0	0.0	0.0	0.0	0.0	35.8	24.9	0.1	1.5	0.0	0.0	0.0	62.3
1981	0.0	0.0	0.0	0.0	14.0	16.0	2.4	0.9	1.2	0.0	0.0	0.0	34.4
1982	0.0	0.0	0.0	0.0	5.9	20.5	25.8	0.0	0.0	0.0	0.0	0.0	52.2
1983	0.0	0.0	0.0	0.0	0.0	7.1	41.7	14.3	3.3	0.0	0.0	0.0	66.3
1984	0.0	0.0	0.0	0.0	9.6	25.4	2.0	1.2	0.1	0.0	0.0	0.0	38.3
1985	0.0	0.0	0.0	0.0	20.0	34.0	2.0	0.0	0.0	0.0	0.0	0.0	56.0
1986	0.0	0.0	0.0	0.0	21.1	36.9	19.4	0.0	0.0	0.0	0.0	0.0	77.4
1987	0.0	0.0	0.0	0.0	8.5	17.1	0.0	0.0	0.0	0.0	0.0	0.0	25.6
1988	0.0	0.0	0.0	0.0	14.9	46.1	5.8	0.0	0.0	0.0	0.0	0.0	66.8
1989	0.0	0.0	0.0	0.0	22.8	21.2	0.0	0.2	0.0	0.0	0.0	0.0	44.3
1990	0.0	0.0	0.0	0.0	18.0	31.4	17.8	0.1	0.0	0.0	0.0	0.0	67.4
1991	0.0	0.0	0.0	0.0	14.9	33.0	4.7	0.2	0.0	0.0	0.0	0.0	52.7
1992	0.0	0.0	0.0	0.0	24.2	23.5	1.0	0.0	0.0	0.0	0.0	0.0	48.6
1993	0.0	0.0	0.0	0.0	12.3	26.2	33.6	0.0	0.0	0.0	0.0	0.0	72.1
1994	0.0	0.0	0.0	0.0	22.4	21.2	0.2	0.6	0.0	0.0	0.0	0.0	44.4
1995	0.0	0.0	0.0	0.0	0.0	6.6	39.0	0.0	0.0	0.0	0.0	0.0	45.7
1996	0.0	0.0	0.0	0.0	32.1	36.3	25.6	0.5	0.9	0.0	0.0	0.0	95.3
1997	0.0	0.0	0.0	0.0	20.0	20.3	12.7	6.3	2.5	0.0	0.0	0.0	61.9
1998	0.0	0.0	0.0	0.0	28.7	31.0	27.1	0.0	0.7	0.0	0.0	0.0	87.4
1999	0.0	0.0	0.0	0.0	1.2	24.0	25.4	0.0	0.0	0.0	0.0	0.0	50.6
2000	0.0	0.0	0.0	0.0	18.6	23.1	0.0	0.0	0.0	0.0	0.0	0.0	41.7
2001	0.0	0.0	0.0	0.0	12.8	21.3	0.8	0.0	0.0	0.0	0.0	0.0	35.0
2002	0.0	0.0	0.0	0.0	0.0	14.8	0.3	0.0	0.0	0.0	0.0	0.0	15.1
2003	0.0	0.0	0.0	0.0	6.4	33.0	10.7	0.0	0.0	0.0	0.0	0.0	50.0
2004	0.0	0.0	1.0	0.0	5.6	29.1	4.9	0.0	0.0	0.0	0.0	0.0	40.6
2005	0.0	0.0	0.0	0.0	21.0	31.6	7.3	0.0	0.0	0.6	0.0	0.0	60.6
2006	0.0	0.0	0.0	0.0	24.6	26.8	0.0	0.0	0.0	0.0	0.0	0.0	51.4
2007	0.0	0.0	0.0	0.0	17.4	33.0	0.0	0.0	0.0	1.1	0.0	0.0	51.5
2008	0.0	0.0	0.0	0.0	7.4	31.9	16.6	0.7	1.5	0.0	0.0	0.0	58.1
Average	**0.0**	**0.0**	**0.0**	**0.0**	**13.2**	**26.4**	**13.5**	**0.9**	**0.4**	**0.1**	**0.0**	**0.0**	**54.5**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**6.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**15.1**
Max	**0.0**	**0.0**	**1.0**	**0.0**	**32.1**	**46.1**	**41.7**	**14.3**	**3.3**	**1.1**	**0.0**	**0.0**	**95.3**

Table A-18. Consumptive Use of Lake Canal Company Supplies - Johnson

(all values in acre-feet)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1975	0.0	0.0	0.0	0.0	8.4	4.1	23.5	0.1	0.0	0.0	0.0	0.0	36.1
1976	0.0	0.0	0.0	0.0	8.0	14.3	0.9	2.0	0.1	0.0	0.0	0.0	25.4
1977	0.0	0.0	0.0	0.0	3.2	12.7	0.0	0.0	0.0	0.0	0.0	0.0	15.8
1978	0.0	0.0	0.0	0.0	4.9	15.6	16.4	0.0	0.1	0.0	0.0	0.0	36.9
1979	0.0	0.0	0.0	0.0	1.3	11.4	19.8	1.8	1.1	0.0	0.0	0.0	35.3
1980	0.0	0.0	0.0	0.0	0.0	18.2	14.2	0.1	0.8	0.0	0.0	0.0	33.3
1981	0.0	0.0	0.0	0.0	8.1	9.1	1.4	0.5	0.7	0.0	0.0	0.0	19.7
1982	0.0	0.0	0.0	0.0	3.4	11.7	14.5	0.0	0.0	0.0	0.0	0.0	29.6
1983	0.0	0.0	0.0	0.0	0.0	4.1	23.8	8.1	1.9	0.0	0.0	0.0	37.9
1984	0.0	0.0	0.0	0.0	5.5	12.5	1.1	0.7	0.1	0.0	0.0	0.0	19.9
1985	0.0	0.0	0.0	0.0	11.4	17.1	1.1	0.0	0.0	0.0	0.0	0.0	29.7
1986	0.0	0.0	0.0	0.0	12.1	9.4	11.1	0.0	0.0	0.0	0.0	0.0	32.6
1987	0.0	0.0	0.0	0.0	4.9	9.8	0.0	0.0	0.0	0.0	0.0	0.0	14.6
1988	0.0	0.0	0.0	0.0	8.5	15.0	3.3	0.0	0.0	0.0	0.0	0.0	26.8
1989	0.0	0.0	0.0	0.0	13.1	10.0	0.0	0.1	0.0	0.0	0.0	0.0	23.2
1990	0.0	0.0	0.0	0.0	10.3	9.4	10.2	0.1	0.0	0.0	0.0	0.0	30.0
1991	0.0	0.0	0.0	0.0	8.5	12.8	2.7	0.1	0.0	0.0	0.0	0.0	24.1
1992	0.0	0.0	0.0	0.0	13.8	5.5	0.6	0.0	0.0	0.0	0.0	0.0	19.8
1993	0.0	0.0	0.0	0.0	7.0	14.4	19.2	0.0	0.0	0.0	0.0	0.0	40.6
1994	0.0	0.0	0.0	0.0	12.8	12.1	0.1	0.3	0.0	0.0	0.0	0.0	25.4
1995	0.0	0.0	0.0	0.0	0.0	3.8	22.3	0.0	0.0	0.0	0.0	0.0	26.1
1996	0.0	0.0	0.0	0.0	16.2	9.9	14.6	0.3	0.5	0.0	0.0	0.0	41.5
1997	0.0	0.0	0.0	0.0	11.5	7.5	7.2	3.6	1.4	0.0	0.0	0.0	31.2
1998	0.0	0.0	0.0	0.0	16.2	10.2	15.5	0.0	0.4	0.0	0.0	0.0	42.2
1999	0.0	0.0	0.0	0.0	0.7	13.7	14.5	0.0	0.0	0.0	0.0	0.0	28.9
2000	0.0	0.0	0.0	0.0	10.6	13.2	0.0	0.0	0.0	0.0	0.0	0.0	23.8
2001	0.0	0.0	0.0	0.0	7.3	12.2	0.5	0.0	0.0	0.0	0.0	0.0	20.0
2002	0.0	0.0	0.0	0.0	0.0	8.5	0.2	0.0	0.0	0.0	0.0	0.0	8.6
2003	0.0	0.0	0.0	0.0	3.6	16.2	6.1	0.0	0.0	0.0	0.0	0.0	25.9
2004	0.0	0.0	0.6	0.0	3.2	16.6	2.8	0.0	0.0	0.0	0.0	0.0	23.2
2005	0.0	0.0	0.0	0.0	12.0	6.3	4.2	0.0	0.0	0.4	0.0	0.0	22.9
2006	0.0	0.0	0.0	0.0	14.1	15.3	0.0	0.0	0.0	0.0	0.0	0.0	29.4
2007	0.0	0.0	0.0	0.0	10.0	16.4	0.0	0.0	0.0	0.6	0.0	0.0	27.0
2008	0.0	0.0	0.0	0.0	4.2	15.0	9.5	0.4	0.8	0.0	0.0	0.0	29.9
Average	**0.0**	**0.0**	**0.0**	**0.0**	**7.5**	**11.6**	**7.7**	**0.5**	**0.2**	**0.0**	**0.0**	**0.0**	**27.6**
Min	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**3.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**8.6**
Max	**0.0**	**0.0**	**0.6**	**0.0**	**16.2**	**18.2**	**23.8**	**8.1**	**1.9**	**0.6**	**0.0**	**0.0**	**42.2**

Appendix C: Accounting Form

Note:	This is a sample of summary data to be provided. Actual reports may be in the form of a database or direct data transfer.					
CWIC/Lake Canal Project						
Preliminary Accounting Worksheet Summary						
Date:	*2/27/2012*					
Reporting Period:		*June 1 - June 30*				
				Unit	Amount or Info	
					Day of Month	
					1	2
Fields (this section of the accounting will be repeated for each participating farm)						
	Farm #1 - Field #1					
	Crop:	*Corn*				
	Area (ac):	*50*				
	Soil:	*Silt Loam*				
	Code	Description				
		Farm Inflows				
			Measured headgate delivery	ac-ft		
			Water right used for irrigation		[water right name]	
			Measured effective rainfall	ac-ft		
		Farm Outflows				
			Measured deficit consumptive use	ac-ft		
			Measured surface return flow	ac-ft		
			Measured soil water content from previous reporting period	ac-ft		
			Measured soil water content at end of reporting period	ac-ft		
			Calculated deep percolation in field	ac-ft		
			Calculated on-farm delivery losses allocated to deep percolation	ac-ft		
		Baseline Consumptive Use and Return Flow Measurements				
			Measured baseline consumptive use	ac-ft		
			Measured baseline surface return flow	ac-ft		
			Measured baseline subsurface return flow	ac-ft		
		Impacts of deficit irrigation				
			Transferrable consumptive use	ac-ft		
			Change in surface return flows (i.e. surface return flow obligation)	ac-ft		
			Change in deep percolation (i.e. subsurface return flow obligation)	ac-ft		
Recharge Structures (this section will be repeated for each structure)						
	Pond #1					
			Amount			
	Code	Descri	(ac-ft)			
		Pond storage volume from previous day				
		Measured inflow (delivery to pond)		ac-ft		
		Evaporative Losses		ac-ft		
		Pond storage volume at end of day		ac-ft		
		Ground Water Recharge (calculated)		ac-ft		
				ac-ft		

Bypass activities						
	Code	**Description**				
		Total transferrable consumptive use from farms using direct flow water right		ac-ft		
		Total surface return flow obligation from farms using direct flow water right		ac-ft		
		Flows bypassed at river headgate		cfs		
Storage activities						
	Code	**Description**				
		Lake Canal Reservoir Company/South Grey Reservoir				
			Volume of stored, transferrable consumptive use from previous day	ac-ft		
			Total transferrable consumptive use from farms using LCRC storage	ac-ft		
			Reduction in release rate from reservoir	cfs		
			Evaporation losses on stored, transferrable consumptive use	ac-ft		
			Release of stored, transferrable consumptive use to C-BT water user	ac-ft		
			C-BT diversions bypassed at river headgate	cfs		
			Volume of stored, transferrable consumptive use at end of day	ac-ft		
		Cache La Poudre Reservoir Company/Timnath Reservoir				
			Volume of stored, transferrable consumptive use from previous day	ac-ft		
			Total transferrable consumptive use from farms using CLPRC storage	ac-ft		
			Reduction in release rate from reservoir	cfs		
			Evaporation losses on stored, transferrable consumptive use	ac-ft		
			Release of stored, transferrable consumptive use to C-BT water user	ac-ft		
			C-BT diversions bypassed at river headgate	cfs		
			Volume of stored, transferrable consumptive use at end of day	ac-ft		
Project Totals						
	Code	**Description**				
	90005	Total Transferrable Consumptive Use		ac-ft		
	90006	Total Effective Rainfall		ac-ft		
	90008	Total Surface Return Flow Obligation		ac-ft		
	90003	Total Subsurface Return Flow Obligation		ac-ft		
	90002	Total Pond Evaporation		ac-ft		
	90001	Total Reservoir Evaporation		ac-ft		
	90009	Total Change in Soil Water Content		ac-ft		
	90004	Total On-Farm Delivery Losses		ac-ft		
	90007	Total on-field Deep Percolation		ac-ft		

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APPENDIX B – COMMENTS TO IWSA APPLICATION

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WATER RESOURCES

John W. Hickenlooper
Governor

Mike King
Executive Director

Dick Wolfe, P.E.
Director/State Engineer

March 30, 2012

Robert W. Beccard, PE
Aqua Engineering
Transmission via email: Beccard@aquaengr.com

RE: IWSA for Colorado Water Innovation Cluster – Initial Questions/Comments

Dear Mr. Beccard:

We have conducted an initial review of the subject Interruptible Water Supply Agreement (IWSA) proposal received March 1, 2012. Per our phone call on March 23, 2012, we are holding onto your check for your team to consider proceeding with an IWSA or Substitute Water Supply Plan (SWSP) pursuant to Section 37-92-308(5), C.R.S. This project could potentially comply with either type of plan and the fee for a SWSP is lower ($300). An IWSA cannot approve out-of-priority depletions caused by diversions from surface or ground water sources and the replacement of those depletions. A 308(5) SWSP cannot approve depletions exceeding five years.

Below is a list of our initial questions/comments for the consideration of your team in advance of us meeting in person. Overall, most of our concerns are related to the historical consumptive use analysis and maintenance of historical return flows. Some of these concerns can be alleviated if we are provided with additional information and calculations.

Initial Comments:

1. The engineering report includes a consumptive use analysis based on the proposed crops to be grown in 2012, rather than the crops historically grown on the farm. Since 37-92-309(1), C.R.S. states the goal of IWSA is "to enable water users to transfer the historical consumptive use of an absolute water right", the transfer of saved consumptive use needs to be limited not only by the proposed deficit irrigated crop for the year of transfer, but also by the historical consumptive use. This approach is also consistent with the requirement for all change of water rights that such change cannot result in an expansion of use. Therefore, a historical consumptive use analysis based on actual crops grown on each farm is also necessary to assure that no expansion of use is occurring under this change. This historical consumptive use would then serve as an upper bound for the baseline consumptive use from which the savings is calculated.
2. Please provide all models and spreadsheets used in the historic use analysis.

3. We have concerns about the execution of the calibrated crop coefficient method for the historic use analysis. For the purposes of historic use analysis, the Modified Blaney-Criddle method may be more defensible.
4. Irrigation efficiency (60%) may be an overestimated for some of the farms.
5. The Water Borrowers will not be exercising an instream flow water right in the legal sense, as only CWCB can hold an instream flow water right. As such, the water commissioner will not be able to shepherd the saved consumptive use water past any diversion in priority, unless a downstream water user is identified. However, our understanding is that the next several diversions in priority after the Lake Ditch are downstream of Fort Collins, such that the goal of higher flows in the city could likely be accomplished by leaving Lake Ditch water in the stream. We recommend using a different term to describe the use of the water by the Water Borrowers to avoid confusion with CWCB's instream flow water rights.
6. Provide more explanation of the proposed exchange of water upstream in the Poudre from the Water Lenders' reservoirs for late summer operations. Our interpretation is that if a Lake Ditch water user calls for their C-BT water, that water would be released from Horsetooth Reservoir by NCWCD, but rather than that water being diverted into the Lake Ditch, it would be left in the stream and a like amount of water would be released from the Water Lenders' local storage for delivery to the farm. In addition, please provide evidence that NCWCD has approved of the proposed operations, since it involves C-BT water. Also, please provide evidence that all of the involved C-BT users are aware of and approve of this operation.
7. Provide the proposed timing of releases from storage in lieu of C-BT water delivery in order to show how the saved consumptive use water will be used. In addition, please clarify how this operation will work if the amount of consumptive use water in storage is less than the amount of C-BT water being delivered to the C-BT water users. All water that is subject of an IWSA must be used during the year the IWSA is exercised, based on the IWSA Rules.
8. Please provide proposed operation plans for each farm complete with diagrams of control areas, deficit irrigation areas, location of monitoring and recording equipment, size and location of recharge area.
9. The IWSA application specifies that subsurface return flows will be estimated, however it does not clarify how they will be estimated. Although the assumption of 60 percent efficiency on the farm is mentioned several times in the plan, we believe that daily mass balance calculations will not use the assumption of 60 percent, but would rather rely on measurements of soil moisture and calculated potential ET to divide subsurface water between actual consumptive use, soil moisture storage, and ground water return flow. Also, will the deficit irrigation ground water return flows via the recharge pit be tied to the 60 percent efficiency, or to the amount on an acre-foot per acre basis observed on the baseline field? Please provide all assumptions and

calculations that will be used to estimate the daily mass balance, particularly the subsurface return flows.

10. Please provide a description of the irrigation systems that will be use to irrigate the fields. How will they system be operated so that the crops at the beginning on the field don't receive a full water supply and the crops at the end of the field receive no supply? It seems that the irrigation efficiency could increase in a deficit irrigation system. Please clarify the basis for the assumption that the irrigation efficiency is the same in a system that receives a full supply of water as a system that only receives a partial supply of water.
11. Accurate measurements of soil moisture will be important in the calculation of consumptive use and ground water return flows. Explain how many soil moisture sensors you propose for each field, how they will be distributed on the field to account for the variation in water application across the field, and how the variation across each field will be accounted for in the daily mass balance. Will each sensor be representative of a particular zone in each field?
12. We expect that deficit irrigated fields will have a lower soil moisture content at the end of the irrigation season than fully irrigated fields. How do you propose to offset this lack of moisture in the soil at the end of the season to avoid injury to senior water rights?
13. How do you intend to use the aerial and satellite imagery obtained?
14. Please clarify how the measurement of surface return flows will take into consideration surface return flows from precipitation.
15. Pan evaporation is to be measured at the Windsor weather station. Which weather station will be used to estimate potential ET and precipitation? Will there be local wind or precipitation measurements on the farms? If not, considering the localized nature of wind and precipitation, how is the lack of on-site measurement justified?

The comments provided above are our initial comments, however we may have additional questions and concerns as we continue to review the plan, as comments are provided by other parties and as our questions shown above are addressed.

We expect to meet with you in the next week or two to discuss operations and the installation of monitoring equipment on the participating farms, as the equipment installation needs to be completed in the near future. Beyond that, we may continue discussing the saved consumptive use and transfer of that water pursuant to the IWSA or SWSP statutes.

Feel free to contact me for clarification or to provide the requested electronic materials. We look forward to meeting with you further on this project.

Sincerely,

Tracy Kosloff
Water Resources Engineer
303-866-3581 ext 8211

cc: Kevin Rein, Dave Nettles, Jeff Deatherage, Joanna Williams, George Varra

STATE OF COLORADO

Colorado Water Conservation Board
Department of Natural Resources
1313 Sherman Street, Room 721
Denver, Colorado 80203
Phone: (303) 866-3441
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www.cwcb.state.co.us

March 29, 2012

Kevin Rein, P.E.
Assistant State Engineer
Division of Water Resources
1313 Sherman St., Room 818
Denver, CO 80238

RE: INTERRUPTIBLE WATER SUPPLY AGREEMENT BETWEEN LAKE CANAL, FORT COLLINS, AND THE NATURE CONSERVANCY

Dear Mr. Rein:

The Colorado Water Conservation Board (CWCB) Stream and Lake Protection Section (ISF section) has received the request for approval of the Interruptible Water Supply Agreement (IWSA) between the Lake Canal, the City of Fort Collins, and the Nature Conservancy dated February 29, 2012. While the CWCB ISF section staff supports the efforts outlined in the proposal, we have a few comments pursuant to C.R.S. §37-92-309.

1. Applicant has stated that the "saved consumptive use" from the deficit irrigation practices that will be implemented under this plan will be used for "in-stream flows" in the Cache La Poudre River. To prevent confusion regarding the use of the saved consumptive use credits , the ISF section requests that any approval letter clearly state that the consumptive use credits are not included in the Colorado Water Conservation Board's Instream Flow Program and the water does not have protections pursuant to C.R.S. §37-92-102(3). We ask this because the CWCB has exclusive authority in Colorado to appropriate instream flows pursuant to C.R.S. §37-92-102(3), and Applicant has not requested that the saved consumptive use be protected through a particular stream reach. It also may help to use a different term instead of "in-stream flows" for the new use of this water because use of the term could cause confusion about whether the changed water is protected within the CWCB Instream Flow and Natural Lake Level Program.

2. The ISF section may have additional comments once the exchange reaches are more clearly identified and described. It appears that the exchanges could potentially extend up the Poudre River and into areas where CWCB holds instream flow water rights.

3. In this particular project, the CWCB does not hold ISF water rights in the immediate vicinity. However, since one goal of this demonstration project is to elicit comments regarding this type of project, the ISF section submits the following comments. If the project were in an area with existing ISF water rights, the CWCB ISF section would have concerns about the level of detail offered. Specifically, we would request more detail about the method of consumptive use quantification and maintenance of return flows in time, place and amount so as to not cause

injury. This IWSA request is different than a typical Substitute Water Supply Plan where the future out-of-priority depletions and replacements are quantified prior to the State Engineer's Office (SEO) approval. In this IWSA, the amount of future saved consumptive use water and return flow obligation from deficit irrigation is not quantified because the amounts are not known ahead of time. Rather, the applicant is requesting the SEO to approve the method of quantifying those values in the future, not the actual consumptive use or return flow obligation amounts. If the CWCB held water rights within or downstream of the Lake Canal Ditch, we would likely request ongoing SEO oversight regarding the computations and the ability for objectors to review the computations throughout the irrigation season. We may also request that Applicant evaluate the potential for crop consumptive water to be obtained through sub-irrigation.

You may reach me by telephone at (303) 866-3441 if you have any questions regarding this letter.

Sincerely,

Don West, P.E.
Water Resource Engineer

cc: Linda Bassi, Colorado Water Conservation Board
Kaylea White, Colorado Water Conservation Board
Todd Doherty, Colorado Water Conservation Board
Robert W. Beccard, P.E., Aqua Engineering, Inc.

FISCHER, BROWN, BARTLETT & GUNN, PC

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March 30, 2012

Ms. Joanna Williams, P.E.
Colorado Division of Water Resources
1313 Sherman Street, Room 818
Denver, CO 80203

Via Email: Joanna.Williams@State.Co.Us

Re: Application for Interruptible Water Supply Agreement
Lake Canal Company, the City of Fort Collins and the Nature Conservancy District
Comments on behalf of the New Cache la Poudre Irrigating Company and the
Cache la Poudre Reservoir Company

Dear Joanna:

This letter provides comments on behalf of the New Cache la Poudre Irrigating Company and the Cache la Poudre Reservoir Company (the "Companies") on the proposed Interruptible Water Supply Agreement submitted on February 29, 2012 by the Colorado Water Innovation Cluster ("CWIC") pursuant to C.R.S. §37-92-309(3)(a). In general, the Companies have concerns that the proposed plan may not be administrable as proposed, may cause injury to the Companies' water rights, and may require the consent of the Companies for use of their facilities which has not been granted.

As an initial matter, the proposed plan would operate by temporarily changing the use certain water rights attributable to shares in the Lake Canal Company, the Lake Canal Reservoir Company, and the Cache la Poudre Reservoir Company (the "Subject Water Rights") for use for "in-stream flows". It is not clear whether the CWIC or any of the contracting parties has the statutory authority to make the requested appropriations for instream flow purposes. Furthermore, the "aspiration elements" of the plan, which proposes to lease the consumptive use credit portion of the subject water rights to the City of Greeley, is speculative without a firm contract for such use, and should not be approved.

We understand that CWIC proposes to change the Subject Water Rights based on a deficit irrigation approach, whereby the historically irrigated farms will continue to be irrigated with the Subject Water Rights under deficit irrigation conditions, and the "saved" consumptive use portion thereof will be used for instream flow purposes. While the Companies are generally supportive of efforts to find new techniques for transferring water rights, including the concept of transferring water

rights based deficit irrigation techniques, the Companies have the following concerns with the plan as proposed:

1. Under the plan, the amount of water "saved" under the deficit irrigation practices will be computed by subtracting the amount of water delivered to the deficit irrigated portion of the farm from the amount of water delivered to the portion of the farm irrigated under "normal" practices, and the consumptive use portion and the surface return flow components will be left in the Cache la Poudre River at the Lake Canal river headgate. The surface return flows from the subject farms historically accrued to the Poudre River below the Greeley Canal No. 2 river headgate, satisfying downstream senior rights that would, but for such return flows, otherwise require the Greeley Canal No. 2 to bypass water for the benefit of those senior water rights. To the extent that the historical surface return flows are not fully replaced to the historical point of return, after appropriate transit losses, the water rights decreed to the Greeley Canal No. 2 will be injured. The proposed plan does not adequately demonstrate that such return flows can be made to the required point of replacement, and in the summer months the low flows in the Poudre between Lake Canal and the Greeley Canal No. 2 may make it difficult to ensure that 100% of the historical return flows are delivered to the appropriate location.

2. The proposed plan's calculation of the "saved" portion of the water under the deficit irrigation practices may be flawed because it requires an implicit assumption, not supported in the documentation, that the water delivered to the portion of the field irrigated under "normal" practices is consistent with historical practices. In other words, the amount of water delivered under the "normal" irrigation practices must be the same as it would have been but-for the deficit irrigation practice on the remainder of the farm. In reality, this is difficult, if not impossible to confirm, as there is no guaranteed that the amount of water delivered to the "normal" parcel is taking delivery of the amount of water that it would have but-for the change in irrigation practices. One potential solution to this problem would be the use of volumetric limitations on deliveries to the "normal" irrigated area based on historical deliveries, with the first year of operations limited to the historical average deliveries for each farm. The first year would need to be limited to the historical average, rather than the historical maximum, because the temporary nature of the operation does not lend itself to averaging deliveries over a long term period (as would be the case with a permanent change of use), and therefore the potential for an unchecked expansion of use is greater under these temporary operations.

3. The Cache la Poudre Reservoir Company's bylaws require any shareholder seeking approval of a change of the water rights represented by its shares to first seek and obtain approval from the Company. CWIC, and/or the contracting parties, have not sought such approval nor has the Company approved the proposed changes of the subject shares. Therefore, and in accordance with the Colorado Supreme Court's decisions in *Fort Lyon Canal Co. v. Catlin Canal Co.*, 642 P.2d 501 (Colo. 1982), and *Fort Lyon Canal Co. v. Catlin Canal Co.*, 762 P.2d 1375 (Colo. 1988), the requested change of the subject shares in the Cache la Poudre Reservoir Company cannot be approved.

4. The quantification of the historical use of the subject shares in Cache la Poudre Company has not been fully explained in the documentation, and may not correctly quantify the historical deliveries for the shares. It appears that the quantification is based on available *diversion* records

from CDSS for the Cache la Poudre Reservoir Inlet Canal. Those records do not account for all of the decreed sources of inflow to the Cache la Poudre Reservoir, system losses, including reservoir seepage and evaporation, or actual historical deliveries for the subject shares, and, therefore, CWIC's analysis may not be correct.

5. Part of the proposed plan involves storing the saved consumptive use credits attributable to the subject Cache la Poudre Reservoir Company Shares in Timnath Reservoir for subsequent delivery to owners of C-BT water in exchange for releases out of Horsetooth Reservoir. As this may require changes to the historical operation and administration of Timnath Reservoir, including additional administrative duties and costs, CWIC should be required to obtain consent and/or an agreement with the Cache la Poudre Reservoir Company prior to commencing with such operations.

Finally, due to the fact that the proposed plan is the first such plan to institute deficit irrigation techniques as a means of the transfer of water rights, and that such techniques are essentially untested in Colorado, the Companies request that they be provided electronic copies of the daily accounting under the plan on at least a monthly basis. Such accounting can be sent to the Companies c/o Dale Trowbridge at dale@newcache.com.

Sincerely,

Donald E. Frick

CC: Dale Trowbridge
Robert W. Beccard, P.E.
David Nettles, P.E., Division 1 Engineer

Trout, Raley, Montaño,
Witwer & Freeman, P.C.

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dsinor@troutlaw.com
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April 2, 2012

Sent via Electronic Mail - joanna.williams@state.co.us

Joanna Williams
Colorado State Engineer's Office
Division of Water Resources
1313 Sherman Street, Suite 818
Denver, Colorado 80203

Re: Northern Colorado Water Conservancy District's Comments on Application for Interruptible Water Supply Agreement Between Lake Canal and the City of Fort Collins and the Nature Conservancy

Dear Joanna:

Pursuant to C.R.S. § 37-92-309(3)(a), this letter provides comments by Northern Colorado Water Conservancy District ("Northern Water") on the Application for Interruptible Water Supply Agreement ("IWSA") between Lake Canal and the City of Fort Collins and the Nature Conservancy, filed on March 1, 2012. Northern Water is the beneficial owner of water rights associated with the Colorado-Big Thompson ("C-BT") Project that may be injured if the Application is granted as requested.

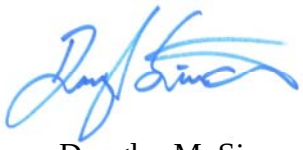
Section 3.3 of the Application describes a proposed "exchange agreement" involving C-BT Project water allocated to a Lake Canal shareholder: "water remaining in storage from reduced consumptive use will be released to satisfy a request for C-BT and the actual C-BT will be released so as to pass through downtown Fort Collins at a suitable rate and time period." This appears to be a substitution or trade of "saved" consumptive use water for C-BT Project water within the Lake Canal system, rather than a physical river exchange.

Although the application provides little information about the end use of the saved water, we understand that the intent of the IWSA is to provide fully consumable water to the City of

Greeley at the headgate of the Canal No. 3.[1] The C-BT Project water in question, however, is allocated for irrigation use by Northern Water under an allotment contract. Pursuant to the allotment contract and Northern Water's rules, C-BT Project water is allocated for a single use only. Return flows from the use of C-BT Project water are reserved to Northern Water for the benefit of downstream lands within the district. *Town of Estes Park v. Northern Colorado Water Conservancy District*, 677 P.2d 320 (Colo. 1984). The Applicants may not, by the proposed substitution, unilaterally change the character of C-BT Project water to fully consumable and reusable water in violation of the allotment contract and Northern Water's rules. Therefore, the proposed "exchange agreement" involving C-BT Project water should not be approved as part of the IWSA.

Please send to me copies of any correspondence from your office to the Applicants regarding the IWSA Application. Thank you.

Sincerely,



Douglas M. Sinor
for
Trout, Raley, Montaño,
Witwer & Freeman, P.C.

cc: Robert Beccard

[1] Northern Water notes that the Application emphasizes private "instream flow" uses by the Nature Conservancy and City of Fort Collins and provides little information about the actual end use of the water, or how it will be delivered and measured at the Canal No. 3 headgate.

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April 27, 2012

Brown AND Caldwell

Mr. Douglas Sinor
Trout, Raley, Montaño, Witwer & Freeman, P.C.
1120 Lincoln Street, Suite 1600
Denver, Colorado 80203-2141

Dear Mr. Sinor:

This letter was written in response to your April 2, 2012 letter to Ms. Joanna Williams (Colorado State Engineer's Office) regarding Northern Colorado Water Conservancy District's (NCWCD) comments on an Interruptible Water Supply Agreement (IWSA) between the City of Fort Collins/Nature Conservancy and the Lake Canal.

In your letter you describe issues related to an exchange or trade of Colorado-Big Thompson (C-BT) supplies for fully consumable water derived from deficit irrigation practices and fallowing that will take place pursuant to the IWSA. Our understanding of the issue is that the C-BT supplies targeted for this trade are allocated for single use only, and an exchange of the C-BT supply for stored transferrable consumptive use will change the nature of the C-BT, which would be counter to NCWCD's rules and allotment contract.

Brown and Caldwell and Regenesis Management Group staff met with NCWCD staff on April 19, 2012 to discuss the trade and NCWCD's concerns with the IWSA. Staff from NCWCD clarified issues associated with exchanging C-BT for fully consumable supplies. At the conclusion of the meeting, it was determined that a trade of supplies that does not change the character of C-BT water would be permissible and is, in fact, commonly done.

The trade will be between the Lake Canal irrigators and the New Cache la Poudre Irrigating Company (New Cache). The Lake Canal irrigators will trade an amount of C-BT irrigation supply to New Cache that is commensurate with the amount of transferrable consumptive use that is stored in the Gray Reservoirs and Tinmath Reservoir. The stored, transferrable consumptive use water will then be delivered to irrigators on the Lake Canal system for irrigation purposes in a single-use fashion. Return flows will be generated from the irrigation use of the water and will not be reclaimed. The C-BT irrigation supplies traded from the Lake Canal irrigators to New Cache will flow down the Cache la Poudre River (thus achieving one of the goals of the IWSA) and will be diverted at the Greeley No. 2 Canal headgate for delivery to New Cache irrigators.

At your convenience, please provide a written response to this letter acknowledging that this approach addresses the issues raised in your April 2, 2012 letter to Ms. Joanna Williams. Please do not hesitate to call with questions or additional concerns.

Very truly yours,

Brown and Caldwell

Matthew Lindburg, P.E.

cc: Ms. Joanna Williams, Office of the State Engineer
Ms. Tracy Kosloff, Office of the State Engineer
Mr. Bob Beccard, Aqua Engineering, Inc.
Mr. Stephen Smith, Regenesis Management Group, LLC

Trout, Raley, Montaño,
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May 10, 2012

Sent via Electronic Mail – mlindburg@brwncald.com

Matt Lindburg
Brown and Caldwell
1697 Cole Boulevard, #200
Lakewood, Colorado 80401

Re: Colorado Water Innovative Cluster IWSA

Dear Matt:

This letter is in response to your letter to me dated April 27, 2012, in which you described a new proposed trade of Colorado-Big Thompson Project ("C-BT") water in connection with the Interruptible Water Supply Agreement ("IWSA") filed on March 1, 2012.

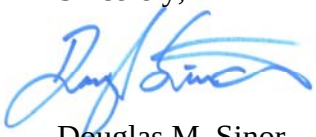
As you know, Northern Colorado Water Conservancy District ("Northern Water") had concerns with the initial proposal, which involved a trade of C-BT water to provide fully consumable water to the City of Greeley. Northern Water understands that Colorado Water Innovative Cluster is now proposing a trade of C-BT water between Lake Canal irrigators and New Cache Canal irrigators. As we understand the proposal, saved consumptive use water will be stored in Timnath or Gray Reservoirs and delivered to Lake Canal Irrigators in lieu of C-BT water that would otherwise be called for by Northern Water allottees under the Lake Canal system. The Lake Canal allottees will transfer an equivalent amount of C-BT water to irrigators under the New Cache system. The Lake Canal allottees will submit a CD-4 transfer card or an on-line transfer to Northern Water to effectuate the trade.

Under the new proposal, C-BT water allotted for a single, irrigation use will continue to be used for that purpose. The transfer will be recorded with Northern Water in accordance with its rules; therefore, Northern Water has no objection to the new proposed trade. Northern Water requests, however, that the Applicant provide to Northern Water accounting that shows the

details of all the trades and eventual releases of C-BT water to the river for delivery to New Cache in completion of the proposed trade.

Please let me know if you have any questions. I would appreciate it if you would send me copies of any future correspondence between you and the State Engineer's Office regarding this IWSA. Thank you.

Sincerely,



Douglas M. Sinor
for
Trout, Raley, Montaño,
Witwer & Freeman, P.C.

cc: Joanna Williams
Andy Pineda
Alan Berryman