KWC
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Ms. Cindy Medina
Alamosa Riverkeeper
P.O. Box 753
La Jara, CO 81140

Subject: Water Rights and Consumptive Use Analysis for Alamosa Riverkeepers

September 17, 2012

Dear Ms. Medina:

Knox Water Consultants (KWC) is pleased to provide Alamosa Riverkeepers with this water right and consumptive use analysis associated with the Valdez Ditch, Priority No. 9 in the Alamosa River watershed. This investigation provides an assessment of the firm yield of the water rights claimed to be under ownership and/or control of Mr. Gil Lucero that is being contemplated for acquisition by Alamosa Riverkeepers. Should you deem additional investigation or actions appropriate, this assessment will serve as the technical foundation for a change in water right application filed in the Division III Water Court. The major tasks and findings of this analysis are described within the ensuing narrative.

Review of Adjudicated Water Rights

The first task included a review of the adjudicated direct flow water rights for the Valdez Ditch in former Water District 21 in the Rio Grande Basin to verify the amount, location, adjudicated beneficial use(s), priority, and other relevant information.

Upon compilation and review of the court decrees, the water rights considered for acquisition by Alamosa Riverkeepers are decreed for irrigation use only. The table below describes the net adjudicated status of water rights in the Valdez Ditch.

Table 1. Adjudicated Water Rights in the Valdez Ditch in Water District 21

Water Right	Adjudication Date	Appropriation Date	Amount	Priority	Status
Valdez Ditch	07/11/1888	04/10/1870	14.0 cfs	No. 9	Absolute
Valdez Ditch	07/11/1888	09/23/1887	57.63 cfs	No. 90	Absolute

For the purpose of this investigation, it is my understanding that Alamosa Riverkeepers is contemplating the acquisition of 0.5 cubic feet per second (cfs) from Mr. Lucero, which is from the senior No. 9 priority water right. The structure and lands irrigated under the subject Valdez Ditch Priority No. 9 water rights that are contemplated for acquisition by Alamosa River Keepers are portrayed in Figure 1.

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Compilation of Water Diversion and Irrigated Acreage Records

Historic diversion and irrigated acreage records available through electronic files maintained by the Colorado Division of Water Resources were compiled for this investigation. The period of record available for the water conveyance structures associated with the Valdez Ditch extended from 1950 through 2008. This period of record reflects periods of drought or dry conditions, wet periods, and average conditions. Provided below is a summary of the water diversion records.

Valdez Ditch (Structure ID Number 604) retains a senior net absolute water right for 14.0 cubic feet per second for diversion from the Alamosa River. The ditch retains a junior absolute water right for 57.63 cubic feet per second that is filled sporadically during periods of wet or excess water supplies[1]. The diversion headgate for the Valdez Ditch is located approximately 5.1 miles northwest of Capulin, Colorado. The diversion structure includes a low-head diversion and headgate structure diverting from the south bank of the Alamosa River in the SE ¼ of Section 27, Township 36 N, Range 7 E, New Mexico Principal Meridian. Two different periods of time were analyzed to provide a comparative analysis of historic diversions under this structure. The first reflects the entire period of record available electronically from 1950 through 2008. The second is a 29-year period from 1980 through 2008 that also includes a series of wet, average, and dry year's hydrology. Review of annual and daily diversion records indicate the maximum daily recorded diversion typically occurs early in the irrigation season in April to late-May, followed by decreasing diversions in subsequent summer months when natural streamflows in the Alamosa River decline. This period was also selected because it reflects more recent historic diversion activity. Results of the diversion analysis are tabulated below:

Table 2. Valdez Ditch Diversion Record Summary

Period of Record	Average Number of Days Water Carried	Average Annual Diversion (acre-feet)
1950-2008	164	3,814
1980-2008	171	4,070

Irrigated Acreage – Lucero Property

The irrigated lands attributed to Mr. Gil Lucero encompass a total of 17.16 acres in the NE ¼ NW ¼ Section 12, Township 35 N, Range 7 E, NMPM. The aerial photograph shows two parallel and rectangular fields that were irrigated with a respective area of 8.859 and 8.298 acres respectively. The total amount of irrigated land was reduced from the original 20.0 acres to reflect the long-term storage of equipment and sheds in the northeast corner of the easternmost parcel as portrayed on the aerial photograph. The irrigated acreage estimates were derived from

[1] The original adjudicated amount for Priority No. 90 was 72.63 cfs. In Case 02CW12, 15 cfs was abandoned.

five years of aerial photographs and irrigated acreage information: 1936, 1955, 1990, 1998, and 2002. The claimed 17.16 acres is considered representative of the historic irrigated lands.

In an interview with Mr. Lucero on June 15, 2010 he indicated his historic cropping practice was to rotate alfalfa and grass hay on the two parcels on an approximate equal time basis over the last several decades. At the time of the field inspection, both fields were planted in grass hay. However, remnants of alfalfa were also evident in the two subject fields.

Review of the Water Administration Practice/ River Call Regime

I performed an investigation into the typical water administration scheme for the Alamosa River watershed to qualify the frequency and duration the direct flow water and storage water rights are curtailed, in total or partial amounts, necessary to meet the demands of senior water right owners within the system who exercise their authority to "call" for water.

For context, the Alamosa River is within the Rio Grande Basin in Water Division III. The Alamosa River system is considered to be over-appropriated (water demand exceeds available supplies). Direct flow and storage water rights within these systems are routinely curtailed, in total or partial amounts, to satisfy the demands of downstream senior water rights that are receiving insufficient supplies.

Investigation into the historic diversion records and sporadic historic river call chronology for the Alamosa River system indicates the owners of the Valdez Ditch routinely exercise their authority as holders of the senior Number 9 priority to divert water. The Valdez Ditch is also located higher in the watershed than other senior water rights in the Alamosa River system such as the El Viejo Ditch (Number 1 Priority) and Gabino Gallegos Ditch (Priority No. 11). The close proximity to the mountain/valley interface and senior priority reflects the amount and duration of water that is diverted in the Valdez Ditch and documented in the annual diversion records. Review of the historic diversion records indicate the ditch does not call for its entire senior 14.0 cfs priority only during times of excess water supply during spring runoff, significant precipitation events, or during limited periods when diversions are reduced to harvest alfalfa or other crops.

It is apparent that the Valdez Ditch is routinely able to receive additional water supplies under its junior No. 90 priority. During the period of record from 1980 through 2008, the maximum recorded diversion exceed 14.0 cfs (senior priority No. 9) the majority of the time, 17 out of 29 years.

Rio Grande Compact

Administration of tributary water rights in Water Division III is founded upon the dual water allocation requirements of complying with the Doctrine of Prior Appropriation (priority system) within the tributary stream system in Colorado and meeting interstate delivery obligations under the 1938 Rio Grande Compact. The Valdez Ditch, as part of the Alamosa River system, is exempt from compliance with Rio Grande Compact water delivery obligations. The Colorado Supreme Court found the compact negotiators did not include the Alamosa River or La Jara Creek because they "flow through flat land, the stream channels are not clearly defined, and

practically no water from either creek reaches the Rio Grande except during periods of flooding".[2]

Historic Consumptive Use Analysis

A historic consumptive use analysis was performed for the 0.5 cfs claimed by Mr. Lucero. Although historic cropping information was not available, the crop mix for the Lucero lands was apportioned as 50% alfalfa and 50% grass hay. These estimates are considered reasonable in context of farming practices in the local community. The crop irrigation requirement was determined for the subject water rights using the Manassa, Colorado area climate information and through application of the modified Blaney-Criddle formula. The estimated crop irrigation requirement used in this analysis, after subtracting effective precipitation, for alfalfa is 21.41 inches per year and for grass hay is 17.35 inches per year (1.78 and 1.45 feet respectively). Review of the historic diversion and irrigated acreage records maintained by the Division of Water Resources indicates the Valdez Ditch is able to provide a full irrigation water supply in most years. Therefore, the consumptive use attributed to the proportional ownership for Mr. Lucero in the Valdez Ditch Priority No. 9 is based upon his fractional ownership (0.5 cfs divided by the total of 14.0 cfs in Priority No. 9) multiplied by the monthly crop irrigation requirement based upon the aforementioned crop mix and their respective irrigated acreages.

The total historic consumptive use attributed to 0.5 cfs of the Valdez Ditch for lands historically irrigated by Mr. Lucero is **26.74** acre-feet/year.

Table 3. Valdez Ditch Diversions and Consumptive Use (all values in AF)

1950-2007	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
Average Diversions[3]	9.20	327.43	885.85	1039.94	657.40	475.60	357.26	266.50	48.90	4068.06
Lucero % Diversions	0.33	11.69	31.64	37.14	23.48	16.99	12.76	9.52	1.75	145.29
Lucero Consumptive Use	0.72	1.56	3.14	5.38	6.00	4.86	3.30	1.37	0.41	**26.74**

Field inspection and interviews

In conducting this investigation, I conducted a series of interviews with the present owner of the water right and local water officials to develop a more comprehensive understanding of ditch

[2] *Alamosa-La Jara Water Users Protection Association v. Gould* (1983).
[3] The Total column in Table 3 represents the cumulative average diversions during the irrigation season months of March through November for the period of record. The Total of 4068.06 differs from the 4070 acre-feet quantity represented in Table 2 due to differences in rounding. The amount of 4068.06 acre-feet is conservative and reliable for application within a consumptive use analysis.

operations and to identify outstanding issues that may impact the historic consumptive use computation and/or the contemplated change in water rights application.

I also participated in a one-day field inspection of the water rights, conveyance structure, their proximity to other water rights, and lands served by the Valdez Ditch that are subject to the proposed transfer on June 15, 2010. Parties in attendance included: Luis Heredia, Water Commissioner; Gil Lucero, water right and landowner; and myself.

Irrigated Lands

Mr. Gil Lucero verbally confirmed ownership of his respective water rights in the Valdez Ditch Priority No. 9. Mr. Lucero also verified the historically irrigated lands on an aerial photograph that was used to quantify his respective acreage. The lands under ownership of Mr. Lucero have been irrigated exclusively through flood irrigation. The lands are level and a flood irrigation efficiency of 60% is a reasonable estimate based upon the quality of land preparation and topographical relief.

Return Flows

The general slope of land in the vicinity of the subject property is minimal and to the south by southeast. The Lucero lands are irrigated by a lateral from the Valdez Ditch as depicted on Figure 1. There was no evidence of phreatophytes or other physical features that exhibited excess or surface water runoff from the irrigated fields. It is therefore reasonable to conclude that any irrigation waters delivered to the irrigated return flows not consumed by the crop evapotranspiration process percolate through the soil moisture profile into the unconfined aquifer.

It is typically necessary to replace the return flows in time, amount, and location for a pending water right transfers to the degree that such change would adversely impact downstream water rights. Due to the rather unique circumstances surrounding the discrete water rights and irrigated lands that form the subject of this investigation, particularly in context of the natural hydrology of the Alamosa River and proximity to other water rights, there is no apparent evidence the return flows migrate back to the stream and contribute toward fulfilling downstream water rights during the periods in which they are in priority and could apply water to beneficial use. As confirmed by local water administration officials, the Alamosa River is a highly dynamic river that typically requires administrative curtailment of junior water rights in a rapid progression that corresponds to a steep declination of streamflows after early spring runoff. Return flows from the irrigated lands on the Lucero property do not appear to accrue back to the stream system in time or amount available for irrigation by downstream water streamflow diversions.

The contemplated change of water right application is designed to enhance the in-channel beneficial use of water in the Alamosa River. The Alamosa River is an ephemeral stream. It is tributary to the Rio Grande only during times of excess flooding conditions. The dedication of these water rights in a change of water right proceeding to supplement existing streamflows in the Alamosa River will naturally percolate through the streambed channel and recharge the unconfined aquifer as they progress down the river to a greater extent than the current irrigation practice. Water formerly consumed by crop evapotranspiration will supplement streamflows and increase the total contribution of water into the ground water aquifer.

Ditch Conveyance Losses

The Valdez Ditch is an open-channel water conveyance structure. The estimated distance between the headgate and delivery to Lucero irrigated lands (including laterals) is approximately 3.5 miles. There are no empirical gain/loss studies available that quantify the ditch loss between the headgate and Mr. Lucero's point of delivery.

Findings and recommendations

This water rights and consumptive use analysis is limited to observance of the current physical state of existing structures and the review of historic data and information associated with the Valdez Ditch and two subject irrigated properties Based upon this analysis, the primary findings are as follows:

1. In-priority water diversions under the Valdez Ditch, Priority No. 9 in the amount of 0.5 cfs have historically provided the source of water supply to irrigate 17.16 acres owned by Mr. Lucero.
2. Quantification of the historic consumptive use of water attributed to the 0.5 cfs owned by Mr. Lucero to irrigate 17.16 acres in the NE ¼ of the NW ¼ in Section 12, Township 35 N, Range 7 E, NMPM is estimated to be 26.74 acre-feet per year.
3. The dominant restriction in a change of water right proceeding before the Water Court is a limitation to historic consumptive use. This restriction may not apply to the change in water right application contemplated by Alamosa Riverkeepers. It is my understanding that acquisition of these water rights is intended to facilitate a potential change in water right for those portions of the Valdez Ditch from irrigation of croplands to temporary storage in Terrace Reservoir and the subsequent release downstream for in-channel river restoration and ecosystem enhancement. The total of in-priority diversions, 0.5 cfs attributed to Mr. Lucero under the Valdez Ditch No. 9 priority, is contemplated for the change in water right. Injury to other vested water rights in the Alamosa River system is not evident from this potential change in water rights since there is no expansion of use or impact to downstream water rights through diminution of return flows.
4. The potential acquisition and change in water right water court proceedings for each of the contemplated acquisitions under the Valdez Ditch, Priority No. 9 is not dependent upon the other.

Conversion of the potential acquired water rights in the Valdez Ditch from irrigation to temporary storage in Terrace Reservoir and the subsequent release of these waters for instream flow purposes in the Alamosa River is a viable option for Alamosa Riverkeepers. It is important to note that the authority to approve the contemplated change in water right application to facilitate this transfer is vested exclusively to the Water Court for Division III.

Recommendations

In the event Alamosa Riverkeepers acquires those portions of the Valdez Ditch, Priority No. 9 that is contemplated and progresses toward a change in water right application, I respectfully recommend the following actions:

1. Collaborate with representatives of Terrace Irrigation Company, the Colorado Water Conservation Board, and appropriate legal counsel to prepare a change in water right application.
2. Coordinate with legal counsel to prepare a change of water right application and to identify potential terms and conditions for a draft decree; to develop a strategy for potential litigation; and to prepare exhibits and provide expert witness testimony, if necessary.

Thank you for the opportunity to provide this analysis into the water rights contemplated for acquisition by Alamosa Riverkeepers. If you have any questions or wish to discuss the report further, please contact me at your convenience.

Sincerely,

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