CWCB Loan Feasibility Study
Pioneer Reservoir Project

Groundwater Management Subdistrict
of the Central Colorado Water Conservancy District

Mining operations at J2 Pit (Pioneer Reservoir)

PREPARED FOR:

COLORADO WATER CONSERVATION BOARD

JANUARY 2019

FEASIBILITY STUDY APPROVAL
Pursuant to Colorado Revised Statutes 37-60-121 &122, and in accordance with policies adopted by the Board, the CWCB staff has determined this Feasibility Study meets all applicable requirements for approval.

Signed

3/8/2019
Date

CWCB Loan Feasibility Study
Pioneer Reservoir Project

Groundwater Management Subdistrict
of the Central Colorado Water Conservancy District

Mining operations at J2 Pit (Pioneer Reservoir)

PREPARED FOR:

COLORADO WATER CONSERVATION BOARD

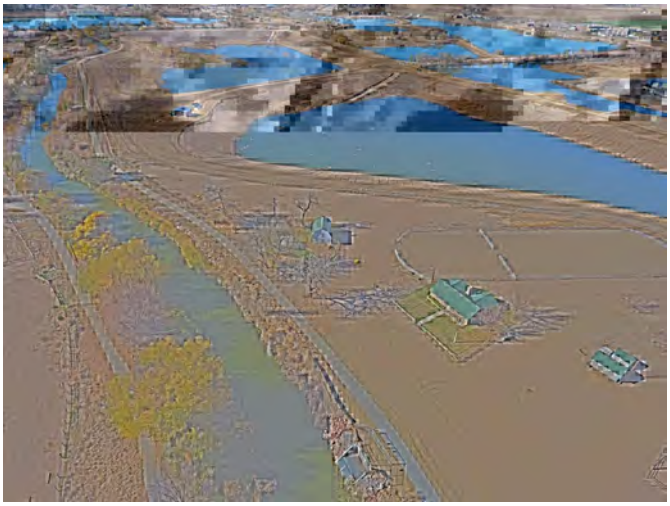
JANUARY 2019

white sands water engineers, inc

CWCB Loan Feasibility Study

Pioneer Reservoir Project

Groundwater Management Subdistrict of the Central Colorado Water Conservancy District



Central's Geisert Reservoir Project, Cache la Poudre River

The technical material in this report was prepared by or under the supervision and direction of the undersigned, whose seal as a Professional Engineer is affixed below.

COLORADO REGISTERED EDWARD JOSEPH ARMBRUSTER 37253 1/31/19 PROFESSIONAL ENGINEER

_____

Ed Armbruster, P.E.
President

The following staff at Central Colorado Water Conservancy District contributed to the preparation of this report.

Randy Ray, Executive Director
William Mihelich, District Engineer
Danyelle McCannon, Financial Analyst

Table of Contents

Figures

Tables

Appendices

1 Introduction

This report summarizes results of a feasibility study completed for the Groundwater Management Subdistrict (GMS) of the Central Colorado Water Conservancy District (Central). GMS is the Project Sponsor for development of the Pioneer Reservoir Project.

The Pioneer Reservoir Project is in Weld County between the towns of Greeley and Kersey, Colorado (**Figure 1**). The Project involves reclaiming a soon to be completed sand and gravel mine to allow water storage and release operations (Central has developed numerous other storage reservoirs from reclaimed sand and gravel mines). Water stored in Pioneer Reservoir, 1,800 af – 2,000 af, will be used in the GMS plan for augmentation as a replacement supply for alluvial wells. The purpose of the Project is to increase GMS's reliable water supplies and allow alluvial wells to pump additional tributary groundwater. The GMS Board of Directors will pass a resolution to appropriate water from the South Platte River to fill and refill Pioneer Reservoir each year and obtain a decreed water.

This report supports an application to the CWCB by GMS to borrow up to a total of $8.071 million from the Water Project Loan Program. Funding from the loan will be used to acquire the Pioneer Reservoir site and develop associated infrastructure necessary to store and release water. Following is a summary description of GMS, their purpose, existing facilities and operations, their need for the Project, availability of unappropriated water, and GMS's assets, financial resources and ability to repay the requested loaned funds to CWCB.

White Sands Water Engineers, Inc. and staff at Central conducted this study and prepared this report at the request of the Board of Directors of GMS.

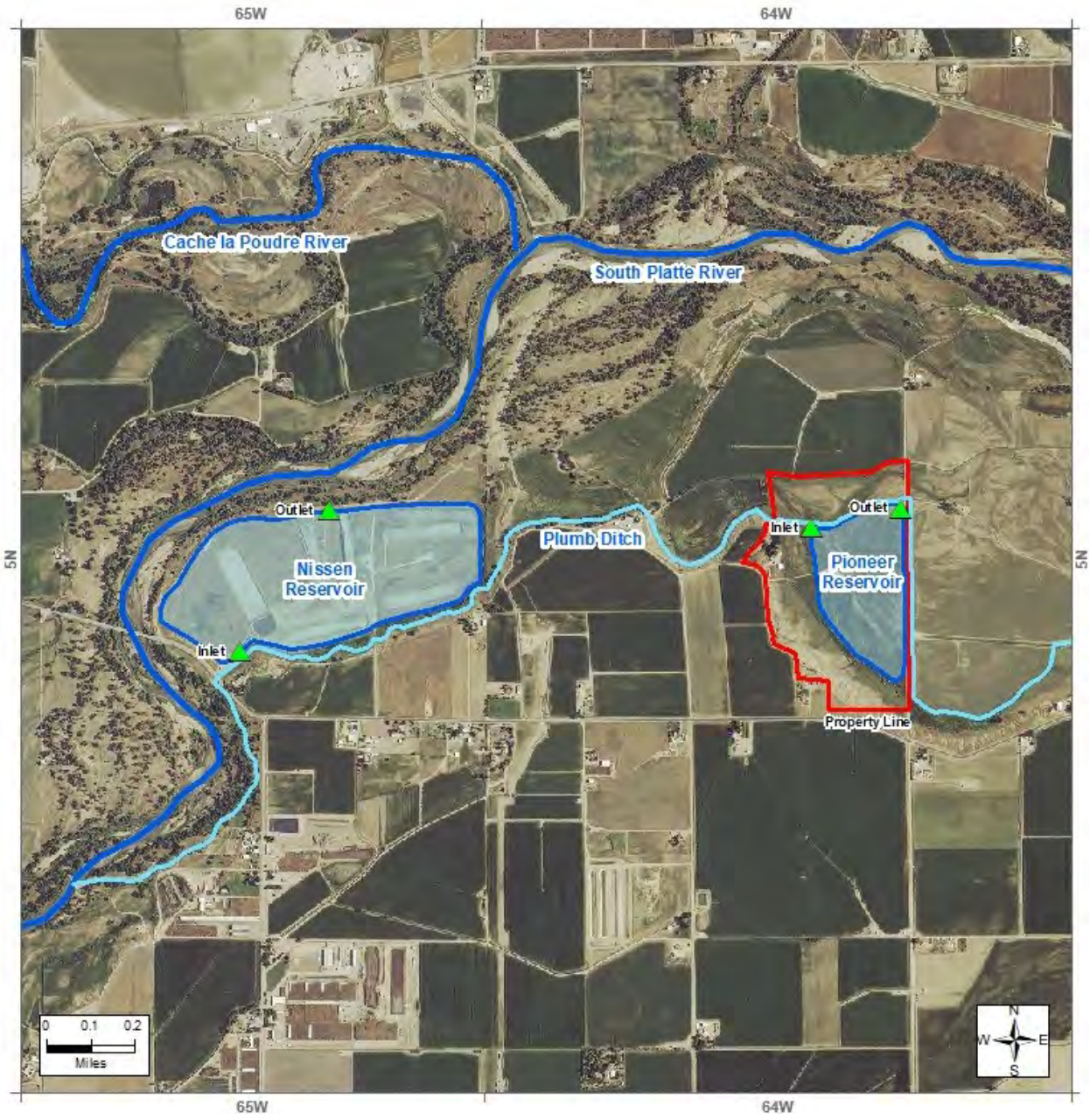


Figure 1. Pioneer Reservoir Project

2 Central and the Groundwater Management Subdistrict

Central was formed in 1965 pursuant to the 1937 Water Conservancy Act of the State of Colorado (CRS 150-5). The District includes over 750 square miles in Adams, Weld, and Morgan Counties (**Figure 2**). The geographic boundary of Central generally includes lands in the South Platte River basin between Denver and Fort Morgan, Beebe Draw, and the lower portions of the Box Elder Creek and Lost Creek drainages. The boundaries of Central include portions of several cities and towns (e.g. Thornton, Brighton, Fort Lupton, Platteville, Greeley and Fort Morgan), numerous smaller rural communities (e.g., Gilcrest, LaSalle, Kersey and Hudson) and approximately 210,000 acres of irrigated agricultural lands supplied by ditches and groundwater wells.

GMS is the sponsor of the Pioneer Reservoir Project. GMS was formed in 1973 as a subdistrict of Central through an amendment to the decree authorizing Central's formation. One purpose of GMS is coordination and operation of a plan for augmentation to replace depletions caused by the pumping of alluvial wells owned by its constituent members. GMS boundaries are similar to the boundaries of the Central District but do not include the Lost Creek drainage. GMS operates the plan for augmentation decreed in Case No. 02CW335 (the "GMS Decree" or the "GMS Plan for Augmentation"). There are currently 892 constituent wells in the GMS augmentation plan distributed among 518 allotment contracts. GMS also replaces evaporative losses associated with two unlined gravel pits that expose groundwater to the atmosphere.

Individual GMS groundwater wells have water right priority dates ranging from 1906 to 1991. Most of the wells were constructed during the 1930s, 1940s and 1950s, and approximately 85 percent of the wells have priority dates senior to 1960. Senior water rights located downstream are often calling for water. and the water rights associated with the wells are out of priority. Depletive effects of pumping constituent member wells must be replaced by operation of the GMS augmentation plan when there is a call for water from a downstream water right senior to the priority date of individual wells.

Replacement water is made available to constituents of GMS through Class B, C and D allotment contracts currently totaling approximately 67,000 acre-feet (af). All current contracts are defined in terms of a volume of consumptive use which has been quantified based on a needs assessment for the lands identified in each contract. Current GMS irrigation contracts identify approximately 56,000 acres of irrigated land, and roughly one-half of the total area relies solely on groundwater for irrigation supplies. GMS may authorize additional contracts at the request of landowners within its boundaries and with approval of their respective Board of Directors.

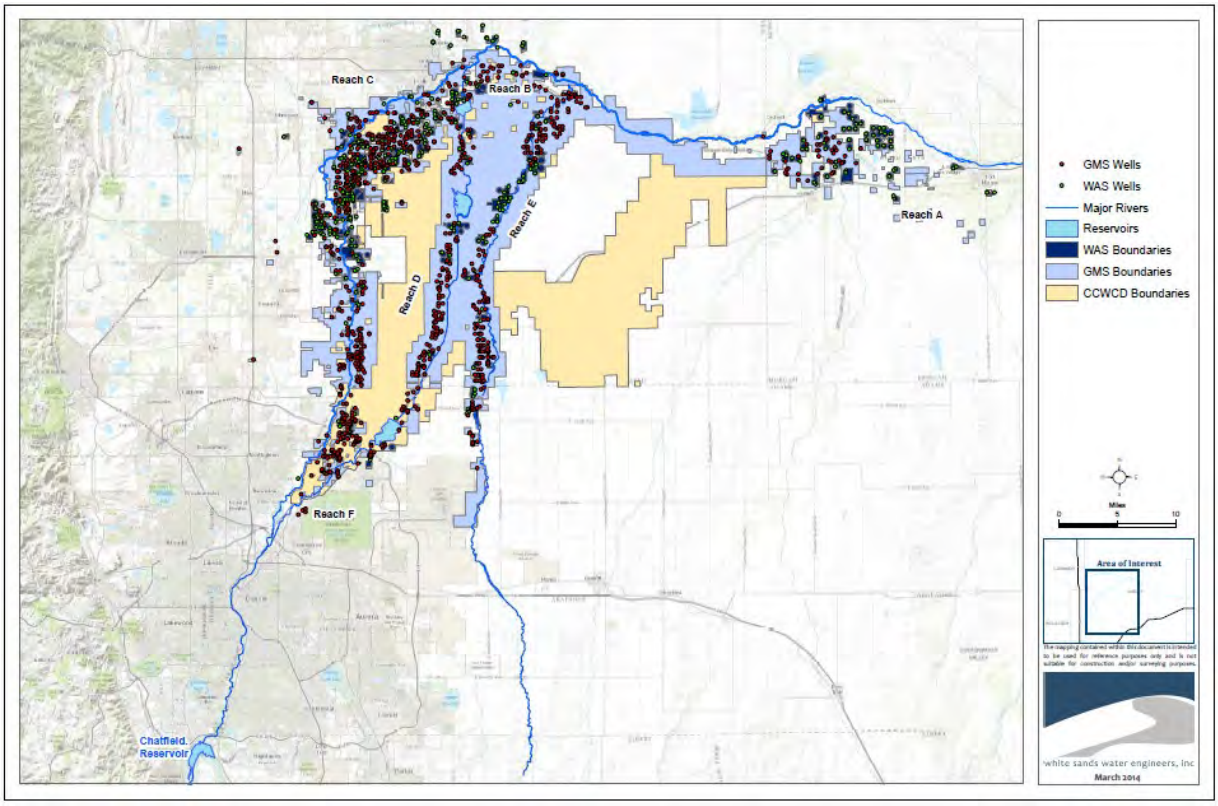


Figure 2. Boundaries of Central and GMS

The GMS plan for augmentation is operated, accounted for and administered using administrative river reaches along the South Platte River that extend approximately from the headgate of the Fulton Ditch at the upper end near Denver, to the headgate of the Upper Platte & Beaver Canal on the lower end below Fort Morgan (**Figure 3**). There are six decreed administrative river reaches identified in the GMS plan that are used for operation, accounting and administration of the plan.

The location of the depletive effect of pumping for each GMS well in the plan for augmentation is assigned to one of the six administrative reaches. The approximately 67,000 ac-ft of GMS allotment contracts is distributed across reaches as shown in **Figure 4**. Aggregation into administrative river reaches provides Central an efficient means to manage replacement supplies and depletions associated with a very large number of wells. Replacement supplies from any source located upstream of any point of well depletion may be used for replacement although because of conveyance losses along the river, the use of replacement sources far upstream is less efficient. Therefore, GMS develops replacement supplies, including reservoir storage, that are geographically dispersed.

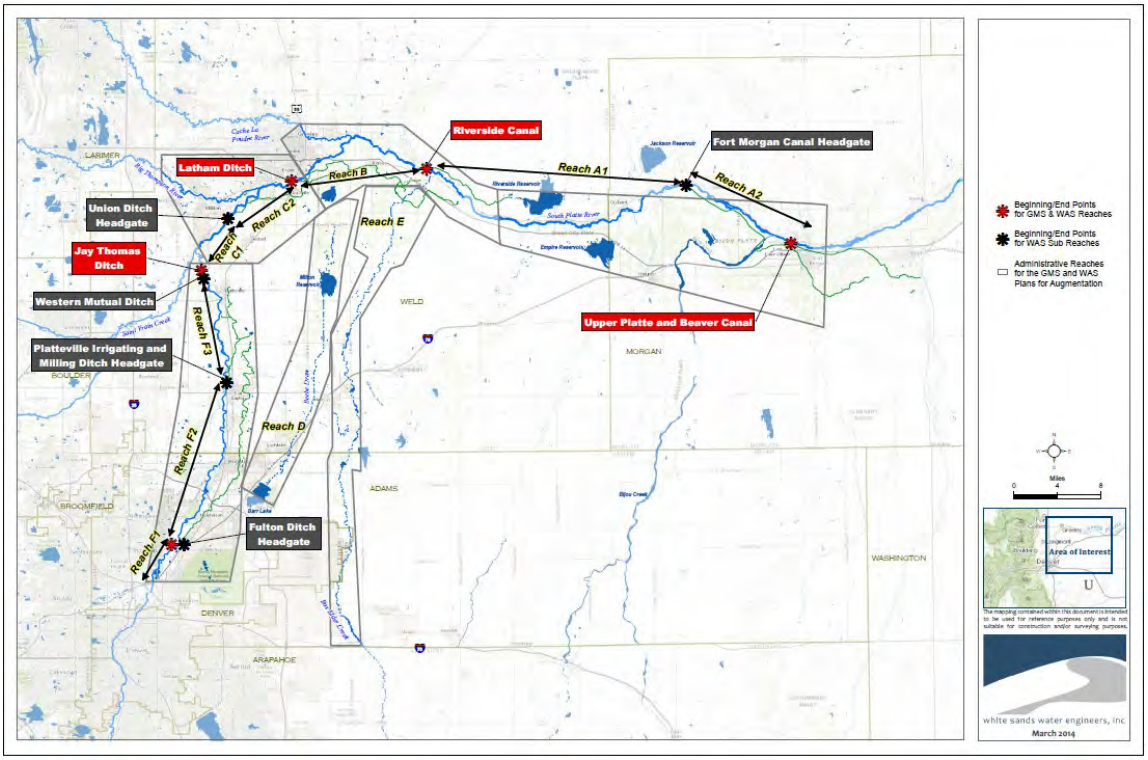


Figure 3. Augmentation Plan Administrative Reaches

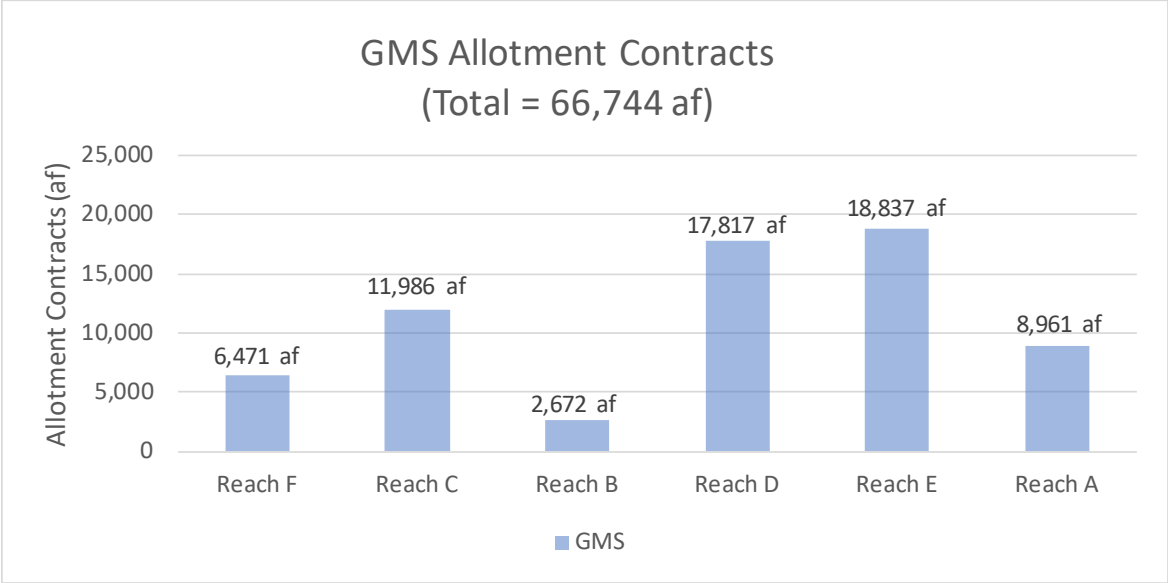


Figure 4. Geographic Distribution of GMS Allotment Contracts

GMS issues a "quota" to its constituent member wells on an annual basis. The quota is a percentage of each member's contracted amount of augmentation supply and is an allocation of overall GMS augmentation supplies. The annual quota is determined by comparing available supplies to well pumping depletions over a multi-year scenario. Recent annual quotas have averaged only about 50 percent, i.e., there have been well curtailments of about 50 percent. The annual quota depends heavily on the amount of water GMS has been able to recharge in prior years and water that is available in storage reservoirs at the beginning of each irrigation season.

Throughout each year GMS continuously operates their water rights to provide augmentation supplies for its constituent wells. During the irrigation season, augmentation supplies come from changed direct flow water rights, storage releases, and recharge accretions. During the non-irrigation season the augmentation supplies are primarily storage releases and recharge accretions. Fully consumable water, including sewered municipal effluent, may also be available for lease for augmentation purposes on a short-term basis.

GMS replaces water to the river at times when downstream senior water rights are calling for more water. At other times, junior water rights owned by GMS can divert and replenish water supplies that have been used during times of senior calls.

3 Need for Additional Water Supplies

3.1 Current and Future GMS Water Demands

As discussed in **Section 2** of this report, current GMS allotment contracts total approximately 67,000 af per year. However, existing demands for water supplies within the District and subdistricts exceed amounts currently contracted by GMS to its constituents. Requests are routinely made to GMS to provide additional augmentation supplies and water supplies for other uses. While GMS has the authority to issue additional allotment contracts, very few have been authorized in recent years. Instead, GMS has focused on developing additional augmentation supplies so that existing contracts can routinely rely on 100 percent annual allocations.

Many of the water rights owned by GMS have junior priorities. All of GMS's storage and recharge rights have priority dates later than 1980. Reliably supplying demands using junior water rights requires substantially higher volumes of water. For example, water may only be available to fill junior storage rights along the South Platte River an average of one out of every two or three years. This means that roughly three times the contracted delivery amount must to be captured during wet periods to provide a full supply every year. Inevitable system operational losses require that even greater amounts to be captured during wet periods. This is the reason for Central's focus on developing storage and recharge projects.

3.2 Location and Timing of Water Needs

GMS allotment contracts are distributed geographically between Denver and Fort Morgan. While most GMS member wells are pumped during the irrigation season for agricultural purposes, the delayed response of well pumping on surface streams creates a year-around demand for augmentation supplies. Differences in well locations and alluvial aquifer characteristics result in different seasonal patterns of depletions between the different reaches (**Table 1**). For all reaches combined, approximately 62 percent of depletive effects from pumping occurs during the irrigation season, and 38 percent occurs during the non-irrigation season. Pumping by wells located in Reaches F, C, B and A result in longer and more steady, monthly depletions across the year. Pumping by wells located in Reaches D and E (Beebe Draw and Box Elder Creek drainages, respectively), effect the river more quickly resulting in more monthly variability across the year. **Figure 5** illustrates depletions within each administrative reach following a period of steady-state pumping.

Table 1

GMS Depletions at Steady State (af)

Reach	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Total
F	478	485	511	568	630	645	630	585	532	490	459	458	6,471
C	912	919	952	1,028	1,103	1,127	1,114	1,064	1,002	950	909	905	11,986
B	203	203	207	220	241	251	252	244	230	217	206	198	2,672
D	1,174	1,244	1,435	1,814	2,024	2,045	1,891	1,608	1,339	1,141	995	1,109	17,817
E	1,261	1,325	1,509	1,886	2,152	2,171	2,010	1,709	1,411	1,201	1,056	1,147	18,837
A	707	705	714	739	761	779	787	782	770	754	734	728	8,961
Total	4,735	4,883	5,328	6,255	6,910	7,017	6,684	5,992	5,284	4,751	4,358	4,545	66,744

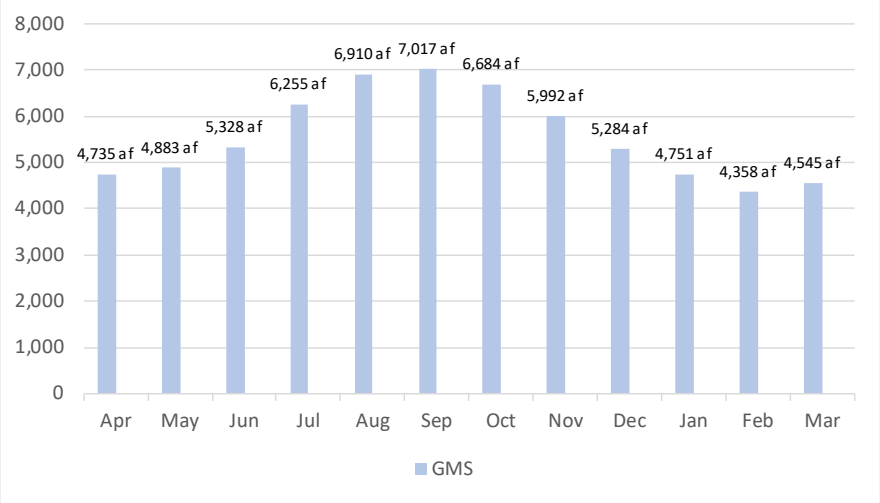


Figure 5. Seasonal Well Depletion Pattern (all reaches).

3.3 Comparison of GMS's Supplies and Demands

GMS's water supplies include changed senior rights, junior storage, recharge and exchange rights, and leased supplies. Changed senior rights comprise a relatively small, but important component of GMS's water rights portfolio (approximately 6,000 af per year). A majority of the rights are located in Water District 2 (South Platte River above the Bijou Canal), Water District 3 (Cache la Poudre River), and Water District 6 (Boulder Creek). These rights are instrumental in providing supplies during the irrigation season but are not available during the non-irrigation season unless they are delivered to reservoir storage or into recharge projects. In fact, return flow maintenance during the non-irrigation season for these changed direct flow rights increases Central's overall obligation during the winter.

As noted above, approximately 38 percent of depletions from pumping GMS member wells during the irrigation season impact the river during the winter months. Junior recharge and storage water rights

provide both irrigation season and non-irrigation season supplies but are particularly important during the winter months. Central's existing reservoirs have storage rights that total approximately 28,000 af (GMS shares a portion of this storage space with Central and the Well Augmentation Subdistrict). However, since the water rights are junior, the yield of these reservoirs is expected to be substantially less.

Most of Central's reservoir storage consists of reclaimed sand and gravel mines similar to Pioneer Reservoir. Central has been working with gravel mine operators to create reservoir storage as part of post-mining reclamation since the mid-1980s. Gravel pit storage has been constructed by Central along the South Platte River (Koenig Reservoir), Boulder Creek (Shores Reservoir, Rinn Valley Reservoir and Hokestra Reservoir), Big Thompson River (Bernhardt Reservoir), and the Cache la Poudre River (JoDee Reservoir, LaPoudre Reservoir, 83rd Avenue Reservoir and Geisert Reservoir). Nissen Reservoir (discussed below) is an active gravel mining operation just west of Pioneer Reservoir that will be reclaimed by GMS for reservoir storage.

GMS operates multiple recharge projects along the South Platte River between Denver and Fort Morgan. Recharge is vital component of both irrigation and non-irrigation season supplies but again, since the recharge rights are junior, yield can vary significantly between years. An advantage of recharge operations is that they re-time supplies from wet periods to drought periods and avoid evaporative losses. Recharge projects are typically very cost effective to develop. A disadvantage to recharge is that once water is delivered into the alluvial aquifer, the timing of accretions cannot be controlled, and some portion may return to the river when unneeded.

GMS has relied on numerous leases, primarily from municipal water providers for many years. These leases are typically for fully consumable effluent but have also included shares in various irrigation ditch companies. In recent years these leases have become increasingly difficult to obtain as municipal interests have developed means to recapture and use their effluent. GMS and Central lease approximately 12,000 af per year, but most current leases expire within the next eight years.

3.4 GMS Decree Requirements – Projected Operations

The GMS augmentation plan decree requires annual projections of future operations that demonstrate sufficient water supplies will be available to fully replace out-of-priority well depletions. These projections must occur before additional well pumping can be authorized. The projections require the assumption of drought conditions and a continuous downstream senior call over a six-year period. The projection concept, i.e., comparing future water supplies to future replacement obligations, is shown in **Figure 6**.

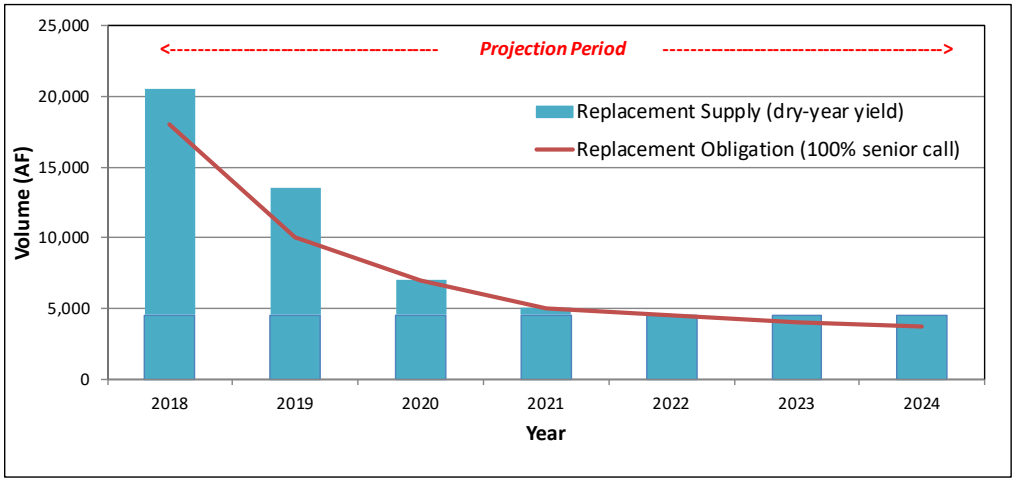


Figure 6. Example Projection (Supply vs. Replacement Obligation).

It should be noted from the example shown in **Figure 6** that although there are projected excess water supplies in the first two projection years, later years of the example projection control the amount of additional well pumping that Central can authorize. Since both projected supplies (under dry-year conditions) and projected replacement obligation (year around call assumption) are unusual conditions, GMS may have more than sufficient replacement supplies during actual operations (at the annual quotas they have been able to authorize).

The projection required by the GMS augmentation plan decree has severely restricted constituent well pumping. In recent years GMS has been able to authorize annual quotas ranging from only 25 to 65 percent because of decree requirements, i.e., well pumping has been curtailed 35 to 75 percent. The annual quota for GMS in 2018 was 55 percent (45 percent of well pumping was curtailed). This curtailment of well pumping emphasizes the need for GMS to develop additional long-term projectable replacement water supplies consistent with the amount and timing of depletions from well pumping. Because water can be held in storage reservoirs over several years, new storage projects provide a good opportunity to develop longer term supplies to support higher annual well pumping quotas.

4 Water Availability for a New Water Right

Pioneer Reservoir will divert water from the South Platte River under a new, junior water right. Because of its junior priority, downstream calls will at times, limit the amount of water that can be diverted. A daily point flow model (Excel spreadsheet) was developed to evaluate water availability in the South Platte River at Pioneer Reservoir. The model reflects a study period from October 1, 1998 to September 30, 2009 and examines streamflows and administrative calls on the South Platte River from the streamflow gage below Chatfield Reservoir to the streamflow gages at Julesburg, Colorado.

River reaches in the point flow model were defined based on locations of historical streamflow measurement gages. Within each river reach (between historical streamflow stations), gains or losses were calculated by subtracting the upstream gage and any inflow within the reach and adding any diversions within the reach from/to the downstream gage.

Gain or Loss = Downstream Gage – Upstream Gage – Inflows + Diversions

Resulting gains or losses were then reallocated across the modeled points within each river reach based on river distance between the streamflow gages. This process provides a reasonable estimate of flows at all individual points represented in the model; the quantified flow defines the physical amount of water available for diversion.

Historical administrative calls from water rights on the South Platte River downstream of Pioneer Reservoir were incorporated into the point flow analysis to determine whether the junior right for the Reservoir could legally divert in priority at the headgate of the Plumb Ditch, regardless of the physical water availability. At times of downstream senior calls, point flows at the Plumb Ditch were set to zero (no water available to divert under a junior water right). When there was no downstream call, water available to divert at Pioneer Reservoir was defined as the minimum point flow between the headgate of the Plumb Ditch and the Julesburg streamflow gaging stations downstream, and as constrained by a 50 cfs diversion rate (the anticipated diversion rate for the new junior water right).

Central is proposing to divert up to 4,000 af from the South Platte River under its new water right at Pioneer Reservoir (2,000 af initial fill and 2,000 af refill). Results of our analysis to examine legal and physical water availability are shown in **Table 2**. Our results indicate 4,000 af will be available for diversion in some years, although because the Project will operate under a junior water right priority, little or no water will be available during extreme drought periods. In some years, only the initial fill of the Reservoir (2,000 af) will be available.

Table 2.

Water Available for Diversion at Pioneer Reservoir

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Total
1999	2,700	2,800	2,600	3,100	2,800	800	700	3,100	2,400	700	2,100	3,000	**26,800**
2000	3,100	3,000	3,100	3,100	2,900	3,100	1,700	100	0	0	0	0	**20,100**
2001	0	0	1,600	3,000	2,800	500	2,800	1,300	1,100	200	0	1,500	**14,800**
2002	700	700	900	1,400	800	600	100	0	0	0	0	0	**5,200**
2003	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2004	0	0	0	0	0	0	0	0	0	0	0	0	**0**
2005	0	0	0	0	0	0	0	0	1,200	0	0	0	**1,200**
2006	100	0	0	0	200	500	0	0	0	0	0	0	**800**
2007	0	0	500	1,000	700	0	300	2,000	800	0	0	0	**5,300**
2008	0	0	1,100	1,900	0	0	0	0	0	0	100	0	**3,100**
2009	0	0	900	0	0	0	500	300	2,300	800	600	400	**5,800**
Min	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Max	**3,100**	**3,000**	**3,100**	**3,100**	**2,900**	**3,100**	**2,800**	**3,100**	**2,400**	**800**	**2,100**	**3,000**	**26,800**
Avg	**600**	**600**	**1,000**	**1,200**	**900**	**500**	**600**	**600**	**700**	**200**	**300**	**400**	**7,500**

The period represented in our point flow model (1999 – 2009) represents both wet and dry conditions but is likely somewhat drier than average when compared to a longer-term period for the South Platte River. In addition, it should be noted that storage under the refill right being claimed for Pioneer Reservoir will only occur after prior releases of the initial fill to downstream senior calls (thereby making space available for the refill). With operation of its initial fill and refill storage rights, GMS anticipates the average storage and release volume will be approximately 1,500 af per year on a long-term basis. This amount of water will have significant impacts on GMS and its ability to authorize additional well pumping for its constituent wells.

5 Pioneer Reservoir Project

The Pioneer Reservoir Project is in the SW ¼ of Section 7, Township 5 North, Range 64 West, just west of Weld County Road 51 and just north of Weld County Road 58 (**Figure 7**). The Project involves reclamation of a sand and gravel extraction site for use as water storage. Mining at the Journey Ventures Pit (aka "J2 Pit" commenced in 2012 pursuant to Permit No. M-2008-080 issued by the Mine Land Reclamation Board.

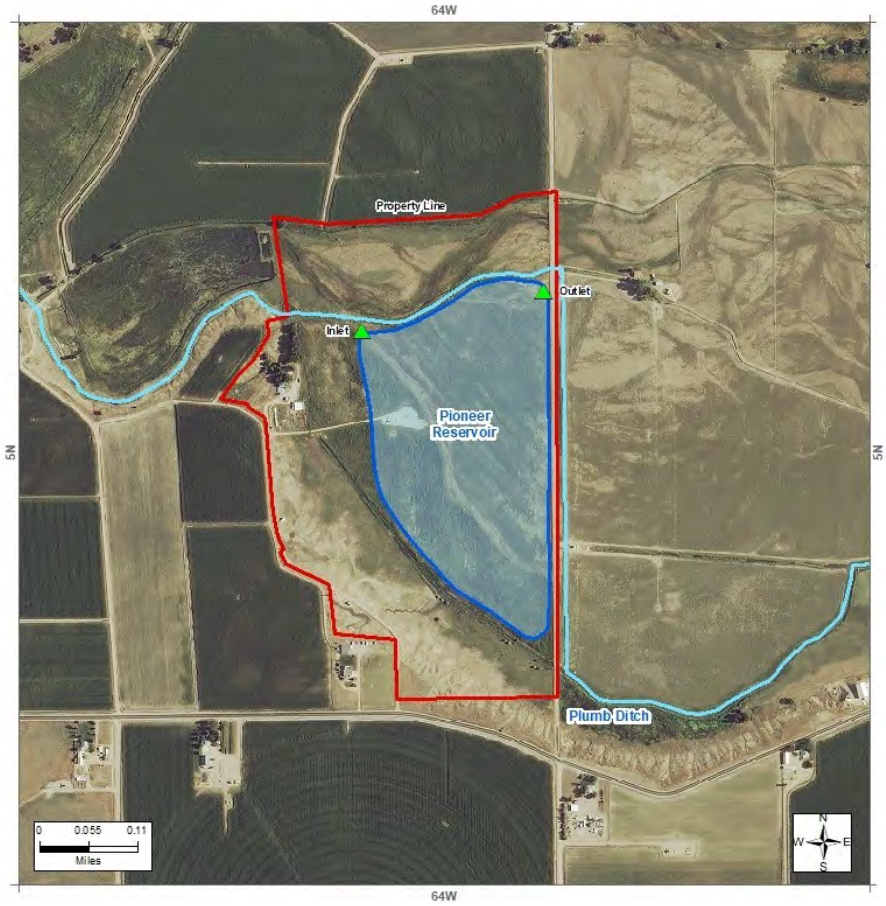


Figure 7. Pioneer Reservoir Property

In 2014 a bentonite slurry wall was constructed around the perimeter of the mining area. The slurry wall extends downward from the ground surface to a depth of approximately 70 feet and keys into the underlying Pierre shale bedrock 3 to 4 feet (**Figure 8**). The slurry wall isolates the interior of the site from surrounding groundwater and has been conditionally approved for storage by the Division 1 Engineer (**Appendix A**). Mining within the slurry wall is expected to be completed in 2021. The entire Pioneer Reservoir Property comprises approximately 104 acres, and the slurry wall encloses an area of approximately 41 acres.

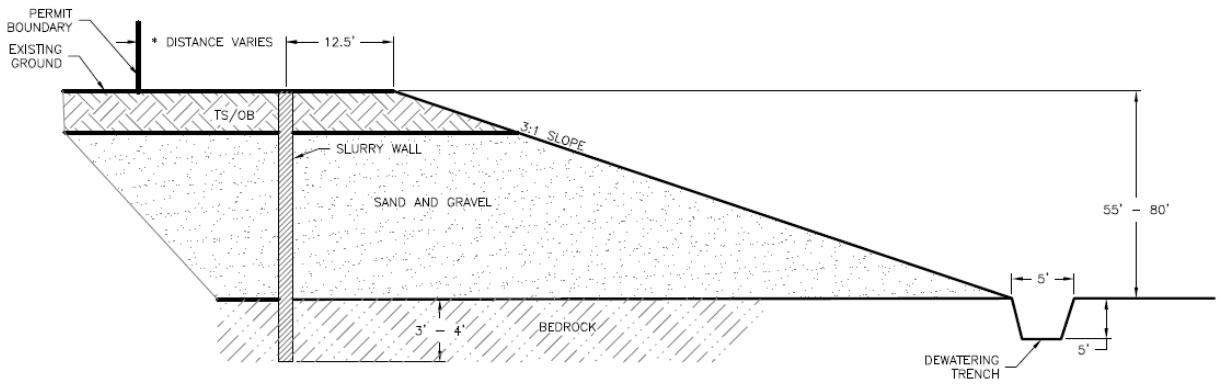


Figure 8. Typical Slurry Wall and Backfill Section.

Figure 9. Mining Operations at J2 Pit (Pioneer Reservoir)

Water will be delivered into Pioneer Reservoir via the Plumb Ditch (aka Highland Ditch). The Plumb Ditch (WDID 0200837) diverts water from the South Platte River through a headgate located approximately 2.5 miles to the west of the Reservoir and approximately two miles upstream of the South Platte confluence with the Cache la Poudre River. The Plumb Ditch was constructed by the Plumb Irrigation Company in the 1880s to irrigate approximately 1,000 acres, some of which was located at the site of the Project. The Ditch flows generally eastward for approximately 3.8 miles before tailing back to the South Platte River.

GMS owns another gravel pit reservoir under the Plumb Ditch. In 2002 GMS obtained a storage right for 3,000 af in Nissen Reservoir (WDID 0203928) in Case No. 02CW270. Nissen Reservoir is also a sand and gravel mining operation under the Plumb Ditch service area in the SE ¼ of Section 12, Township 5 North, 64 West. A bentonite slurry wall was constructed around the perimeter of the Nissen property in 2005, and GMS delivers water to *in situ* storage at the site via the Plumb Ditch (*in situ* storage capacity is roughly 875 af). The inlet to Nissen Reservoir from the Plumb Ditch is located approximately 1.5 mile west of Pioneer Reservoir and consists of two 24-inch Rubicon gates. Mining operations have commenced at Nissen and mining and reclamation are expected to be completed within five years. As part of the development of Nissen Reservoir and obtaining a decree for use of the Plumb Ditch water rights for augmentation use, GMS constructed several ditch improvements to convey and measure water deliveries to the South Platte River (**Figure 10**).

Figure 10. Augmentation Station for Deliveries from Plumb Ditch.
(The site of Pioneer Reservoir is shown in the background).

GMS is a majority shareholder in the Plumb Ditch Company (ownership is 52.2 percent) and has a carriage agreement to carry water in the Ditch for purposes other than irrigation. GMS has delivered water to Nissen Reservoir under this carriage agreement and can also deliver water for recharge purposes along the course of the Ditch pursuant to a decree entered in Case No. 05CW331. The Plumb Ditch is ideal and very economical for conveying water from the South Platte River to Pioneer Reservoir because of GMS's ownership interest in the Plumb Ditch Company, their existing carriage agreement and improvements put in place during development of Nissen Reservoir. The Ditch will require only minor improvements to accommodate the anticipated fill rate for Pioneer Reservoir (50 cfs).

5.1 Project Development

Development of the Pioneer Resevoir Project will occur in two phases. The first phase is completion of sand and gravel mining followed by site reclamation. Final reclamation at the site is expected to occur in 2021. The second development phase will consist of constructing inlet, outlet and measurment facilities, and minor modifications to the channel of the Plumb Ditch between the inlet to Nissen Reservoir and the Inlet to Pioneer Reservoir to accommodate flow rates up to 50 cfs.

5.2 Infrastructure Components

The inlet to Pioneer Reservoir will consist of a new check structure installed in the Plumb Ditch near the northwest corner of the Reservoir. Water will be delivered from the Ditch through an approach channel and broad crested flume capable of conveying and measuring up to 50 cfs. A pipeline will extend from the flume to an inlet structure at the edge of the Reservoir. A grouted rip-rap rundown channel will be constructed from the reservoir inlet structure approximately 250 feet into the Reservoir basin along the interior slope.

The outlet from Pioneer Reservoir will consist of a pump station capable of discharging up to 10 cfs. Because of the considerable depth of the Reservoir (over 70 feet), two options are being considered for sizing the pump station. Under one alternative a pump station with high lift capabilities would be constructed that could access the full volume of the Reservoir. Under another alternative a lower head pump station would be constructed that is capable of de-watering approximately the top 40 feet of the Reservoir, and a smaller high-head centrifugal floating pump would be used to de-water from lower elevations. Water pumped from the Reservoir will be delivered into the Plumb Ditch through a new outlet structure with a flow measurement device.

GMS anticipates several locations along an approximately 1.5 mile stretch of the Plumb Ditch between the Nissen Reservoir inlet and the Pioneer Reservoir inlet will require minor improvements in order to convey flows up to 50 cfs. These improvements may include channel stabilization and/or repair or replacement of culverts under farm roads.

5.3 Project Costs

Preliminary cost estimates have been developed for the Project. GMS will acquire the Pioneer Reservoir property for $5.318 million. Preliminary engineering design and infrastructure costs have been estimated to be $2.753 million (**Table 3**). These costs include fees for engineering design, engineering construction, and a 10 percent contingency. GMS anticipates entering into a contract for design of the Reservoir inlet and outlet structures during 2021, with construction to be completed by early 2022.

Table 3.
Pioneer Reservoir Project Preliminary Cost Estimate

Pioneer Reservoir Project Opinion of Probable Cost				
Description	**Unit**	**Quantity**	**Unit $**	**$**
Project Property				
J2 Pit Storage Site/Surry Wall (44 acres)	af	1,800	$2,700	$4,860,000
Surrounding Property (60 acres)	LS	1	$457,720	$457,720
Total (Property)				**$5,317,720**
Improvement Description	**Unit**	**Quantity**	**Unit $**	**$**
Fill Infrastructure				
Check and Headgate Structure in Plumb Ditch	LS	1	$80,000	$80,000
Flume Approach Channel	LS	1	$60,000	$60,000
50 CFS Broad Crested Flume Structure	LS	1	$80,000	$80,000
Pipe from Flume to Reservoir Inlet Structure	LS	1	$30,000	$30,000
Reservoir Inlet Structure	LS	1	$40,000	$40,000
Grouted Rip-Rap Rundown channel	LS	1	$240,000	$240,000
Miscellaneous Plumb Ditch Improvments	LS	1	$100,000	$100,000
Slurry Wall Crossing and Repair	LS	1	$25,000	$25,000
Sub Total				**$655,000**
Extraction Infrastructure				
10 CFS Pump Station	LS	1	$1,241,000	$1,241,000
Power and Electrical	LS	1	$75,000	$75,000
Pipeline to Plumb Ditch	LS	1	$35,000	$35,000
County Road Crossing	LS	1	$10,000	$10,000
Oulet Structure in Plumb Ditch	LS	1	$20,000	$20,000
Slurry Wall Crossing and Repair	LS	1	$25,000	$25,000
Sub Total				**$1,406,000**
Design & Permitting	10%			**$206,100**
Surveying	LS	1	$25,000	**$50,000**
Slurry Wall Test	LS	1	$50,000	**$50,000**
Construction Engineering	LS	1	$180,000	**$180,000**
Contingency	10%			**$206,100**
Total (Infrastructure)				**$2,753,200**
Project Total				**$8,070,920**

The Pioneer Reservoir Project will be funded through the CWCB loan being requested by GMS. Long-term operational and maintenance costs of the Project will be funded through subdistrict tax collections and member assessments. The term of the loan from CWCB would be 10 years at an annual interest rate of 1.25 percent (the loan application is provided as **Appendix B**).

GMS has a long history of successfully financing and building water development projects in Morgan, Weld and Adams counties. Central and GMS have worked successively with CWCB on several prior loans to finance other water development projects.

6 Alternatives Analysis

6.1 No Action

Under this alternative GMS would not develop the Pioneer Reservoir Project and would continue to rely on its existing infrastructure and water rights to provide water supplies to constituent members. This alternative is unacceptable because it does not result in development of additional water supplies. As discussed above, additional water supplies are needed by GMS.

6.2 Alternative Storage Locations

Under this alternative GMS would seek to develop additional reservoir storage at alternative locations. Central and GMS routinely investigate new reservoir storage opportunities, including evaluation of property acquisition and infrastructure costs associated with individual locations. Projects evaluated in recent years showed unit costs for finished storage (reservoir property and necessary infrastructure) ranging from approximately $5,000 to $6,500 per af. At a total cost of $8.071 million for Pioneer Reservoir and a storage capacity of 1,800 af to 2,000 af, the unit cost for finished storage will be approximately $4,000 to $4,500 per af. The favorably low cost of Pioneer Reservoir is due largely to the location of the project and the ability to use the Plumb Ditch for conveyance of water to the reservoir inlet and from the reservoir outlet. Alternative storage locations are therefore less economically favorable.

6.3 Preferred Alternative

The alternative preferred by GMS to address their need for more reservoir storage and to improve their ability to provide additional augmentation supplies to constituent member wells is to develop the Pioneer Reservoir Project described above. GMS believes that that the Pioneer Reservoir Project is the most economically efficient alternative that meets the project purpose.

7 Financial Information

7.1 GMS

In 2018 the Groundwater Management Subdistrict's total annual revenues were $5.167 million, and revenues are projected to be $9.614 million in 2019. Funds are obtained by GMS from both tax revenues (Weld, Morgan and Adams counties) and annual Class B, C and D member assessments for the GMS plan for augmentation. GMS' revenues are used to purchase, lease and develop water rights, as well as to operate the annual augmentation plan.

Comparative financial information for GMS over the period 2014 – 2018 is shown in **Table 4**. Detailed financial statements and reports from an independent auditor for the years 2016 - 2018 are provided as **Appendix C.** GMS's financial budget for 2019 is provided as **Appendix D**.

Table 4
Comparative Historical Financial Information

GMS	2018*	2017	2016	2015	2014
Assessed Valuation	$2,023,944,073	$ 1,570,042,055	$ 2,405,120,830	$ 2,160,620,900	$ 1,542,160,719
Mill Levy	1.353	1.583	1.232	1.319	1.301
Operations - All Funds					
Property & Specific taxes	$2,953,913	$ 2,485,376	$ 3,054,689	$ 2,698,301	$ 1,980,615
Water Assessments & Other Revenue	$2,213,005	$ 1,776,956	$ 1,491,465	$ 1,766,662	$ 3,160,993
Total Revenues	$5,166,918	$ 4,682,985	$ 5,044,874	$ 4,979,086	$ 5,141,608
Total Expenditures	$11,954,916	$ 4,325,859	$ 4,118,919	$ 3,197,185	$ 4,442,274
Excess (deficiency) of Revenues**	-$6,787,998	$ 357,126	$ 925,955	$ 1,781,901	$ 699,334
Financial Position					
Cash & Investments**	$3,342,562	$ 10,805,694	$ 10,431,702	$ 10,149,092	$ 9,937,215
Water, Property & Equipment	***	$ 30,629,329	$ 28,642,623	$ 23,284,914	$ 25,206,771
Total Liabilities	***	$ 17,543,270	$ 16,979,731	$ 19,021,816	$ 16,280,146
Total Net Assets	***	$ 21,313,467	$ 19,705,699	$ 17,563,144	$ 16,035,588

** Data for 2018 has not yet been audited.*
*** Reflects early payments of $7.8 million on CWCB loans C150160 and C150117.*
**** Will be completed following 2018 financial audit.*

GMS maintains three separate funds for purposes of their financial operations: 1) the General Fund is used to fund daily operations at GMS including salaries and benefits of staff, and to acquire water rights and develop water storage and recharge projects, 2) the Water Enterprise Fund is used to fund operations

of the GMS plan for augmentation, and specifically water leases (ditch shares, recharge, effluent), and 3) the Debt Service Fund is used to repay loans and other debt that may be carried by GMS. Property taxes are generally used to supply the General Fund and the Debt Service Fund, whereas member assessments are used to supply the Water Enterprise Fund.

GMS' water supply projects are funded through their General Fund, their Water Enterprise Fund, and/or through loans and grants. For example, several projects have been and are being developed through grants obtained from the U.S. Bureau of Reclamation, U.S. Department of Agriculture's Agricultural Water Enhancement Project (AWEP), and grants made available through the Colorado Water Plan.

In 2018 voters approved issuance of debt up to $48.7 million to fund water acquisition and infrastructure projects. A portion of this debt issuance will be through this loan request for $7.454 million from the CWCB Water Project Loan Program. GMS is not subject to the Taxpayers Bill of Rights Amendment (TABOR) to the Colorado Constitution.

GMS is seeking to borrow $8.071 million from CWCB. Over a 10-year period at an interest rate of 1.25 percent, annual loan payments are expected to be approximately $863,613. Information concerning GMS's ability to repay the loan from CWCB is provided as **Appendix E**.

8 Loan Request, Credit Worthiness, and Collateral

GMS is requesting is 10-year loan for $8.071 million. This amount relects the cost to acquire the Pioneer Reservoir property ($5.318 million) and a preliminary cost estimate to develop the required infrastructure and improvements ($2.753 million).

GMS sought input concerning their ability to repay debt from George K. Baum & Company and requested a credit worthiness rating from Standard & Poor's Ratings Services concerning financial feasibility (**Appendices E**).

Collateral for this loan will be in the form of the water supply project, i.e., he Pioneer Reservoir Project facilities, developed with the loan funds.

Proceeds from this CWCB loan may provide substitute funding for water supply projects that would otherwise be funded by a long-term bond issuance funded though GMS's debt service funds. This would mean that repayment of the loan is guaranteed because it has already been approved by GMS voters (taxes to service the debt will be collected).

9 Conclusions

The GMS Board of Directors have determined that the Pioneer Reservoir Project is an essential component of their water supply infrastructure future and necessary for long-term operations and economic security. This report provides a description of how funds from a CWCB loan would be used, the probable benefit to GMS, and the financial capacity of GMS to repay the loan from CWCB.

10 Limitations

This document was prepared for Colorado Water Conservation Board in accordance with professional standards at the time the services were performed and in accordance with a contract between White Sands Water Engineers, Inc. and Central Colorado Water Conservancy District. The document is governed by the specific scope of work authorized by Central and is not intended to be relied upon by any other party. White Sands Water Engineers, Inc. makes no warranties, express or implied, with respect to this document. Any party that relies on this document, except those authorized herein or under the terms of the contract between Central and White Sands Water Engineers, Inc. does so at its own risk. Further, we have relied on information or instructions provided by Central and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

Appendix A

Pioneer Reservoir – Conditional Approval of Slurry Wall

COLORADO
Division of Water Resources
Department of Natural Resources

John W. Hickenlooper
Governor

Robert Randall
Executive Director

Kevin G. Rein, P.E.
Director/State Engineer

December 7, 2018

J & T Consulting Inc.
J.C. York, P.E.
305 Denver Avenue, Suite D
Fort Lupton, Co 80621
Transmission via Email: jcyork@j-tconsulting.com

RE: Slurry Wall Liner Approval - Provisional
Journey Venture Reservoir (WDID 0103032)
Journey Venture Gravel Pit, DRMS M-2008-080 (WDID 0110849)
E½ of Section 7, T5N, R64W, 6th P.M.
Water Division 1, Water District 1, Weld County

Dear Mr. York:

The purpose of this letter is to provisionally approve the lining of the Journey Venture Reservoir. This reservoir is located in the E½ of Section 7, Township 5 North, Range 64 West of the 6th P.M., and is a part of the Journey Venture gravel pit (DRMS M-2008-080). A slurry wall was constructed around the mining area. Mining has not completed within the liner boundary and will continue for several years. The slurry wall liner leak test commenced on July 28, 2018 and concluded on October 26, 2018. A site inspection was performed by our office on November 20, 2018 to review site conditions.

Your report dated November 5, 2018 provides the liner summary and leak test result. The test data provided indicates that **liner meets the performance standard** referenced in the August 1999 State Engineer Guidelines for Lining Criteria for Gravel Pits (1999 SEO Guidelines). **Meeting the performance standard requires that during reservoir operations all water inflows and outflows for the liner perimeter enclosed area be accounted for on a weekly basis**.

This liner approval is applicable only during mining operations at the site and does not classify the structure as a reservoir capable of water storage. However, for the remainder of mining operations, water within the liner boundary is now classified as trapped native ground water. The trapped native ground water may be removed from within the lined area and returned to the stream system through surface flow or ground water recharge without the need for replacement so long as the operator does not put the water to beneficial use. All native trapped ground water remaining that is put to beneficial use (except for the water removed in product) must be replaced by the operator. All inflow of water into the liner boundary from any source, including precipitation and ground water inflows shall be removed by the pit operator so as not to cause out-of-priority storage. **In order for the liner to be approved for water storage the operator must perform a final leak test once mining is complete and the site is at final grade.** The final leak test will be allowed to have a modified duration of 30-days as long as the liner continues to satisfactorily operate during mining operations.

Please contact me at 303-866-3581 x8246 if you have any questions.

Sincerely,

Ioana Comaniciu, P.E.
Water Resource Engineer

Ec: Michael Hein, Assistant Division Engineer (Michael.Hein@state.co.us)
Evan Snyder, District 1 Water Commissioner (Evan.Snyder@state.co.us)
Louis Flink, Diversion Records Coordinator (Louis.Flink@state.co.us)
WDID File (0103032 & 0110849)

Appendix B
CWCB Loan Application

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Water Project Loan Program

Projects financed by the Water Project Loan Program must align with the goals identified in Colorado's Water Plan and its measurable objectives.

Application Type

☐ Prequalification *(Attach 3 years of financial statements)* ☑ Loan Approval *(Attach Loan Feasibility Study)*

Agency/Company Information

Company / Borrower Name: Groundwater Management Subdistrict

Authorized Agent &Title: Randall Knutson, Board President

Address: 3209 West 28th Street Greeley, CO 80634

Phone: (970) 330-4540 | Email: knutsonra@aol.com

Organization Type: ☐ Ditch Co, ☑ District, ☐ Municipality ☐ other: _____ | Incorporated? ☐ YES ☑ NO

County: Adams, Morgan, Weld | Number of Shares/Taps:

Water District: Conservancy District | Avg. Water Diverted/Yr _____ acre-feet

Number of Shareholders/Customers Served: | Current Assessment per Share $_____ (Ditch Co)

Average monthly water bill $ _____ (Municipality)

Contact Information

Project Representative: Randy W. Ray

Phone: (970) 330-4540 | Email: rray@ccwcd.org

Engineer: Ed Armbruster

Phone: (303) 495-7576 | Email: ed.armbruster@whitesandswater.com

Attorney: Brad Grasmick

Phone: (970) 622-8181 | Email: brad@ljcglaw.com

Project Information

Project Name: Pioneer Reservoir Project

Brief Description of Project: (Attach separate sheets if needed)

Pioneer Reservoir will be a water storage reservoir developed following reclamation of a sand and gravel mine. GMS will acquire the property in June, 2019. A bentonite slurry wall has been constructed around the perimeter of the site to allow water storage. Water will be diverted to the reservoir from the South Platte River via the existing Plumb (aka Highland) Ditch. The Project includes constructing inlet and outlet facilities at the reservoir.

Project Start Date(s) Design: June - December 2021 Construction: January - June 2022

General Location: (Attach Map of Area) map attached

The Project location is in Weld County, south the South Platte River between Greeley and Kersey.

Project Costs - Round to the nearest thousand

Estimated Engineering Costs: $306,000 | Estimated Construction Costs: $5,318,000

Other Costs (Describe Above): $2,447,000 | Estimated Total Project Costs: $8,071,000

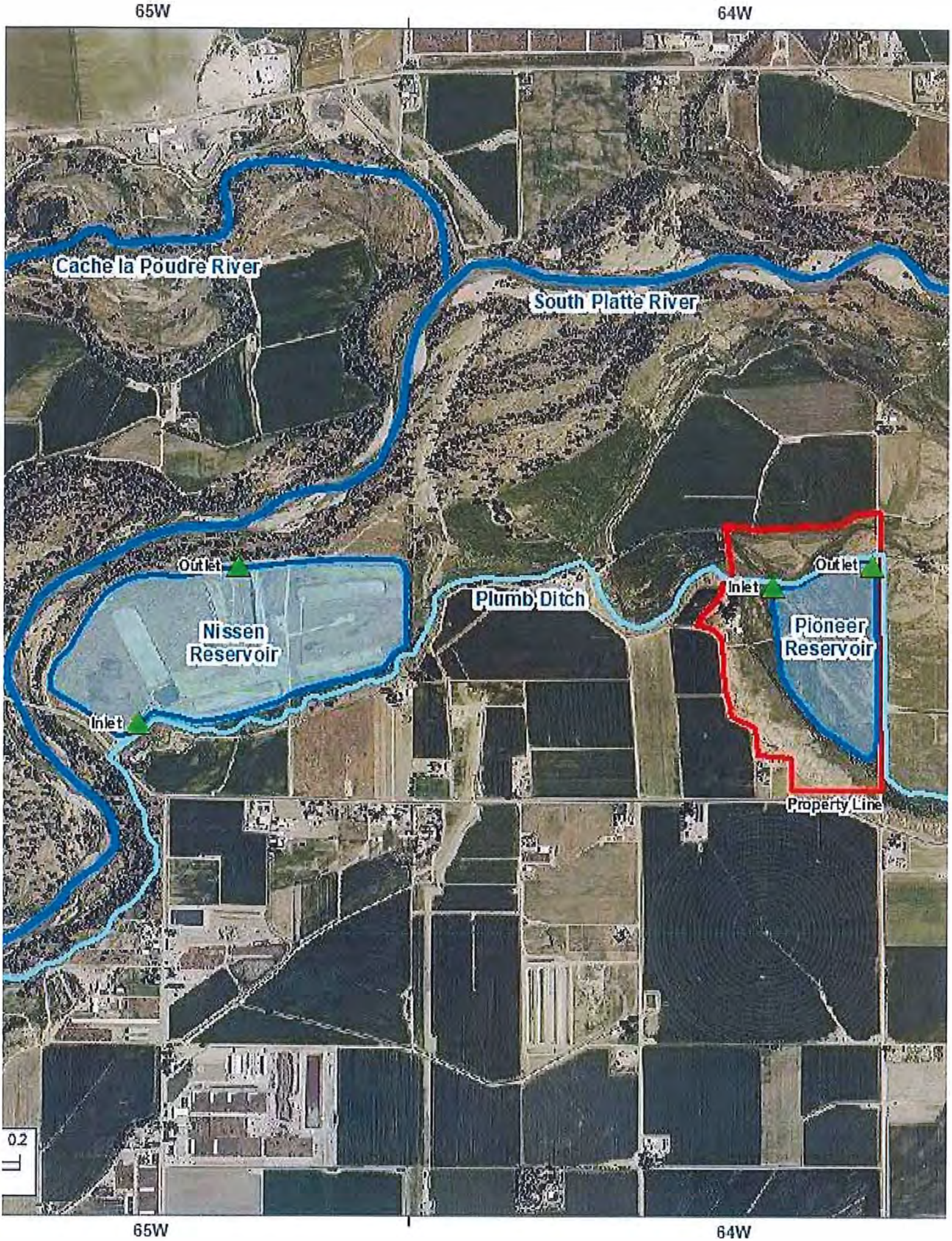
Requested Loan Amount: $8,071,000 | Requested Loan Term(10, 20, or 30 years): 10 Years

Signature

Randall C Knutson 1/29/2019

Signature / Title Date

Return to: Finance Section Attn: Anna Mauss
1313 Sherman St #718
Denver, CO 80203
Ph. 303/866.3449
e-mail: anna.mauss@state.co.us


65W
64W
Cache la Poudre River
South Platte River
Outlet
Nissen Reservoir
Inlet
Plumb Ditch
Outlet
Inlet
Pioneer Reservoir
Property Line
0.2
65W
64W

APPENDIX A
FORM OF THE BALLOT ISSUE

Ballot Issue ___: Ground Water Management Subdistrict Debt

SHALL THE GROUND WATER MANAGEMENT SUBDISTRICT OF THE CENTRAL COLORADO WATER CONSERVANCY DISTRICT DEBT BE INCREASED UP TO $48.7 MILLION, WITH A MAXIMUM REPAYMENT COST OF UP TO $91.9 MILLION, AND SHALL SUBDISTRICT TAXES BE INCREASED UP TO $4.4 MILLION ANNUALLY FOR THE PURPOSE OF DEVELOPING, ACQUIRING AND MANAGING RELIABLE WATER RESOURCES THROUGH DEBT FINANCING TO:

- INCREASE WATER SUPPLIES NECESSARY TO SUPPORT AND MAINTAIN A VIABLE FARMING AND BUSINESS COMMUNITY THROUGH DEVELOPMENT OF WATER PROJECTS TO CAPTURE WATER DURING TIMES OF HIGH SUPPLY FOR USE DURING TIMES OF NEED,
- LESSEN DROUGHT IMPACT THROUGH THE ACQUISITION OF SENIOR WATER RIGHTS,
- REPLACE LEASED MUNICIPAL WATER RESOURCES THAT ARE BEING CONSUMED BY GROWTH IN AREA MUNICIPALITIES, AND
- CONSTRUCT AND IMPROVE WATER STORAGE RESERVOIRS AND OTHER FACILITIES TO MORE EFFICIENTLY USE WATER AVAILABLE TO THE SUBDISTRICT,

SUCH DEBT TO CONSIST OF THE ISSUANCE AND PAYMENT OF BONDS OR SIMILAR LIMITED TAX OBLIGATIONS, WHICH DEBT SHALL BEAR INTEREST AT A MAXIMUM NET EFFECTIVE INTEREST RATE NOT TO EXCEED 5.5% PER ANNUM AND SHALL BE DATED AND SOLD AT SUCH TIME OR TIMES, AT SUCH PRICES (AT, ABOVE OR BELOW PAR) AND IN SUCH MANNER AND CONTAINING SUCH TERMS, NOT INCONSISTENT HEREWITH, AS THE BOARD OF DIRECTORS MAY DETERMINE; AND SHALL (I) AD VALOREM PROPERTY TAXES BE LEVIED IN ANY YEAR AT A LIMITED MILL LEVY RATE NOT TO EXCEED 6 MILLS, EXCEPT AS PERMITTED IN SECTION 37-45-126 OF THE COLORADO REVISED STATUTES, AND IN SUCH AMOUNTS AS SET FORTH ABOVE AND (II) THE SUBDISTRICT BE AUTHORIZED TO ENCUMBER AND PLEDGE ANY OTHER REVENUES OF THE SUBDISTRICT TO BE USED TO PAY THE PRINCIPAL OF AND INTEREST ON SUCH BONDS AS THE SAME BECOME DUE AND TO FUND ANY RESERVES FOR THE PAYMENT THEREOF?

STATE OF COLORADO
COUNTY OF ADAMS

At the 2018 General Election held in Adams County, Colorado on the 6th day of November, 2018, the following votes were cast for

Central Colorado Water Conservancy District Ballot Issue 7E

YES/FOR	***1,349***
NO/AGAINST	***1,405***

as reported in the official canvass certified to the Colorado Secretary of State on the 28th day of November, 2018

I, Stan Martin, Clerk and Recorder within and for said Adams County, do hereby certify that "No/Against" on Ballot Issue 7E received the greatest number of votes cast.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 28th day of November, 2018

Christi Cobun, Chief Deputy

Stan Martin, Adams County Clerk and Recorder

Certificate of Election

State of Colorado
County of Morgan

I, Susan L. Bailey, Clerk and Recorder within and for said Morgan County, do hereby certify that at a Coordinated Election held in said County on the 6th of November, 2018 the following numbers of votes were cast on:

Central Colorado Water Conservancy – Groundwater Management Subdistrict –

Ballot Issue 7E

In and for said Morgan County as appears from the official canvass of the votes cast at said Election in said County, said canvass made on the 20th of November, 2018 and certified to the Secretary of State of Colorado on November 20, 2018.

YES	89	votes
NO	47	votes

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 20th day of November, 2018.

Seal

Susan L. Bailey

Susan L. Bailey, County Clerk and Recorder
Morgan County, Colorado

Revised 5/26/09

STATE OF COLORADO)
) SS. **CERTIFICATION OF ELECTION**
CENTRAL COLORADO WATER CONSERVANCY DISTRICT GROUND WATER MANAGEMENT SUBDISTRICT

I, Carly Koppes, Weld County Clerk and Recorder, do hereby certify the Official Abstract of Votes Cast attached herein for the 2018 General Election held in Weld County on the 6th Day of November 2018.

We the undersigned Canvass Board for the 2018 General Election do hereby certify that:

- We have reviewed the Risk-limiting Audit
- We have reviewed all ballot forms and ballot logs associated with this election
- We have compared the number of ballots counted to the number of ballots cast
- We have reviewed and do hereby certify the results in the Official Abstract of Votes Cast

Witness our hands and seal this 20 of November 2018.

Bradley Inhulsen, Republican Canvass Board Member

Patricia Kiovsky, Democratic Canvass Board Member

Carly Koppes, Weld Clerk and Recorder

Central Colorado Water Conservancy District Ground Water Management Subdistrict Ballot Issue 7E (Vote for 1)

Precinct	Registered Voters	Precinct	Yes/For	No/Against	Total Votes
Cumulative	0	Cumulative	0	0	0
Cumulative - Total	0	Cumulative - Total	0	0	0
County - Total	15,059	County - Total	5,344	3,887	9,231

Appendix E

Opinion Concerning Financial Feasibility

George K. Baum & Company
INVESTMENT BANKERS SINCE 1928

January 31, 2019

Ms. Danyelle McCannon
Financial Analyst
Groundwater Management Subdistrict
c/o Central Colorado Water Conservancy District
3209 W. 28th Street
Greeley, CO 80634

Re: $8,071,000 CWCB Loan for Pioneer Reservoir By e-mail and USPS

Dear Ms. McCannon:

We have been asked to express an opinion on the ability of the Groundwater Management Subdistrict (GMS) to borrow and repay a proposed $8,071,000 loan from the Colorado Water Conservation Board (CWCB) to be taken down in 2019. It is our understanding the loan of $8,071,000 will be for 10 years at an interest rate of 1.25%.

GMS has an assessed valuation of $2,747,006,018 for property taxes collected in 2019. The District currently levies 2.739 mills which results in the collection of $7,524,049 in property taxes. In addition to the above-mentioned revenue, GMS receives annual water assessments which, in 2019, will amount to $1,756,300. From these amounts $5,539,115 is currently collected for annual debt payments which will be retired in full by 2028. Assuming GMS receives a CWCB loan of $8,071,000 the annual payment will be about $863,622 for principal and interest which would require a levy of .314 mills based on the current assessed valuation of $2,747,006,018.

In November 2018, GMS voters approved a $48.7 million limited tax general obligation bond issue. GMS has the ability to repay a CWCB loan of $8,071,000 with property taxes. Based on this analysis and a review of the financial condition of the Groundwater Management Subdistrict, it is the opinion of George K. Baum & Company that a $8,071,000 million loan on the above described terms can be repaid by the Subdistrict.
Your comments are welcome.

Sincerely,

Donald W. Diones
Senior Vice President

white sands water engineers, inc