

**The Ruby Ranch Subdivision
2019-2020 Irrigation and Meadow Management Plan**

Summit County, Silverthorne Colorado
FINAL V 12.05.19

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Introduction

The purpose of this document is to provide a consolidated set of information on Ruby Ranch subdivision's irrigation system, meadow maintenance, and hay operations. This document also provides guidance and minimum requirements for properly managing these assets as is required by the Covenants, and in a manner that helps achieve the owners strategic vision of Ruby Ranch as a unique equestrian community. A community focused on protecting current water rights, maximizing the usage of those water rights, improving soil and meadow grass health, increasing hay yield, and improving the value of these operations for owners.

This plan has been evolved from past practices, includes input from local specialist, and recommendation from agricultural experts. Implementation of this plan will be a highly collaborative effort between the Ruby Ranch Owners Association (RROA), the Stable, Irrigation, and Hay (SIH) committee, the Willow Brook Metro District (WBMD), and key service providers.

Stable, Irrigation & Hay Committee's Vision Statement

We envision a unique equestrian community where collaborative stewardship results in a well-maintained stable, secure water rights, healthy meadow, high quality hay, and increased value for Ruby Ranch owners.

Multiple irrigation and hay operation models have been used over the years. Most recently, a model that leveraged different independent contractors for irrigation management versus hay harvesting. Going forward, one of the main objectives is to leverage a single independent contractor for both, and to assist in the achievement of the following goals;

- ✓ Protect Water Rights
- ✓ Maximize Water Right Usage
- ✓ Improve Soil & Meadow Grass Health
- ✓ Increase Hay Yield
- ✓ Improve Operations Efficiency & Value for Owners

These goals will be accomplished through the implementation of this management plan and completion of specific improvements over the next few years (Annex G).

Irrigation Management

The Ruby Ranch subdivision has the benefit of flood irrigation rights on three ditches within Colorado's Water Division 5; Sawmill Ditch, Ruth Ditch, and the Ruby Ditch. A total of 7.4 cubic feet per second (c.f.s.) of water is deeded to the Ranch out of these ditches for the purpose of agricultural use. The 7.4 c.f.s. equates to 199,281 gallons per hour or 4.8m gallons per day and is one of our most valuable resources. The source water for the ditches is the Willow Creek, which is a tributary of the Blue River.

Article III, Section 2 (a) and (d) include the provisions that dedicate common tracts to WBMD, and the water rights to the RROA. Article VII, Section 7 of the Covenants grants the RROA ownership

of “all of the hay in the irrigated meadows of the subdivision...”, together with the responsibility “for irrigation of the meadows and fertilization, cutting and harvesting of the hay each season.” In September of 1999, by resolution of the Board of Directors, the RROA confirmed that it retains title to all water rights, but transferred the responsibility for operating and maintaining the irrigation system in the manner directed by the Covenants (Annex E) to the WBMD. The Boards now leverage the SIH committee to care for the day-to-day management of irrigation and hay operations, improvements, and to provide recommendations and support as needed.

Water is the most important input required for plant growth and agricultural (hay) production. Flood irrigation is a tried and true method that dates back to 6000 BC, and has been the legacy method of irrigation here on the Ranch since 1908. These irrigation ditches help water our meadows, and the subsurface water replenishes our wells and supports the lush diversity of vegetation predominant on the ranch. This method uses the soil surface to flow a sheet of water across the field, from the upper end to the lowest end, replenishing soil water storage in the plant root zone through methods other than natural precipitation. The advantage of this method is that it is inexpensive, both in terms of system costs and energy costs. The disadvantage is that it is the most difficult irrigation method to manage efficiently because performance depends strongly on soil properties, infiltration rate, grade, and surface roughness.

The irrigation system and meadows should be systematically managed throughout the season to avoid overwatering, excess surface run off, poor grass quality, meadow erosion, rodent and weed infestations. Historically, the irrigation system is operational from May through October in both Filing 1 and 2. Each ditch has a unique profile, assets, and management considerations. Irrigation cycles and durations are influenced by hay harvesting schedules, and by measuring the depletion of soil moisture between irrigations, and then irrigating when depletion occurs.

Ditch Profiles

All ditches are tributaries of Willow Creek, Division #5, Water District #36, Summit County.

Sawmill Ditch (CDSS Ditch #3600797): provides irrigation water to Filing 1 (tracts A, B, C, D, H, lots 7, 8, 9, and southerly 1/3 of lots 22 and 23), and residential wells.

- Head Gate Legal Location Description
 - i. Latitude 39.635133, Longitude -106.112392. SE ½ of Section 3, S ½ of Section 10, NW ¼ Section of 11, T. 5 S., R. 78 W., 6th Principal Meridian
- Water Right
 - i. 4.0 c.f.s. of Sawmill Ditch, # 222, priority #235, decreed 10/26/1937, appropriation date 05/01/1918, for irrigation use, reserving to grantor 1.833 c.f.s. of Sawmill Ditch No. 84, Priority 85, for domestic use, decree 10/26/1937 with appropriation date of 05/01/1918.
 - ii. 0.167 cfs of Sawmill Ditch No. 84, Priority 85, decreed 10/26/37 with appropriation date of 05/01/1918 was transferred to the wells of the Willowbrook Metropolitan District in consolidated Cases 80CW31 and

80CW200 by decree of the Water Court for Water Division 5, State of Colorado dated January 22, 1981

- iii. Easement Length (7,620 ft), Width (20 ft), Area (3.5 acres)
- Asset Inventory
 - i. Head Gate (Wilderness Area)
 - ii. Parshall Flume (below head gate)
 - iii. Ditch lined with half cut culvert at various locations in the Wilderness portion
 - iv. Diversion box is installed near pond on lot 24
 - v. Wooden Flume (Lot 23)
 - vi. Underground PVC piping and grate cover (1/2 of Lot 7 down to Lot 8)
 - vii. Ditch lined (plastic with rock) from end of Lot 7 piping to the ledge above Ruby Road (Lot 8)

Ruth Ditch (CDSS Ditch #3600794): provides irrigation water to Filing 2, acreage lower than 9050 feet in elevation (tracts O, P, K, M).

- Head Gate Legal Location Description
 - i. Latitude 39.647788, Longitude -106.101452. N ½ corner of Section 2, Township 5 S, Range 78 W of the 6th P.M., bears N 55'35' E 3250 ft.
- Water Right
 - i. 2.4 c.f.s. of the 3.0 c.f.s. decreed 12/23/1920 absolute and 1 c.f.s. decreed 12/23/1920 conditionally to the Ruth Ditch, #202, Basin Rank #2330, for domestic irrigation use, appropriation May 31, 1908
 - 1. District Court, Water Division of the State of Colorado, Case #84-CW-284. Decreed on August 31, 1988. The Town of Silverthorne was decreed .6 c.f.s. of the Ruth's total 3 c.f.s. (20% of the absolute decree, or 9.2 acres worth) for domestic and municipal use. The decreed diversion can only be used from June 1st through to October 31st. The diversion shall take place at N ½ corner of Section 2, Township 5 S, Range 78 W of the 6th P.M., bears N 55'35' E 3250 ft.
 - a. From 1988 prior, the total amount of historic consumptive use resulting from the irrigation practices under the Ruth Ditch water right had amounted to 62.6 acre-feet per year in an average rain year, and 78.7 acre-feet in a dry year. The .6 c.f.s. equates to 9.2 acres of land that will no longer be irrigated.
- Asset Inventory
 - i. Head Gate
 - ii. Metal Flume (below Heat Gate)
 - iii. Underground pipe from Emerald/Agate Road culvert through lot 31 to the top of Tract P

- iv. The ditch is lined with half cut culvert above the lots on Opal to reduce excess leakage

Ruby Ditch (CDSS Ditch #3600793): single purpose ditch used to irrigate the 6+ acres lying at the north end of North Tract K, on the boundary of Smith Ranch in Filing 2, acreage irrigated is lower than 8820 feet in elevation.

- Head Gate Legal Location Description
 - i. Latitude 39.649696, Longitude -106.093557. South or right bank of Willow Creek at a point whence the north quarter cor. Sec. 2, T. 5 S., R. 78 W of the 6th P. M. bears N. 8' 05'E. 1109 ft.
- Water Right
 - i. 1 c.f.s. decreed 3/10/1952 to the Ruby Ditch, #269, priority #346, appropriation date of May 15, 1938
- Asset Inventory
 - i. Head Gate (Lowe property)
 - ii. Diversion Box (Lowe property)
 - iii. Metal Flume (Lowe property)

Meadow Management

The Ruby Ranch meadows consist of numerous tracts of common and privately-owned land. Article III, Section 2 (a) and (d) include the provisions that dedicate common tracts to WBMD, and the water rights to the RROA. Article VII, Section 7 of the Covenants grants the RROA ownership of “all of the hay in the irrigated meadows of the subdivision...”, together with the responsibility “for irrigation of the meadows and fertilization, cutting and harvesting of the hay each season.” The WBMD is responsible for ensuring the meadows are maintained and harvested in the manner directed by the Covenants, while the RROA maintains ownership of all water rights.

Meadow Profiles

Tract	Location Reference	Total Acreage	Acreage Hayed	Primary Purpose
Filing 1				
A	<i>Lots 1, 2, 7, Jade, Ruby</i>	11.53	11.53	<i>Hay</i>
B	<i>Lots 9, 11, Ruby</i>	16.10	16.10	<i>Hay</i>
C	<i>Lots 16, 17, Ruby, Topaz</i>	5.78	5.78	<i>Hay</i>
H	<i>Lot 20, 21, Ruby, Jade</i>	2.22	2.22	<i>Hay</i>
Filing 2				
K	<i>Stable pasture</i>	36.13	0.00	<i>Graze</i>
North K	<i>N/E Boundary (Smith Ranch)</i>	7.96	7.96	<i>Hay</i>
O	<i>Lot 50, Ruby, Emerald</i>	1.27	1.27	<i>Hay</i>
P	<i>Lots 30, 31, Ruby, Emerald</i>	3.74	3.74	<i>Hay</i>
		84.73	48.60	

The RROA, through the SIH committee supports WBMD by working with the service providers to maintain and improve the meadows, develop Grazing Plans each season, and communicates with owners throughout the season on changes as needed. Meadow management and grazing plans should consider and address the following;

- Historically, approximately 49 acres (Tracts A, B, C, H, O, P, and K) were hayed by various independent contractors
- Grazing and harvesting rights are vested by covenant and hay is owned by the WBMD
- Meadow soil should be tested each Springs to confirm soil health and address issues as needed, specifically the addition or balancing of critical minerals like nitrogen via fertilization (chemical, manure, compost) and seeding
- Each spring a drag harrow should be used in the meadows to break up the thatch, manure, and spread hay seed
- Remove rocks, exterminate rodents, fill holes with top soil, compact soil, and control weeds
- In the spring/fall additional work should be scheduled to complete improvements
- Commonly owned hay meadows have priority for irrigation and improvement investment
- The WBMD can agree to allow outside livestock graze common meadow
- As permitted by the covenants, the RROA, which has delegated the responsibility to the SIH committee, owners may seek approval from the SIH committee to graze their horses in the common meadows, once the harvest is complete, with special attention to not overgrazing
- Owner must provide appropriate fencing to contain animals in designated areas, if no permanent fencing exists

Key Metrics/ Performance Indicators

Performance Measurement Name	Result	Notes
# of Common Meadows	7	A, B, C, H, O, P, nK
# of Meadows Harvested	6	2019: A, B, H, O, P, nK
Square Bales per Year (S.B.Y.)	937	10-year average
Square Bales per Acre (S.B.A.)	19	10-year average
# of Tracts Irrigated	7	A, B, C, H, O, P, nK
Acres Harvested	42	2019: A, B, H, O, P, nK
# of Ditches Open	3	2019: Sawmill, Ruth, Ruby
# of Laterals	tbd	2020 -count & inventory
# of Laterals Improved	tbd	2020- begin tracking this
Sawmill Delivery Rate	tbd	2020 - distribution efficiency
Ruth Delivery Rate	tbd	2020 - distribution efficiency
Ruby Deliver Rate	tbd	2020 - distribution efficiency
Meadow Health Score	tbd	2020- meadow/grass/soil health

Hay Meadow Production Log

Tract	Location Reference	Total Acreage	Acreage Hayed	Yearly Hay Harvest Data																		
				2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Filing 1																						
A	Lots 1, 2, 7, Jade, Ruby	11.53	11.53											258		406	332	332	314	332	332	
B	Lots 9, 11, Ruby	16.10	16.10	0	83	0	131	184	154	89	364	78	218	29		185	240				129	
C	Lots 16, 17, Ruby, Topaz	5.78	5.78	0	283	0	336	313	225	251	198	104	280	77	96	295	298			258	258	0
H	Lot 20, 21, Ruby, Jade	2.22	2.22																			18
Sub-Total of Square Bales		35.63	35.63	0	366	0	467	497	379	340	562	182	498	364	96	886	870	332	572	591	480	
Filing 1 Average Square Bales per Acre (ASBPA)				0	10	0	13	14	11	10	16	5	14	10	3	25	24	9	16	17	13	
Filing 2																						
K	Stable pasture	36.13	0.00																			
North K	N/E Boundary (Smith Ranch)	7.96	7.96	0	313	0	362	337	362	424	375	429	190	0	0	349	262	325	205	204	202	
O	Lot 50, Ruby, Emerald	1.27	1.27	0	199	0	65	73	111	86	76	114	72	55	42	64	71	74	40	46	80	
P	Lots 30, 31, Ruby, Emerald	3.74	3.74	0	60	0	147	243	281	195	158	160	146	0	200	202	204	194	94	117	120	
Sub-Total of Square Bales		49.10	12.97	0	572	0	574	653	754	705	609	703	408	55	242	615	537	593	339	367	402	
Filing 2 Average Square Bales per Acre (ASBPA)				0	44	0	44	50	58	54	47	54	31	4	19	47	41	46	26	28	31	
Acreage Totals		84.73	48.60																			
TOTAL SQUARE BALES (Filing 1 & 2)		49.10	48.60	0	938	0	1041	1150	1133	1045	1171	885	906	419	338	1501	1407	925	911	958	882	
TOTAL Average Square Bales per Acre (ABPA)				0	19	0	21	24	23	22	24	18	19	9	7	31	29	19	19	20	18	

(ANNEX D for calculations and conversion keys)

Delegation of Authority

The RROA owns the water rights and, by covenant, the right to irrigate and harvest the hay on private lots and the WBMD owns the hay in the public meadows and the right to harvest and graze them.

- Day-to-day operational issues = Irrigator working with the SIH committee
 - The irrigator is the only person authorized to move or turn off water.
 - Water Rights Deeded Ownership -> RROA
 - Irrigation Management and Hay Harvesting -> WBMD
- Improvement Priorities = SIH committee -> RROA
- Funding, Contracts, Liability Approval = SIH committee -> RROA -> WBMD

ANNEXES

ANNEX A: References, Contacts and Resources

FLOOD IRRIGATION OF ALFALFA: HOW DOES IT BEHAVE? Blaine Hanson and Dan Putnam1, ABSTRACT, <https://alfalfa.ucdavis.edu/+symposium/proceedings/2004/04-159.pdf>

Irrigation Term Glossary, <http://irrigation.wsu.edu/Content/Resources/Irrigation-Glossary.php>

https://www-static.bouldercolorado.gov/docs/Ditch_FAQ_FINAL-1-201608291052.pdf

Small Acreage Irrigation Guide, Water Rights and Irrigation Management, February 2019, by Boyd Byelich, Jennifer Cook, Chayla Rowley, USDA NRCS & CSU, <https://sam.extension.colostate.edu/wp-content/uploads/sites/2/2017/04/sam-irr-guide.pdf>

USDA - Natural Resources Conservation Services (NRCS) Toolbox; <http://irrigationtoolbox.com/WebPages/Chapter%204.html>

Stable, Irrigation & Hay Committee

- Rebekah Barrington (Chair) (719)351-6071 cell
- Jon Rovick
- John Longhill (Vice Chair)
- EJ Olbright
- Marilyn Nadeau
- Becky Richmond
- Jane Peterson

Top Notch Fencing

Current Irrigation Manager & Hay Contractor
Top Notch Fence, 59751 West Miami, Montrose CO
Matt Hill (970) 376-3538, Office/Heidi Hill (970) 724-9402

Community Resource Services of Colorado, LLC

Sue Blair, CEO
7995 East Prentice Avenue, Suite 103E
Greenwood Village, Co 80111
(303) 381-4960 Office; (303) 601-6441 Cell

Water District 26

Troy Wineland, Water Commissioner, troy.wineland@state.co.us
(970) 355-4516

International Commission on Irrigation and Drainage (ICID)

USDA - Natural Resources Conservation Services (NRCS)

Derrick Wyle, Soil Conservationist, Derrick.wyle@usda.gov

258 Center Dr., Glenwood Springs, CO 81601

(970)457-0675 Cell; (970) 945-5494 Office

<https://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/>

Ditch & Reservoir Company Alliance (DARCA)

Amber Weber, Executive Director

Lamar Colorado, <http://www.darca.org/>

GPS Lidar Mapping

Austin (720) 628-6590

Colorado Water Trust

Tony LaGreca, Project Manager

tlagreca@coloradowatertrust.org

1420 Ogden Street, Suite A2

Denver, Colorado 80218

(720) 204-5881 Direct

(720) 570-2897 Office

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ANNEX B: USDA - Natural Resources Conservation Services (NRCS) Summary

Date: August 21, 2019
NRCS Lead: Derrick Wyle, Soil Conservationist, Derrick.wyle@usda.gov
258 Center Dr, Glenwood Springs, CO 81601
(970)457-0675 Cell; (970) 945-5494 Office
<https://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/>
SIH Attendees: John Longhill, Jon Rovik, Becky Richmond, Rebekah Barrington

Overview

Derrick and his associate, Kathleen Knight, conducted an on-site visit with four SIH committee members for over three hours. He was given an overview of the subdivision history, management and operations structures, the Irrigation & Meadow Management plan, and strategic improvement goals (maximizing water right usage; increasing hay yield; improving meadow and soil health).

The main objectives of this visit were to:

- obtain a current state assessment on the irrigation system, meadow grass and soil health
- identify improvement opportunities
- design solutions that help achieve improvement goals

Following the overview, the group completed a physical tour of the irrigation system, examined known issue areas, and reviewed a list of predefined questions. The committee found the visit to be extremely informative and instructive.

Current State Summary

The current system has historic value and despite repair needs, it is working fairly well on the three hay meadows in Filing 2. Several improvements opportunities were identified in Filing 2, but the majority of work needed is on the Filing 1 portion of the ditches and laterals. The main issues include:

- **Water conveyance and leakage** in ditches and laterals that is resulting in water loss, low flow volumes, and erosion. Possible solutions include:
 - Reestablish (trench/dig) ditches and associated laterals, redefining the trenches, removing silt, and vegetation
 - Alternative techniques will be needed to properly clear the Sawmill between the ranch boundary and the head gate in the Wilderness area.
 - Run water at a higher capacity/volume (4 c.f.s. is ideal) based on soil type, slope, length of run and quantity of water available.
 - The committee noted that despite having 4.0 c.f.s of rights on the Sawmill ditch, many sections can only handle about 3.5 c.f.s.
 - Replace/repair several (3) wooden diversion boxes. Derrick affirmed that the use of wood is an effective material that is still used in irrigation system design.

- Add piping to improve water flow in eroded or steep elevations
- **Soil composition** should be tested and steps taken, as needed to achieve the right balance of minerals, organic matter, water and air. Nitrogen is an important element in fertile, healthy soil. It is essential for plant health and growth. Plants use it to make their DNA, proteins, and amino acids. Plants with a nitrogen deficiency will stop growing even if they have enough water. Soils that are acidic, with a pH level of less than 7, are often lacking in nitrogen. Possible solutions for nitrogen deficient soils include;
 - Add a nitrogen-rich fertilizer.
 - Some committee members raised concerns over the negative effects of using nitrogen rich fertilizers. Derrick confirmed that problems can occur if too much nitrogen is present in the soil but this is not a likely risk for us.
 - Excess nitrogen can result in the loss of certain plant species, depletion of soil nutrients, an increase in algae, and an overall dependency on usage if excessive. An imbalance of soil nutrients causes a depletion of other important minerals such as calcium, phosphorus and magnesium. When the nitrogen abundance reduces important minerals, toxic elements such as aluminum can proliferate and harm plants and aquatic life.
 - Add compost. Leverage the decomposing process that creates nitrogen and can be added to the soil to boost levels. This can be accomplished by adding compost or grazing animals, which is the ideal solution.
 - Plant nitrogen fixing plants (broadleaf, legumes, clover mix) that pull nitrogen from the air and store it in their roots. The roots develop nitrogen nodules which look like little lumps. The actual growing of these plants doesn't help a nitrogen deficiency, the decomposition of these plants do. When the plant starts to die, the nitrogen nodules release stored nitrogen.
- **Weed, Mole/Vole infestations** causing erosion, noxious weed growth and water waste
 - The meadows should be sprayed for weeds in accordance with the Colorado Department of Agriculture's recommendations and weed fact sheet methods
 - Vermin infestations should be exterminated and holes filled with top soil and compacted
- **No current map of the irrigation system** so it is difficult to track assets, issues and improvements. An up to date and accurate mapping is an important management tool for tracking and setting priorities.
 - Create a master irrigation map using the Lidar technology (as currently prototyped on the Sawmill w/ numbered pointers every 100 ft) and mark existing inventory, issues, and improvements.

Other Recommendations and Best Practice Techniques

- Graze as many of the meadows as much as possible to improve soil and grass health naturally, without overgrazing

- The swamp grass is high in protein (Nebraska Hay) and is not bad for hay
- Investigate opportunities to use excess irrigation water to help reduce fire danger and/or fight a fire
- A Ditch Plough, mini excavator, saw blade, or Ditch Witch are the best tools to use to reestablish ditches and their associated laterals.
- The standard 'rule of thumb' measurement for irrigation is 1 c.f.s irrigates 40-acres. This can be refined by calculating the consumptive use of the crop; irrigation input = crop usage + evaporative losses. Availability versus usage metrics for the Ranch's 7.4 c.f.s. should be refined.
- In order to keep water velocities safe and limit ditch erosion ditch grades should be set at 0.2ft of vertical drop per 100 feet of length. Any ditch grade steeper than 0.5ft drop/100ft of length risks severe erosion/downcutting.
 - Accurately measuring irrigation conveyance flow and overall system inefficiency/water loss and absorption is not easy but it is important. The goal is to achieve a high level of Irrigation Efficiency (IE) coupled with Irrigation Uniformity (IU) IU looks at how evenly water was applied across the entire field. Bad UI tends to lead to poor efficiency. It is difficult to get good uniformity on our steep, undulating slopes. The goal is for the least watered part of the field to receive an amount equal to the desired amount, or that you need to meet the crops water needs at the toughest part of the field at the expense of over-irrigating the easiest to water areas. Most water measurement devices either sense or measure velocity (current meters, propeller meters, vane deflection meters, float and stopwatch), or measure either head or pressure (Flumes, Orifices, Venturi meters, Weirs). Measuring tools, tables, charts, or equations are then used to calculate the corresponding discharge.
 - The decision for how long to run the water should be guided by measurements or at least the use of an Irrigation Infiltration Probe (Water Stick). The irrigation water should be turned on at the top of the meadow and run until the lower portion of the meadow is saturated. Saturation will likely be much deeper at the top of the meadow (i.e. 10 ft deep) versus at the bottom (i.e.5 ft deep). Most meadow vegetation in our region has 2-5 feet of root base the water must reach on a regular basis.
 - The key measurement starts with water volume at the head gate/Parshall Flume and then periodic measures at various points downline in the system that calculate water loss and/or absorption.
 - The most effective measure for reducing surface runoff is to decrease the cutoff time.
 - The most effective measure for reducing excessive percolation is to reduce the check length by ½ along with a corresponding reduction in cutoff time due to a decreased advance time compared to the original check length. This measure, however, may increase the surface runoff compared to that of the original length.

- Leveraging water diversion tools will increase water conveyance efficiencies, enabling more of the meadows to be watered with less c.f.s.
 - Flumes are currently used and should be repaired to increase productivity
 - Sand bags or natural obstructions
 - Canvas dams have been used in the past and should be leveraged in the future for water diversion. Approach is to lay canvas dam across the ditch and run enough water to fill up the ditch behind the dam, slurry the Bentonite in the water, let it sit until it drains or settles out. IF it rapidly drains, fill the ditch back up and add more Bentonite. Once there is little drainage, move the canvas dam downstream and repeat four or five times, moving down the ditch. Two or three dams can be simultaneously set and filled in at least two locations at a time.
- Reducing sediment load in the ditches and laterals will increase water flows and reduce absorption within the trench. Possible solutions include;
 - Reducing surface runoff
 - Redesigning inlets into tailwater ditches
 - Redesigning tailwater ditches
 - Lining of tailwater ditches
 - Injection of polyacrylamides (PAM) into the surface runoff (PAM causes fine soil particles to flocculate, settle, and seal the ditch)
 - Sediment ponds to allow sediments to settle out of the water
 - Grass strips at the end of the field to trap sediment. A strip of grass will increase friction of surface water, slow the water, and allow the sediment to deposit rather than be carried off the field.
 - Grass lined drainage ditches
 - Recirculation systems or storage/reuse systems to prevent the runoff from leaving the field
- The NRCS and DARCA have Farm Bill grants available for design, equipment, and improvement work but our subdivision does not qualify for these since the assets are owned by WBMD (a government entity) and our residence are typically in a higher income bracket than edibility allows.

ANNEX C: Scope of Work – Irrigator and Hay Harvester

Review, understand and manage the irrigation and hay operations in accordance with Ruby Ranch water rights, Covenants & Conditions, Strategic Plan and priorities, the Irrigation and Meadow Management Plan, and this scope of work.

Irrigation

Water will begin flowing through the system when the low elevation melt occurs, as early as April. Some ditch and lateral maintenance and water diversion attention will be required to avoid flooding and erosion during this period.

All head gates should be opened in the spring once the initial snow melt begins to slow, and should be closed early enough in the fall to allow the ditches to dry up before the hard freeze. The head gates are historically open from May through to the middle of October. The meadows can continue to be watered after the harvest and should be grazed to help spread the hay seed and balance critical soil minerals.

Maintain and improve the irrigation system from the head gates down to each designated meadow.

- Control and regulate water flows by operating the head gates, diversion and laterals. Leverage best practice techniques to effectively and efficiently convey water to designated areas for the flood irrigation of hay tracts, common meadows, and (pre-approved) private owner tracts.
 - Run water at as high of c.f.s as the ditch and laterals can handle for high efficiency and to reduce water loss.
 - Actively manage and monitor flows to ensure water is reaching the end of the designated fields, plus has time to infiltrate the roots (2-5 ft deep). Infiltration rates should be measured with a Water Stick to ensure the water is absorbing deep enough (i.e. 10 ft at the top of the field and 5 ft at the bottom).
 - Ensure that roadway ditches and culverts do not overflow onto the roadways. When tail water is observed within 50 feet of a roadway, move the headwater to another meadow location.
 - Avoid over-irrigation and dig diversion channels to fix wet areas, swamp grass, and erosion.
- Complete ongoing maintenance and repairs as needed
 - Walk the ditches multiple times a week to identify issues, fix leaks and breaks, remove vegetation, obstructions, and sediment, reconstruct banks and diversions, address washouts, exterminate rodents, erosion, fill/compact holes, level and grading, repair / replace culverts, piping and diversion boxes, etc.
 - Large repairs should be scheduled for the fall, after the harvest when water can be diverted or shut off (August -October).
- Complete pre-approved, major improvements as directed by the SIH committee and approved by the Board

- Submit a written detailed estimate to the SIH committee for approval before making major repairs that are not included in the contract and require funding
- Submit approved contractor and other invoices to the District Manager for payment, per the District Managers payout schedule
- Assume responsibility for all ditch equipment and supplies
- Special Considerations:
 - Sawmill Ditch
 - The head gate is approximately 2 miles into the wilderness area, beyond the subdivisions border. Easement requirements must be adhered to. No motorized or gas-powered equipment or transport can be used to clear the ditch in this section.
 - Ruby Ditch
 - The wooden diversion box below the head gate needs to be replaced and the surrounding area and ditch reestablished. Tarps and sandbags must be used here to help diver water
 - The ditch that runs on the northern side of the meadow is the Buffalo ditch and is not in service.
 - Ruth Ditch
 - Emerald Road northwest of the stables will slide when over-irrigation occurs on lot 30 and tract P. Do not over irrigate.
 - Tract K has a flat top and requires that the water be proactively diverted to ensure the water runs directly north from where it enters K (near the monument). Irrigation of the north slope on K must be redirected when the tail water reaches the abandoned wagon trail. Ground slumping will occur on the lower slopes if water is allowed to flow below the trail.
 - There is an underground spring from Emerald/Opal on North K track that causes excess pooling and marsh
 - Lateral ditch above lot 19. This ditch should not flow more than 4 hours at a time. Do not overtop.
 - Monitor and manage ditch right-of-way for trespass and unauthorized usage
 - Notify the SIH committee of violations that cannot be resolved independently
 - No owner or service provider should re-direct or divert water, alter ditch/lateral structures, or re-route water (only the irrigator or designated parties are allowed to do this)
 - Coordinate private property irrigation requests and approved water diversions
 - The irrigation of private lots is the lowest priority and will only be allowed if flows can support the irrigation of designated tracts. Water will be allocated based on flow volumes and watering priorities;
 1. Hay Meadows
 2. Grazing/Common Meadows
 3. Owner Meadows

- Home construction projects that need to have the irrigation water turned off or plan to impact a ditches or lateral require prior permission from the SIH committee and ARC. Irrigation of the meadows takes priority over individual property owner needs.

Measure, record, and inform the SIH committee and Boards on operational issues and needs

- Measure, compute, and record flow quantities each week from each head gate for Diversion Reporting. This reporting is a record of water flow in cubic feet per second for a ditch and is a regulatory requirement. The Diversion Report should be submitted to the subdivision’s management company point of contact, Sue Blair, within two weeks of the ditches being turned off in the fall. Sue will submit it into the Summit County Water Commissioner.
 - The SIH committee chair will help Sue coordinate diversions, calls on water, and Diversion Report actions with the Summit County Water Commissioner if needed
 - Sue will share reporting, relevant information from these discussions, and decision making with the SIH committee on items that pertain to their committee area.

May			
Day	Gauge	CFS	Comment
1	0.00	0.0000	
2	0.00	0.0000	

Ditch	Year	open date	close date	Total Days	Total Cubic Yards	Max Gauge	Flume Width
Sawmill	2012	5/16/2013	8/15/2012	78	6975.7	0.34	24
Sawmill	2013	5/16/2013	8/15/2013	97	5373.2	0.3	24
Sawmill	2014	5/28/2014	8/28/2014	75	6510.9	0.35	24
Sawmill	2015	5/10/2015	10/15/2015	127	15101.1	0.4	24
Sawmill	2016	6/1/2016	8/31/2016	91	10833.9	0.38	24
Sawmill	2017	6/1/2017	10/19/2017	141	15139.9	0.4	24
Sawmill	2018	5/25/2018	9/19/2018	118	12735.4	0.4	24
Ruby	2012	5/7/2012	7/23/2012	78	1117.9	0.17	9
Ruby	2013	6/5/2013	8/24/2013	80	1138.7	0.17	9
Ruby	2014	5/28/2014	8/28/2014	92	1707.7	0.2	9
Ruby	2015	5/15/2015	8/15/2015	92	1178.0	0.15	9
Ruby	2016	6/1/2016	8/31/2016	98	2714.7	0.25	9
Ruby	2017	6/1/2017	10/1/2017	102	3454.0	0.3	9
Ruby	2018	5/25/2018	10/1/2018	122	5827.0	0.4	9
Ruth	2012	5/24/2012	8/1/2012	69	3605.2	0.28	18
Ruth	2013	5/6/2013	9/10/2013	97	5373.2	0.3	18
Ruth	2014	5/28/2014	8/28/2014	101	6608.9	0.4	18
Ruth	2015	5/15/2015	10/15/2015	122	6177.9	0.3	18
Ruth	2016	6/5/2016	8/1/2016	57	2839.3	0.25	18
Ruth	2017	6/1/2017	10/15/2017	95	5436.1	0.3	18
Ruth	2018	6/2/2018	10/1/2018	114	10599.5	0.4	18

- Record work performed daily (hours worked, tasks by area, mileage, major issues/emergencies associated with the work). Submit a copy of the work log to the SIH committee and Sue Blair for payment.
- Provide information, assessments, proposals, or data to the SIH Committee on system issues, equipment needs, or other repairs as requested.
- Assist in the capture and recording of various irrigation centric performance metrics as requested by the Boards or SIH committee.
- Provide operational updates to the SIH committee who will then report out at Board meetings. If major proposals or issues will be presented, attendance at the meeting may be required.
- Once the head gate is closed, walk the entire ditch to ensure that all water has stopped flowing.
- Develop an ongoing communication process with other stakeholders and service providers to the subdivision (...Stable Manager, CRS, RKR, ARC, etc.) to coordinate watering schedules and turn water on and off as needed throughout the season for weed spraying, dragging, seeding, harvesting, etc.

Irrigation Tools

- Shovel, Pick, Ax
- Long Handled Fork Rake
- Long Handled Trimmers (loppers)
- Saws & trimmers
- Hammer
- Nails/Screws
- Treated wood
- Bentonite (50-75 sacks)
- Canvas Dam Building Materials: 6-8 2x4s; 6-8 4'x4' square pieces of canvas or waterproof tarp
- Sand Bags
- Ditch digging equipment

Hay Harvesting

- Yearly soil testing should be used to determine soil health needs and address issues
 - Addition of nitrogen to improve soil health (graze, seed with protein rich organics mix)
 - Kill weeds, remove rocks, exterminate rodents and fill/compact holes with top soil
- Each spring a drag harrow should be used in the meadows to break up the thatch, manure, and spread hay seed
- Hay is typically harvested in late July/early August.
 - Turn off irrigation to meadows at least two weeks prior to dry out fields before harvesting
 - Harvest hay when purple tops sprout (this is the highest level of protein in hay)
 - Graze meadows after harvest if possible
 - Notify SIH committee chair at least seven days prior to harvesting the hay
 - Offer the subdivisions owners the first right of refusal to purchase Ranch hay at the going price in the valley. The harvester should work with each resident who purchases hay to coordinate payment and delivery.
 - Baled hay should be removed from Ruby Ranch within 30 days of harvesting
- Large improvements and repairs should be scheduled in the spring when the grass is low and, in the fall, when the ditches can be dried out

Meadow & Hay Tools

- Tractor
- Sickle Mower, Hay Rake, Baler
- Soil Test Kit
- Drag Harrow
- Seeder

Grazing

- Assist the SIH committee in the determination of grazing opportunities each season

- The two southern K tracts should be reserved for horse only grazing unless otherwise approved
 - Livestock will graze as many of the meadows as possible with attention to not overgrazing
 - Owners may seek approval from the SIH committee to graze their horses in the common meadows, once the harvest is complete, with special attention to not overgrazing
 - Owner must provide appropriate fencing to contain animals in designated areas, if no permanent fencing exists
 - Owners are required to maintain their private meadows in a manner that maintains the viability of the soil and grasses
 - The plan should be based on grass quality and capacity by location and develop a standard grazing plan to include refinement of key elements, including the following;
 - *Is a variance needed to Art VII, Section 5 "No animal shall be kept on any lands in the subdivision except ordinary household pets and horses ..." to allow cattle?*
 - *How many livestock can graze for how many consecutive days on which meadows. This depends on the season, forage quality, composition, and type of livestock. For example, a horse needs 30lbs of dry matter per day, so depending on the grass available, a herd of x horses/x cattle should be able to graze x to x acres for a period of x consecutive days.*
 - *The herd should not be allowed to graze an area being irrigated, but rather moved to another meadow or restricted from the irrigation area*
- Manage the grazing of herds they are contractually responsible for.

ANNEX D: Definitions and Calculations

Water Right Appropriation Date is the date an owner is granted the said water right.

Irrigation management is the determination of when to irrigate, where to irrigate, and how much water to apply to target locations for specific durations.

Head Gate is the primary gate or valve at aqueduct or other source that can be opened or closed to regulate the flow of water entering an irrigation system (of lesser gated canals and irrigation ditches).

Diversion Box is a structure, often wooden, that is used to change the direction of water flow.

Ditches divert water from a creek or other large water source. They are larger than laterals and are designed to convey water to smaller laterals or diversion areas.

Laterals branch off of the main ditch and carries less water for delivery to specific meadow.

Prescriptive Easement allows for reasonable access by water right users to maintain and operate a ditch. The standard easement allows 15' of access on either side of the ditch and requires the landowner to be notified prior to crossing property lines.

Head- measurement of the energy in a fluid. Units are typically length.

- Total head at a given point is the sum of three components
 - Elevation head, which is equal to the elevation of the point above a datum
 - Pressure head, which is the height of a column of static water that can be supported by the static pressure at the point
 - Velocity head, which is the height to which the kinetic energy of the liquid is capable of lifting the liquid

Flow rate units can be expressed in the following ways;

- Volume/time
 - Open channel flow
 - Cubic feet per second (c.f.s.)
 - second-feet
 - Pipe flow
 - Gallons per minute (g.p.m.)
- Or, Area x Depth or depth
 - Acre-foot = volume of water that would cover 1 acre to a depth of 1 foot
 - 12 acre-inches
 - 43,560 cubic feet
 - 325,851 gallons
 - Conversion factor calculations

- 1 c.f.s. for 24 hours ≈ 2 acre-feet, or 1 c.f.s. ≈ 1 ac-in/hr
- 1 c.f.s. = 448.8 gpm
- Miner’s inches, 38.4 miner’s inches = 1 c.f.s. (Colorado)

Colorado Decision Support System (CDSS) is a water management system developed by the Colorado Water Conservation Board (CWCB) and the Colorado Division of Water Resources (DWR) for each of Colorado’s major water basins. It can be accessed at <https://dwr.state.co.us/Tools/Structures/>

Agricultural purposes are typically defined as the raising, cultivation, drying, or storage of agricultural products for sale, or the storage of machinery or equipment used in support of agricultural production by the same farm entity. For a property to be classified as ‘agricultural’ based only on the drying or storage of agricultural products, the products being dried or stored must have been produced by the same farm entity as the entity operating the drying or storage facility.

Overwatering is deep percolation below the root zone

Hay Calculations

- Hay Production Table Key
 - Large Round Bales (5 x 6) = average 1200 pounds each, or 18.4 square bales. These have been converted into Square Bale counts (see hidden comments in each cell for round bale counts).
 - Square Bales (16 x 19 x 36') = average 65 pounds each
- Round Bale to Square Bale Conversion: # Rounds x 1200 lbs. / 65 lbs. = # square bales
 - *Large round bale weights and counts provided by John Longhill*
- Tonnage Calculation: Round Bale (# Rounds x 1200 lbs. / 2000 lbs.)
Square Bale (# Bales x 65 lbs. / 2000 lbs.)

Ruby Ranch Domestic Well Profiles

Structure Type	Structure Name	Structure ID	Originatio n Date	Permit #	Permit Status	Issuance Date	Source
Well	Well #1	3605159	1/1/1901	25333-F	Active - Renewed	3/2/2015	Sawmill Groundwater
Well	Well #2	3605160	1/1/1901	8618-AD	Active - Denied	5/27/1982	Sawmill Groundwater
Well	Well #8	3605157	1/1/1901	Historical Structure	Inactive	n/a	Sawmill Groundwater
Well	Well #11	3605158	1/1/1901	25332-F-R	Active - Renewed	9/16/1983	Sawmill Groundwater

ANNEX E: Rights, Easements, and Agreements

Colorado Decision Support System (CDSS) Records

Ruth Ditch Record (reference CDSS Ditch #3600794)

The screenshot displays the CDSS interface for the Ruth Ditch record. The browser address bar shows the URL: <https://dwr.state.co.us/Tools/Structures/3600794>. The page title is "RUTH DITCH".

Structure Overview:

- Structure Name: RUTH DITCH (3600794)
- Structure Type: DITCH
- CDSS Code: Active Structure with contemporary diversion records (A)
- Associated Permits: Tributary
- Water Source Type: Tributary
- Water Source: WILLOW CREEK (08127094) @ Steam Mill, L13

Location:

- Division: 5
- Water District: 36
- County: S.PURSE
- Designated Basin:
- Management District:

Map: A map showing the location of the Point of Diversion. The map includes a "Map" button and a "Satellite" button.

Structure Type Table:

Structure Type	DIST N/E/S	DIST E/W	Q10	Q40	Q100	Section	Township	Range	RPN	UTM x	UTM y	Latitude	Longitude	Location Accuracy
Point of Diversion				SW	SW	2	S.0 S	R.0 W	5	485980.0	4385240.0	39.047708	-106.05142	GPS

Associated Structures:

Structure Association	Structure Type	Start Date	End Date	Associated Structure Type	CDSS Code
3600794 has the following at, point to: 3600000 - SELVESTYCHORNE WELS, NO 01	Ditch	1/1/1901		WELL	A
3600794 has the following at, point to: 3600001 - SELVESTYCHORNE WELS, NO 02	Ditch	1/1/1901		WELL	A
3600794 has the following at, point to: 3600002 - SELVESTYCHORNE WELS, NO 03	Ditch	1/1/1901		WELL	A
3600794 has the following at, point to: 3600003 - SELVESTYCHORNE WELS, NO 04	Ditch	1/1/1901		WELL	A
3600794 has the following at, point to: 3600004 - SELVESTYCHORNE WELS, NO 05	Ditch	1/1/1901		WELL	A
3600794 has the following at, point to: 3600005 - SELVESTYCHORNE WELS, NO 06	Ditch	1/1/1901		WELL	A
3600794 has the following at, point to: 3600006 - SELVESTYCHORNE WELS, NO 07	Ditch	1/1/1901		WELL	A
3600794 has the following at, point to: 3600007 - SELVESTYCHORNE WELS, NO 08	Ditch	1/1/1901		WELL	A
3600794 has the following at, point to: 3600008 - SELVESTYCHORNE WELS, NO 09	Ditch	1/1/1901		WELL	A
3600794 has the following at, point to: 3600009 - SELVESTYCHORNE WELS, NO 10	Ditch	1/1/1901		WELL	A
3600794 has the following at, point to: 3600010 - SELVESTYCHORNE WELS, NO 11	Ditch	1/1/1901		WELL	A

Associated Permits: None

Ruby Ditch Record (reference CDSS Ditch #3600793)

Structure Name: RUBY DITCH (3600793)
 Structure Type: DITCH
 Associated Permits: Tributary
 Water Source Type: WILLOW CREEK [06175976] @ Stream Mile: 0.07

Location:
 Division: 5
 Water District: 36
 County: SUMMIT
 Designated Basin:
 Management District:

Feature Type	Dist N/S	Dist E/W	Q10	Q40	Q160	Section	Township	Range	PH	UTM x	UTM y	Latitude	Longitude	Location Accuracy
Point of Diversion			SE	NE	NW	2	5.0 S	78.0 W	S	406178.0	4389495.4	39.649656	-106.093557	GPS

Associations:
 Associated Structures: None
 Associated Permits: None

Structure Comments:
 Structure History: None

Sawmill Ditch Record (reference CDSS Ditch #3600797)

Structure Name: SAWMILL DITCH (3600797)
 Structure Type: DITCH
 Associated Permits: Tributary
 Water Source Type: WILLOW CREEK [06175976] @ Stream Mile: 1.25

Location:
 Division: 5
 Water District: 36
 County: SUMMIT
 Designated Basin:
 Management District:

Feature Type	Dist N/S	Dist E/W	Q10	Q40	Q160	Section	Township	Range	PH	UTM x	UTM y	Latitude	Longitude	Location Accuracy
Headgate				NE	NW	10	5.0 S	78.0 W	S	404542.0	4387983.0	39.635133	-106.112392	GPS
Measurement Device				NE	NW	10	5.0 S	78.0 W	S	404558.0	4387989.0	39.635468	-106.112394	GPS

Associations:
 Associated Structures:
 @Active @All

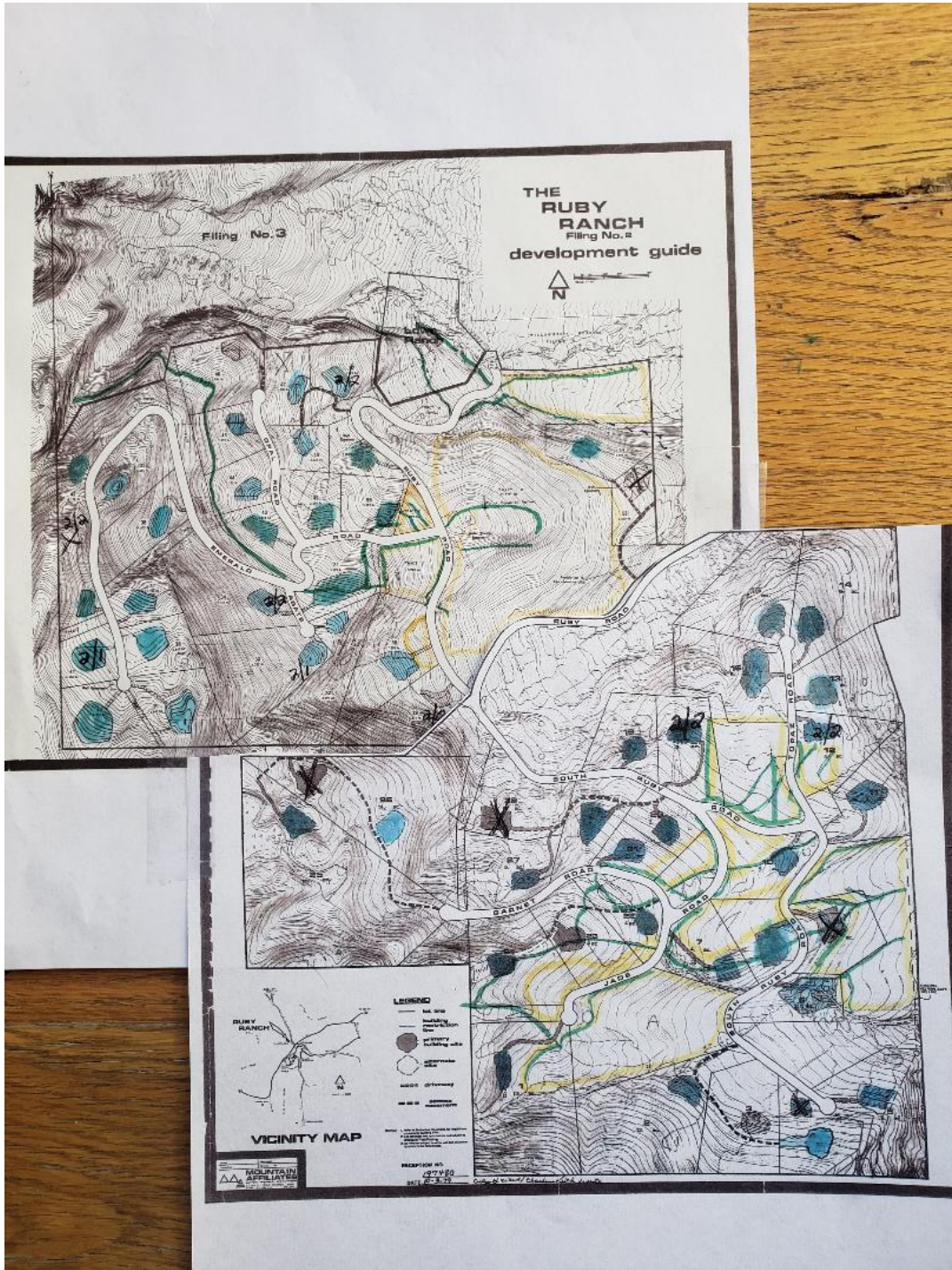
View	Structure Association	Structure Type	Start Date	End Date	Associated Structure Type	CDU Code
View	3600797 has the following st. point to 3605157 - WILLOW BROOK WHELL NO 08	Ditch	1/1/1961		Well	H
View	3600797 has the following st. point to 3605158 - WILLOW BROOK WHELL NO 11	Ditch	1/1/1961		Well	A
View	3600797 has the following st. point to 3605159 - WILLOW BROOK WHELL NO 01	Ditch	1/1/1961		Well	A
View	3600797 has the following st. point to 3605160 - WILLOW BROOK WHELL NO 2	Ditch	1/1/1961		Well	A
View	3600797 is st. point to 3605159 - WILLOW BROOK WHELL NO 01	Ditch	3/29/2015		Well	A

Associated Permits: None

- **JMC – Ruby Ranch Water Rights Quit Claim Deed** *(See paper copy in RROA files)*
- **Case No.: 84-CW-284, September 31, 1988** *(See paper copy in RROA files)*
Grants .6 c.f.s of the Ruth Ditch’s 3.0 c.f.s water rights to the Town of Silverthorne (20% of water right) for domestic and municipal use.
- **Covenants of the Ruby Ranch**
Article III, Section 2 (a) and (d): include the provisions that dedicate common tracts to WBMD, and the water rights to the RROA.
Article VII, Section 7: Grants the Owners Association ownership of “all of the hay in the irrigated meadows of the subdivision...”, together with the responsibility “for irrigation of the meadows and fertilization, cutting and harvesting of the hay each season.” This was revised as follows:
 - **Ruby Ranch Covenants - Resolution Dated September 27, 1999** *(See paper copy in RROA files)*
 - Revises Article VII, Section 7 of the Covenants, transferring the common hay meadows from the RROA, over to the WBMD. It also states that the RROA retains title to the water rights associated with the three irrigation ditches, but gives the WBMD the right to manage/maintain the ditches and harvest the hay in the manner directed in Article VII, Section 7 of the Covenants.
- **Low Ranch Access** *(See paper copy in RROA files)*
Prescriptive Easement to access for irrigation management and maintenance.

ANNEX F: Master Irrigation Map

[Mapping In progress: This map will be replaced by a GPS - Lidar map of the Ruby Ranch Irrigation system up into Eagles Nest Wilderness Area with 100 ft markers]



ANNEX G: 2019-2020 Improvement Plan

Goals

- Protect Water Rights
- Maximize Water Right Usage
- Improve Soil & Meadow Grass Health
- Increase Hay Yield
- Improve Operations Efficiency & Value

Year 1 (2019) Focus Areas

- re-establish the SIH committee, protocol, and assign irrigation & hay leads
- contract a ditch rider to manage the irrigation system for the 2019 season
- contract a harvester to cut/bale/deliver the hay in 2019
- repair existing wood and wire fencing in Tract K to secure boundary for livestock grazing
- re-establish ditches/laterals and repair irrigation assets to improve current operations
- document historical and current irrigation and hay operations
- engage environmental experts, local specialist, and resources to assess current state conditions and provide recommendations on future state improvements
- document, design, and plan improvements
- start working on improvement projects
- create a complete and accurate GPS map of the irrigation system
- create an inventory of irrigation and meadow assets
- develop an Irrigation and Meadow Management Plan (IMMP)
- contract with a single service provider who will manage the irrigation, improve the assets, harvest hay, and provide livestock for grazing in the 2020 season
- Establish a value calculation to include cost to irrigate, harvest, the value of the harvest and grazing

Year 2 (2020) Focus Areas

- obtain a variance from the RROA to Article VII, Section 5 of the covenants that prohibits any livestock, outside of horses, from being 'kept' on the lands, so that cattle can be brought in for a few months to graze
- repair existing wire fencing between Tract K grazing meadow and north Tract K hay meadow to secure boundary for livestock grazing
- repair wood fencing on the eastern boarder of Tract K and along Ruby Road
- develop an approach and plan for grazing meadows (with and w/o permanent fencing)
- refine guidelines and rules for the irrigation and grazing of owner tracts
- continue to implement the Irrigation & Meadow Management Plan improvements
 - continue to improve the ditches and laterals so they can carry the volume of water decreed
 - continue to make meadow improvements that improve soil health, increase hay quality and harvest volumes

- research options to use excess irrigation water for the recharging of our potable water wells
- continue to prioritize, obtain approvals, and implement the IMMP Improvement Log
- Research moving from the Ruth to the Buffalo Ditch. Historically this ditch was a diversion off of Willow Creek near the Lowe homestead and was used to irrigate the Smith Ranch meadows, the meadow east of the Gatehouse, and the willows running along the north side of Ruby road leading up to the gate. Silverthorne purchased the Buffalo Ditch water right, revised its designated usage to municipal, pulled the head gate, and abandoned the ditch. This ditch is not currently operational and the Ranch has no legal interest in it, but research is in progress to assess if moving the Ruth Ditch head gate to this ditch would allow a more efficient way to divert water from Willow Creek and convey it to the 6+ acres on lower Tract K. There a number of things involved with getting a water right transferred to a new ditch; legal determination, Board approval, the prosecution of a water court case, negotiations with the owners of the Lowe property, and then the physical work. If the Ranch were able to use the Buffalo Ditch head gate it could only be used to convey water to Lower Tract K for irrigation and could not be used to irrigate any portion of the former Smith Ranch or willows.
- finalize the mapping of irrigation assets, issue areas, and improvements onto the Master Irrigation Map
- validate common track acreage versus acreage that can be hayed
- add comparative production metrics from other Ranches in the county
- update the irrigation asset inventory
- create an Owner focused irrigation orientation session to review the IMMP and operations

IMPROVEMENT LOG

Black Font = Contractor Estimate
Orange Font = SIH SWAG Estimate, to be confirmed

Filing	Tract	Boundary Reference	Issue Description	Needed Improvement	Estimated Cost	Status
1	A	Lots 1, 2, 7, Jade, Ruby	Hay not cut in some areas	Remove rocks from meadow and fill/compact holes w/ topsoil	\$ 800	In Progress - Spring '20
			Wet area, swamp grass, marshy ground on N/W corner that creates a flooding down the center of the meadow. No ability to contain water or divert away from this area into the N lateral	Reestablish lateral from Lot 1 to the Jade Road culvert into A. Build a intake structure with a gate, to hold the water for release into a reestablished laterals on the north side and into the meadow	\$ 2,500	Spring '20
			Water conveyance issues and leakage on the Sawmill at the boundary of Lot 22 & 23	Replace/repair the wooden Diversion Box at Lot 22 and 23	\$ 500	Spring '20
			Upper Sawmill water conveyance, leakage, erosion	Sawmill Ditch: clear debris, repair ditch sidewalls. Possibly engage the Youth Corp. Focus on runs from Wilderness down to Ruby Rd	\$ 5,000	Summer '20
			Flume is not operating efficiently	Repair Sawmill flume at boundary	\$ 500	Summer '20
			Weeds and erosion	Spray weeds, exterminate rodents, fill holes	\$ 250	Summer '20
			Vegetation growth in ditch, laterals, diversions	Clean ditch, laterals, diversion	\$ -	Contract Inclusion - Summer '20

Filing	Tract	Boundary Reference	Issue Description	Needed Improvement	Estimated Cost	Status
1	B	Lots 9, 11, Ruby	Poor grass quality due to a wet area down the center with swamp grass and marshy ground.	Reestablish the south lateral, dig diversion channels in the center to dry out the marsh.		Completed
			Hay not cut in some areas	Remove rocks from meadow and fill/compact holes w/ topsoil	\$ 350	Summer '20
			Vegetation growth in ditch, laterals, diversions	Clean ditch, laterals, diversion	\$ -	Contract Inclusion - Summer '20
			Weeds and erosion	Spray weeds, exterminate rodents, fill holes	\$ 150	Summer '20
	C	Lots 16, 17, Ruby, Topaz	Hay not cut in some areas	Remove rocks, especially from N/E side and fill/compact holes w/ topsoil	\$ 350	Spring '20
			Wet/marshy area in the center of the meadow. This never dries out so it cannot be harvested.	Detective work to determine where water is coming from. Dig a post hole, insert a tube to visually measure water height, repeat every 100 ft to determine origin. Create a lateral (or add perforated piping) at the deepest point to properly divert water and dry the area out.	\$ 500	Spring '20
			Weeds and erosion	Spray weeds, exterminate rodents, fill holes	\$ 100	Summer '20
			Vegetation growth in ditch, laterals, diversions	Clean ditch, laterals, diversion	\$ -	Contract Inclusion - Summer '20
	Lot 7	Lot 7	Wet/marshy area in the N/W corner, poor grass quality, no connection from culvert to north run	Reestablish the lateral from the culvert to the northern run		tbd
	Lot 8	Lot 8	New house build requires the Sawmill ditch to be rerouted on this lot.	Reroute the Sawmill ditch to the eastern edge of the new build. Line the ditch from the piping on Lot 8 boundary down to the original connection point.		Completed 9/19
			Flooding along eastern boarder of Ruby road	Evaluation need to determine if a new lateral should be created on the north side of the driveway and down into B		tbd
	H	Lot 20, 21, Ruby, Jade	Weeds and erosion	Spray weeds, exterminate rodents, fill holes	\$ 100	Summer '20
			Vegetation growth in ditch, laterals, diversions	Clean ditch, laterals, diversion	\$ -	Contract Inclusion - Summer '20
2	K	Stable Pasture	Fencing is not secure enough to hold livestock; wooden poles are rotted and the wire fencing is broken in Tract K, in-between the north and south meadows.	repair and/or replace the wire fencing in-between north and south K	\$ 5,000	Summer '20
			Rocky ground, poor grass quality, unstable footing and difficult to drag after grazing	Remove rocks (especially from northern side), array weeds, exterminate rodents, fill holes w/topsoil, compact	\$ 500	Summer '20
			Fencing is not secure enough to hold livestock; wooden fencing is rotted, broken, and cribbed, and the wire fencing is broken and poles have rotted on all boundaries.	#1 Repair wire fencing separating the stable pasture from the eastern portion of K, #2 Repair and/or replace fencing around the boundary of tract K and nK	\$ -	Completed, 9/19. Paid by the Security Committee
			Flooding, water pooling, erosion, and marshy ground on the top of K above the stable	Redesign ditch, lateral, and diversion flows, establish the new ditch and laterals.	\$ 2,500	Spring '20
	North K	N/E Boundary	Water conveyance issues. The water pressure against the head gate is not constant; the wooden Diversion Box has decayed allowing very little water to be diverted; the ditch from the flume to the road is overgrown.	Replace the wheel on the head gate; Replace the Diversion Box, create a pool that creates constant water pressure on the head gate, and dig the ditch from the flume to the head of the meadow	\$ 3,000	Spring '20
			Hay not cut in some areas	Remove rocks from meadow, especially the S/E section, and fill/compact holes w/ topsoil	\$ 500	Spring '20
			Weeds and erosion	Spray weeds, exterminate rodents, fill holes	\$ 100	Summer '20
			Vegetation growth in ditch, laterals, diversions	Clean ditch, laterals, diversion	\$ -	Contract Inclusion - Summer '20
	O	Lot 50, Ruby, Emerald	Weeds and erosion	Spray weeds, exterminate rodents, fill holes	\$ 100	Summer '20
			Vegetation growth in ditch, laterals, diversions	Clean ditch, laterals, diversion	\$ -	Contract Inclusion - Summer '20
P	Lots 30, 31, Ruby, Emerald	Weeds and erosion	Spray weeds, exterminate rodents, fill holes	\$ 100	Summer '20	
		Vegetation growth in ditch, laterals, diversions	Clean ditch, laterals, diversion	\$ -	Contract Inclusion - Summer '20	
ALL	ALL	No single source of information on the irrigation, meadow management, and hay operations. These are all dependent on each other. The documents, maps, perspectives, and knowledge are in many places and no strategy for improving them exists.	Create a management document that contains all pertinent information on the irrigation system, meadow management, and hay operations that can be used to educate, prioritize, guide decisions, and communicate strategic goals and priorities. Create an owners focused session to step through the IMMP, operations, improvement goals, and answer questions. Hosted by the OA & SIH Committee at the Gatehouse	\$ 150	In Progress	
		No current or complete map of the current irrigation system, or inventory of assets. No way to accurately track asset inventory, issues, or improvements	Work with Silverthorne (Austin) to get a GPS - Lidar map created for all 3 ditches, laterals, diversions, head gates, flumes, piping, lining, culverts, ditch head and end, 100 ft makers	\$ 700	In Progress, mapping completed 11/19	
TOTAL \$					23,750	