

Stream: Little Cottonwood Creek

Executive Summary

Water Division: 6
Water District: 44
CDOW#: 21185
CWCB ID#: 06/06/A-012

Segment: Headwaters to Freeman Reservoir

Upper Terminus: Headwaters

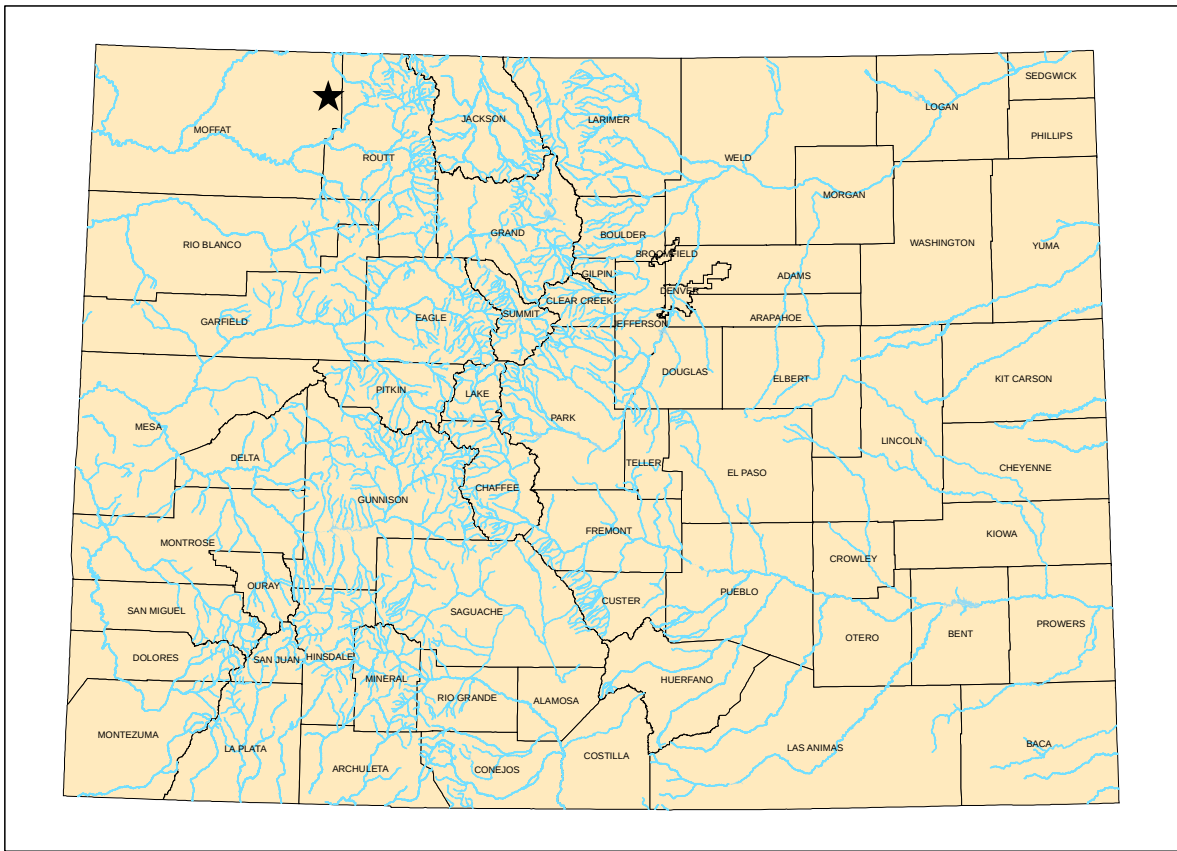
Latitude: 40d46'34.85"N Longitude: 107d24'11.73"W
UTM North: 4516708.793 UTM East: 297191.841
NE1/4, SW1/4, Sctn32, T10N, R89W, 6th pm
2167 ft, E of the W Section Line, 1397 ft, N of the S Section Line

Lower Terminus: 200 Feet Upstream of Freeman Reservoir

Latitude: 40d45'55.02"N Longitude: 107d25'19.2"W
UTM North: 4515523.965 UTM East: 295576.225
NE1/4, SW1/4, Sctn6, T9N, R89W, 6th PM
1638 ft, E of the W Section, 2715 ft, N of the S Section Line
Counties: Moffat
Length: 1.45 miles
USGS Quad(s): Freeman Reservoir
ISF Appropriation: 0.70 cfs (05/01 – 07/31)
 0.35 cfs (08/01 – 12/14)
 0.20 cfs (12/15 – 04/30)



Little Cottonwood Creek



Summary

The information contained in this report and the associated instream flow file folder forms the basis for the instream flow recommendation to be considered by the Board. It is staff's opinion that the information contained in this report is sufficient to support the findings required in Rule 5 i.

Colorado's Instream Flow Program was created in 1973 when the Colorado State Legislature recognized "the need to correlate the activities of mankind with some reasonable preservation of the natural environment" (see 37-92-102 (3) C.R.S.). The statute vests the CWCB with the exclusive authority to appropriate and acquire instream flow and natural lake level water rights. In order to encourage other entities to participate in Colorado's Instream Flow Program, the statute directs the CWCB to request instream flow recommendations from other state and federal agencies. The Colorado Division of Wildlife (CDOW) recommended this segment of Little Cottonwood Creek to the CWCB for inclusion into the Instream Flow Program. Little Cottonwood Creek is being considered for inclusion into the Instream Flow Program because it has a natural environment that can be preserved to a reasonable degree with an instream flow water right.

The CDOW is forwarding this stream flow recommendation to the CWCB to meet the State of Colorado’s policy “... that the wildlife and their environment are to be protected, preserved, enhanced, and managed for the use, benefit, and enjoyment of the people of this state and its visitors ... and that, to carry out such program and policy, there shall be a continuous operation of planning, acquisition, and development of wildlife habitats and facilities for wildlife-related opportunities” C.R.S. 33-1-101 (1). The CDOW Strategic Plan states “Healthy aquatic environments are essential to maintain healthy and viable fisheries, and critical for self-sustaining populations. The Division desires to protect and enhance the quality and quantity of aquatic habitats.”

Little Cottonwood Creek is approximately 10.5 miles long. It begins on the southeast side of Black Mountain at an elevation of approximately 9800 feet and terminates at the confluence with Fortification Creek at an elevation of approximately 6500 feet. Of the 1.7 mile segment addressed by this report, 100% of the segment, or 1.7 miles, is located on public lands. Little Cottonwood Creek is located within Moffat County. The total drainage area of Little Cottonwood Creek is approximately 9.0 square miles. The Little Cottonwood Creek generally flows in a westerly direction.

The subject of this report is a segment of the Little Cottonwood Creek beginning at its headwaters and extending downstream to Freeman Reservoir. The proposed segment is located northeast of the Town of Craig. The staff has received one recommendation for this segment from the CDOW. The recommendation for this segment is discussed below.

Instream Flow Recommendation(s)

The CDOW has recommended 0.7 cfs year-round, based on their data collection efforts (see Table 1 and Appendix A). The modeling results from this survey effort are within the confidence interval produced by the R2CROSS model.

Land Status Review

Upper Terminus	Lower Terminus	Total Length (miles)	Land Ownership	
			% Private	% Public
Headwaters	Freeman Reservoir	1.45	0%	100%

100% of the public lands are owned by the USFS.

Biological and Field Survey Data

As reported in the letter from CDOW to the CWCB “The DOW, in October of 1997, collected stream cross section information, natural environment data, and other data needed to quantify the instream flow needs for this reach of Little Cottonwood Creek. Little Cottonwood Creek is classified as a minor stream (between 4 to 9 feet wide) and fishery surveys indicate the stream environment of Little Cottonwood Creek supports Colorado River cutthroat trout (*Salmo clarki pleuriticus*).

Colorado River cutthroat trout have been identified by the DOW and several other state and federal agencies as “species of greatest conservation need”. DOW is involved in developing

Conservation and Management Plans for these species. The intention of these plans is to increase populations and distributions of identified species, thereby assisting in the long-term persistence of each species. The success of such plans could potentially curtail the need for federal listing of these species under the Endangered Species Act (ESA). These species are not currently federally listed” (See CDOW Fish Survey in Appendix B).

Field Survey Data

CDOW staff used the R2CROSS methodology to quantify the amount of water required to preserve the natural environment to a reasonable degree. The R2CROSS method requires that stream discharge and channel profile data be collected in a riffle stream habitat type. Riffles are most easily visualized, as the stream habitat types that would dry up first should streamflow cease. This type of hydraulic data collection consists of setting up a transect, surveying the stream channel geometry, and measuring the stream discharge. Appendix B contains copies of field data collected for this proposed segment.

Biological Flow Recommendation

The CWCB staff relied upon the biological expertise of the cooperating agencies to interpret output from the R2CROSS data collected to develop the initial, biologic instream flow recommendation. This initial recommendation is designed to address the unique biologic requirements of each stream without regard to water availability. Three instream flow hydraulic parameters, average depth, percent wetted perimeter, and average velocity are used to develop biologic instream flow recommendations. The CDOW has determined that maintaining these three hydraulic parameters at adequate levels across riffle habitat types, aquatic habitat in pools and runs will also be maintained for most life stages of fish and aquatic invertebrates (Nehring 1979; Espegren 1996).

For this segment of stream, two data sets were collected with the results shown in Table 1 below. Table 1 shows who collected the data (Party), the date the data was collected (October 1997), the measured discharge at the time of the survey (Q), the accuracy range of the predicted flows based on Manning’s Equation (240% and 40% of Q), the summer flow recommendation based on meeting 3 of 3 hydraulic criteria and the winter flow recommendation based upon 2 of 3 hydraulic criteria.

Table 1: Data

Party	Date	Q	250%-40%	Summer (3/3)	Winter (2/3)
DOW	10/16/1997	0.48	1.2 – 0.2	2.0 ⁽¹⁾	1.6 ⁽¹⁾
DOW	10/16/1997	1.20	3.0 – 0.5	?	0.7

DOW = Division of Wildlife

(1) Predicted flow outside of the accuracy range of Manning’s Equation.

? = Criteria never met in R2CROSS Staging Table.

Biologic Flow Recommendation

Both summer flow recommendations, which met 3 of 3 criteria and were outside the accuracy range of the R2CROSS model (See Table 1). The winter flow recommendation, which met 2 of 3 criteria and is within the accuracy range of the R2CROSS model range is 0.7 cfs (See Table 1).

Hydrologic Data

After receiving the cooperating agency's biologic recommendation, the CWCB staff conducted an evaluation of the stream hydrology to determine if water was physically available for an instream flow appropriation. Because there are no existing stream gages on Little Cottonwood Creek the next best approach is to look at the flow records of nearby streams with stream gage records. In this case Granite Creek (USGS Gage 9238770) and Middle Fork Fish Creek (USGS Gage 9238750) were the closest gaged streams with similar watershed aspects, drainage areas, and elevation. These creeks have drainage areas of 1.37 square miles and 2.82 square miles, respectively, and 12 years of stream gage record each, from 1984-1995. The hydrograph below was derived by apportioning the averaged stream flow from these basins, using a drainage area ratio. The total drainage area of Little Cottonwood Creek is approximately 1.42 square miles.

Based on this analysis, the hydrograph shows that the summer flow recommendation of 0.7 cfs is available only from May 1 to July 31. Table 2 below displays the estimated average monthly stream flow in Little Cottonwood Creek.

Table 2: Estimated Stream Flow for Little Cottonwood Creek

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CFS	0.22	0.21	0.24	0.37	5.86	23.03	2.04	0.47	0.34	0.36	0.40	0.31

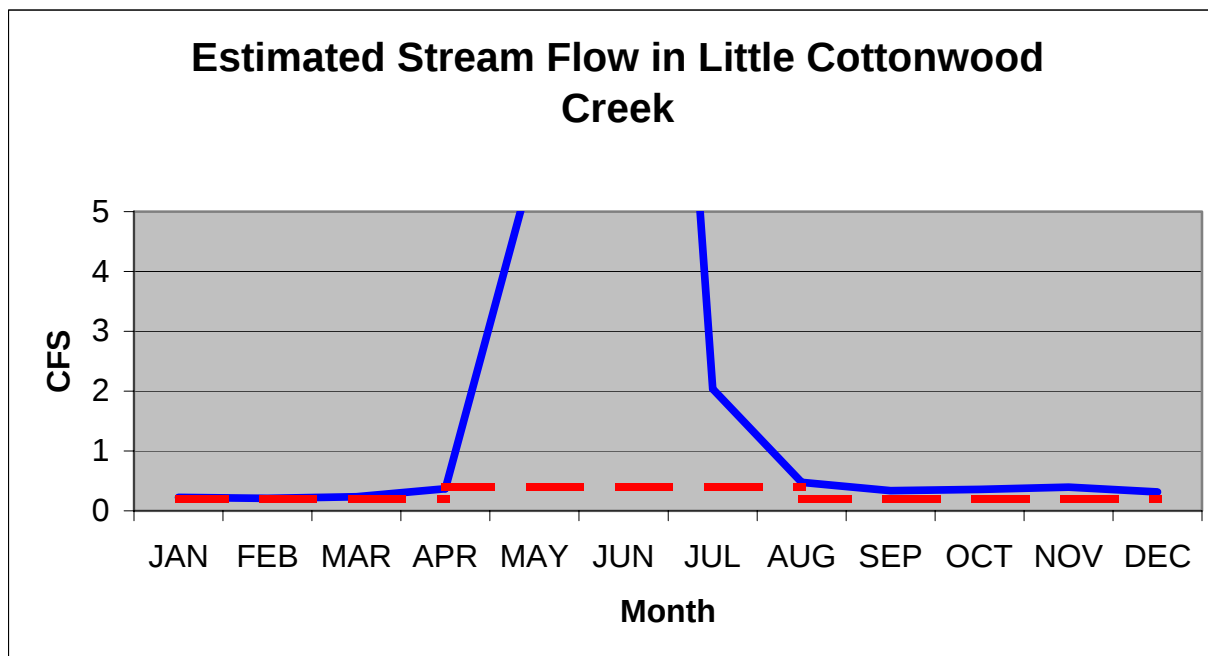


Table 2 shows that the year round flow recommendation of 0.7 cfs is available at least 50% of the time for the month of May 1st through July 31st. The winter flow recommendation of 0.7 cfs is not available at least 50% of the time from August 1st through April 30th. Based on water availability, the winter flow recommendation was further reduced to 0.35 cfs for the time period of August 1st through December 14th and 0.2 cfs December 15th through April 30th.

Precipitation Data

Staff reviewed a local precipitation data set from one site located around the Granite Creek and Middle Fork Fish Creek Drainages (See Precipitation Data in Appendix C). Table 3 shows the water year and the percent of average precipitation recorded at each site. It is staff's opinion that the 12 years of stream-flow data analyzed is representative of average water-years.

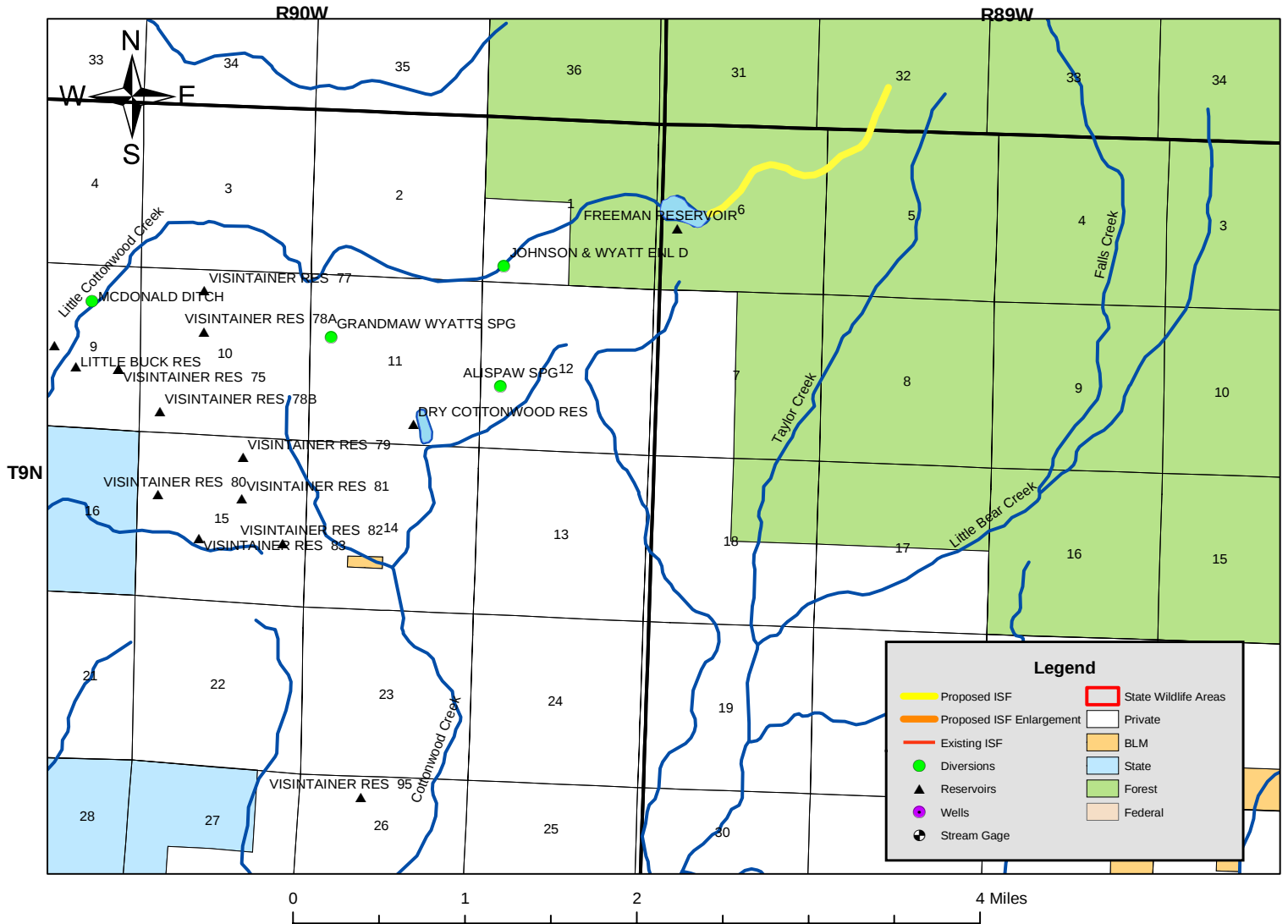
Table 3: Precipitation Data as a percentage of Average

Year	Elevation = 7890 Lat 40 09 Long 106 54 Yampa 59265
1984	93.6%
1985	108.7%
1986	89.6%
1987	74.0%
1988	101.8%
1989	102.4%
1991	110.3%
1992	92.4%
1993	92.0%
1994	No data
1995	No data
Average	96.1%

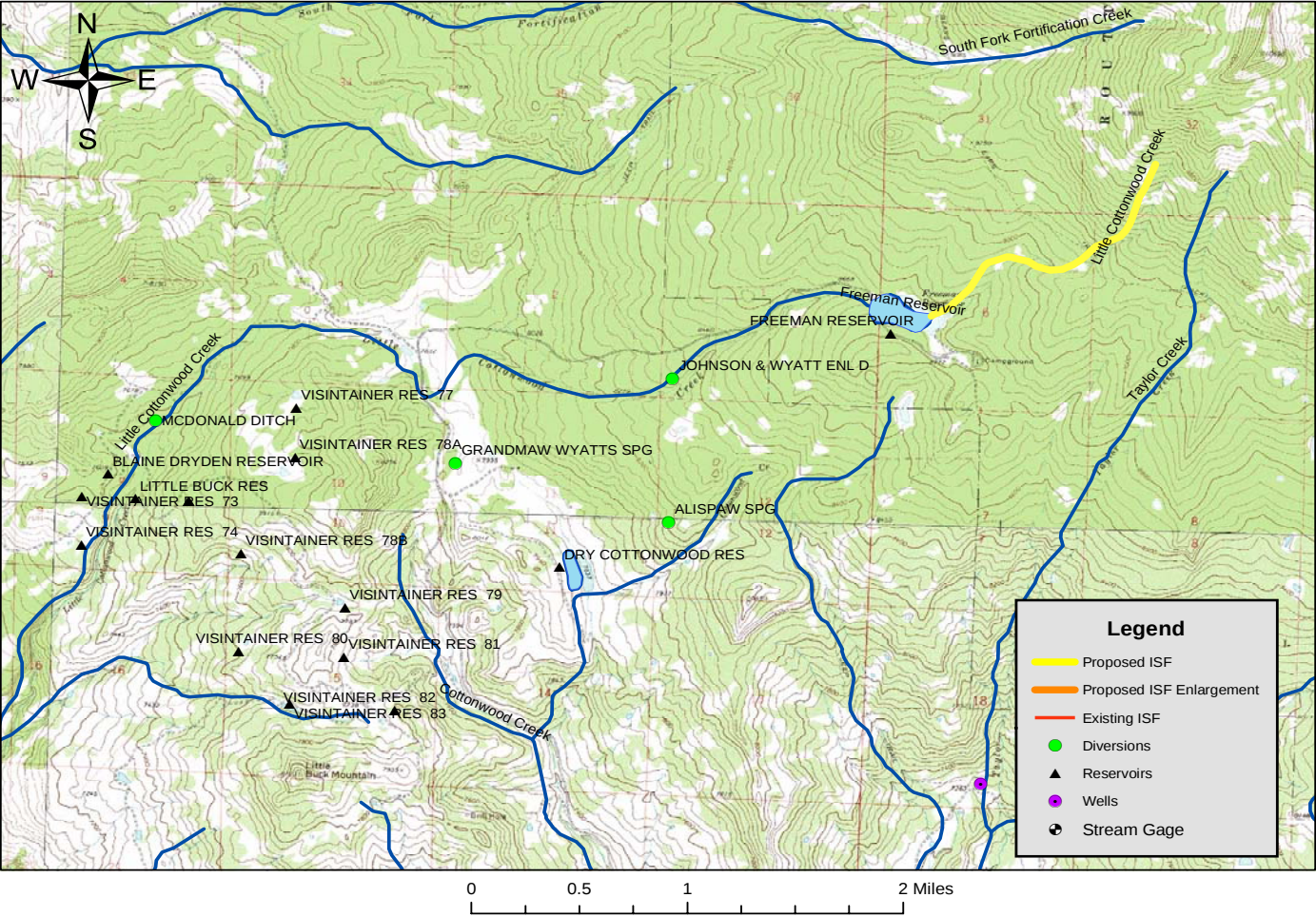
Existing Water Right Information

Staff has analyzed the water rights tabulation and consulted with the Division Engineer's Office (DEO) to identify any potential water availability problems. Records indicate there are no intervening surface water diversions located within this reach of Little Cottonwood Creek. According to the DEO, there is usually sufficient water available within this stream reach to satisfy the recommended instream flow amount. Based on this analysis, staff has determined that water is available for appropriation on Little Cottonwood Creek, from the headwaters to Freeman Reservoir, to preserve the natural environment to a reasonable degree without limiting or foreclosing the exercise of valid existing water rights.

Little Cottonwood Creek



Little Cottonwood Creek



CWCB Staff's Instream Flow Recommendation

Based on the CDOW recommendation, staff recommends the Board form its intent to appropriate on the following stream reach:

Segment: Headwaters to Freeman Reservoir

Upper Terminus: Headwaters

Latitude: 40d46'34.85"N Longitude: 107d24'11.73"W
UTM North: 4516708.793 UTM East: 297191.841
NE1/4, SW1/4, Sctn32, T10N, R89W, 6th pm
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 0.20 cfs (12/15 – 04/30)

APPENDIX – A
ISF Recommendation

STATE OF COLORADO

Bill Owens, Governor

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF WILDLIFE

AN EQUAL OPPORTUNITY EMPLOYER

Bruce McCloskey, Director
6060 Broadway
Denver, Colorado 80216
Telephone (303) 297-1192



*For Wildlife-
For People*

December 15, 2005

Mr. Dan Merriman and Mr. Todd Doherty
Colorado Water Conservation Board
Stream and Lake Protection Section
1313 Sherman Street, Room 723
Denver, Colorado 80203

Re: Colorado Division of Wildlife Instream Flow Recommendations for Little Cottonwood Creek.

Dear Dan and Todd,

The purpose of this letter is to officially transmit the Colorado Division of Wildlife's (DOW) Instream Flow Recommendations for Little Cottonwood Creek in Moffat County. The reach of stream covered by this flow recommendation is from the headwaters of Little Cottonwood Creek to the inlet of Freeman Reservoir, a distance of approximately 1.5 miles.

The DOW, in October of 1997, collected stream cross section information, natural environment data, and other data needed to quantify the instream flow needs for this reach of Little Cottonwood Creek. Little Cottonwood Creek is classified as a minor stream (between 4 to 9 feet wide) and fishery surveys indicate the stream environment of Little Cottonwood Creek supports Colorado River cutthroat trout (*Salmo clarki pleuriticus*)

Colorado River cutthroat trout have been identified by the DOW and several other state and federal agencies as "species of greatest conservation need". DOW is involved in developing Conservation and Management Plans for these species. The intention of these plans is to increase populations and distributions of identified species, thereby assisting in the long-term persistence of each species. The success of such plans could potentially curtail the need for federal listing of these species under the Endangered Species Act (ESA). These species are not currently federally listed."

The stream cross section data was analyzed using the R2CROSS program. The R2CROSS output was evaluated using the methods described in Nehring (1979) and Espegren (1996). The CDOW has reviewed the data collected to date and based on that review recommends that the CWCB appropriated the following flow amounts to preserve the natural environment of Little Cottonwood Creek to a reasonable degree:

DEPARTMENT OF NATURAL RESOURCES, Russell George, Executive Director
WILDLIFE COMMISSION, Jeffrey Crawford, Chair • Tom Burke, Vice Chair • Ken Torres, Secretary
Members, Bernard Black • Rick Enstrom • Philip James • Claire O'Neal • Brad Phelps • Robert Shoemaker
Ex Officio Members, Russell George and Don Ament

APPENDIX – B

Field Data

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 * COLORADO WATER CONSERVATION BOARD *
 * INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM *
 * STREAM CROSS-SECTION AND FLOW ANALYSIS *

LOCATION INFORMATION

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STREAM NAME LITTLE COTTONWOOD CK
 XS LOCATION 200 YDS U/S OF FREEMAN RESERVOIR
 XS NUMBER 1

DATE 10/16/97
 OBSERVERS ESEBREN, UPFENDALE, TA

1/4 SEC
 SECTION
 TWP
 RANGE
 RM

COUNTY MOFFAT
 WATERSHED FORTIFICATION CK
 DIVISION 6
 DOW CODE 21185

USGS MAP FREEMAN RESERVOIR
 USFS MAP ROUTE N F

SUPPLEMENTAL DATA

*** NOTE ***

.....

Leave TAPE WT and TENSION
 at defaults for data collected

TAPE WT 0.0106 with a survey level and rod
 TENSION 17.5

CHANNEL PROFILE DATA

.....

SLOPE 0.026

INPUT DATA CHECKED BY

DATE

ASSIGNED TO

DATE

INPUT DATA * DATA POINTS* 29

WETTED PRISM	WATER DEPTH	AREA (Am)	Q (Qm)	S Q CELL
0 00	0 00	0 00	0 00	0 00
0 00	0 00	0 00	0 00	0 00
0 08	0 00	0 00	0 00	0 00
0 00	0 00	0 00	0 00	0 00
0 00	0 00	0 00	0 00	0 00
0 60	0 05	0 32	0 60	0 00
0 32	0 10	0 03	0 00	0 00
0 36	0 10	0 03	0 02	3 28
0 30	0 20	0 06	0 01	0 00
0 30	0 10	0 05	0 03	5 90
0 30	0 15	0 05	0 05	10 90
0 30	0 15	0 05	0 05	5 78
0 32	0 20	0 06	0 07	13 80
0 30	0 15	0 05	0 06	15 60
0 30	0 15	0 05	0 08	15 80
0 30	0 20	0 06	0 09	17 60
0 30	0 15	0 05	0 01	7 40
0 30	0 15	0 05	0 00	0 00
0 30	0 10	0 05	0 00	0 00
0 30	0 15	0 05	0 01	7 30
0 30	0 15	0 05	0 01	2 30
0 30	0 10	0 03	0 00	0 40
0 32	0 00	0 00	0 00	0 00
0 00	0 00	0 00	0 00	0 00
0 00	0 00	0 00	0 00	0 00
0 00	0 00	0 00	0 00	0 00
0 00	0 00	0 00	0 00	0 00
5 73	0 7	0 11	0 48	100 00

מחזורי' 9 - 00817

SURFAC NAME LITTLE COTTONWOOD CK
 XS LOCATION 700 YDS U/S OF FREEMAN RESERVO
 XS NUMBER 1

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
1 76	0 71	2 79	291 5%
1 78	0 71	2 60	265 6%
1 80	0 71	2 42	240 0%
1 82	0 71	2 24	214 7%
1 84	0 71	2 06	189 7%
1 86	0 71	1 89	165 0%
1 88	0 71	1 71	140 6%
1 90	0 71	1 54	116 6%
1 92	0 71	1 37	91 0%
1 94	0 71	1 21	65 7%
1 96	0 71	1 05	47 0%
1 97	0 71	0 99	33 1%
1 98	0 71	0 93	30 4%
1 99	0 71	0 87	21 9%
2 00	0 71	0 81	13 6%
2 01	0 71	0 75	5 5%
2 02	0 71	0 70	-2 4%
2 03	0 71	0 64	-10 0%
2 04	0 71	0 59	-17 5%
2 05	0 71	0 54	-24 8%
2 06	0 71	0 49	-31 8%
2 08	0 71	0 39	-45 6%
2 10	0 71	0 29	-59 0%
2 12	0 71	0 20	-71 9%
2 14	0 71	0 12	-83 5%
2 16	0 71	0 05	-93 1%
2 18	0 71	0 02	-97 6%
2 20	0 71	0 00	-99 7%
2 22	0 71	0 00	-100 0%
2 24	0 71	0 00	-100 0%
2 26	0 71	0 00	-100 0%

WATERLINE AT ZERO

AREA ERROR = 2 019

STATION NAME LITTLE COTTONWOOD CK
 XS LOCATION 200 YDS U/S OF FREEMAN RESERVOIR
 XS NUMBER 1

GL = lowest Grassline elevation corrected for sag

STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO WATER (FT)	TOP WIDTH (FT)	AVG DEPTH (FT)	MAX DEPTH (FT)	AREA (SQ FT)	WETTED PERIM (FT)	PERCENT WET PER (%)	HYDR RADIUS (FT)	FLOW (CFS)	AVG VELOCITY (FT/SEC)
GL	1.41	10.65	0.60	0.61	6.34	11.17	100.0%	0.57	11.90	1.47
	1.42	10.62	0.59	0.60	6.23	11.13	99.6%	0.56	11.57	1.46
	1.47	10.45	0.55	0.75	5.70	10.92	97.8%	0.52	10.11	1.40
	1.52	10.29	0.50	0.70	5.18	10.72	96.0%	0.48	8.73	1.36
	1.57	10.13	0.46	0.65	4.67	10.52	94.2%	0.44	7.44	1.39
	1.60	9.97	0.42	0.60	4.17	10.31	92.3%	0.40	6.23	1.42
	1.63	9.79	0.38	0.55	3.68	10.09	90.4%	0.36	5.12	1.39
	1.72	9.52	0.34	0.50	3.19	9.79	87.6%	0.33	4.14	1.30
	1.77	9.25	0.29	0.45	2.72	9.48	84.0%	0.29	3.24	1.19
	1.82	8.98	0.25	0.40	2.27	9.17	82.1%	0.25	2.44	1.08
	1.87	8.70	0.23	0.35	1.83	8.86	79.3%	0.21	1.74	0.95
	1.92	8.38	0.20	0.30	1.40	8.50	76.1%	0.16	1.15	0.92
	1.97	6.29	0.16	0.25	1.01	6.39	57.2%	0.16	0.81	0.80
WL	2.02	5.58	0.13	0.20	0.71	5.67	50.8%	0.13	0.49	0.69
	2.07	4.91	0.09	0.15	0.45	4.99	44.7%	0.09	0.25	0.55
	2.12	4.50	0.05	0.10	0.21	4.56	40.9%	0.05	0.08	0.36
	2.17	1.49	0.02	0.05	0.03	1.51	12.5%	0.02	0.01	0.20

2.10 = 2.00 + 0.10
 2.10 = 1.60 + 0.50

```

STREAM NAME      LITTLE COTTONWOOD CK
XS LOCATION      200 YDS U/S OF FREEMAN RESERVOIR
XS NUMBER        1

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SUMMARY SHEET

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MEASURED FLOW (Qm) = 0.46 cfs
CALCULATED FLOW (Qc) = 0.49 cfs
(Qm-Qc)/Qm * 100 = -1.3 %
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RECOMMENDED INSTREAM FLOW

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MEASURED WATERLINE (WLM) = 2.01 ft
CALCULATED WATERLINE (WLC) = 2.02 ft
(WLM-WLC)/WLC = 100 = -0.3 %

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FLOW (CFS)	PERIOD
DATE-TIME	YEAR

MAX MEASURED DEPTH (Dm) =	0.20 ft
MAX CALCULATED DEPTH (Dc) =	0.20 ft
(Dm-Dc)/Dm =	2.2 %

```

MEAN VELOCITY=          0.69 ft/sec
MANNING'S N=          0.088
SLOPE=          0.026 ft/ft

```

4 • Qm =	0 2 cfs
2 5 • Qm =	1 2 cfs

RATIONALE FOR RECOMMENDATION

RECOMMENDATION BY

AGENCY

DATE

CNCB REVIEW BY

DATE _____

PROOF SHEET

LOCATION INFORMATION

INPUT DATA

DATA POINTS=

26

		FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	DATE TO WATER
STREAM NAME	LITTLE COTTONWOOD CK							
XS LOCATION	200 YDS U/S OF FREEMAN RESERVOIR							
XS NUMBER	1	S	0.00	0.50	0.00	0.00	0.00	0.00
		1 G	1.00	1.30	0.00	0.00	0.00	0.00
DATE	10/16/91		1.30	1.95	0.00	0.00	0.00	0.00
OBSERVERS	ESPEGRFN, UPPENDAH, IA		3.00	1.95	0.00	0.00	0.00	0.00
		W	3.40	2.00	0.00	0.00	0.00	0.00
1/4 SEC			4.00	2.05	0.05	0.00	0.02	0.00
SECTION			4.30	2.15	0.10	0.00	0.03	0.00
TWP			4.60	2.15	0.10	0.51	0.03	0.02
RANGE			4.90	2.20	0.20	0.16	0.06	0.01
PM			5.20	2.15	0.15	0.74	0.05	0.02
			5.50	2.15	0.15	1.17	0.05	0.05
COUNTY	MOFFAT		5.80	2.10	0.10	0.91	0.03	0.03
WATERSHED	PORTIFICATION CK		6.10	2.10	0.20	1.11	0.06	0.02
DIVISION	E		6.40	2.15	0.15	1.67	0.05	0.06
DCW CODE	21185		6.70	2.15	0.15	1.67	0.05	0.08
			7.00	2.20	0.20	1.43	0.06	0.03
USGS MAP	FREEMAN RESERVOIR	BR	7.30	2.15	0.15	0.25	0.05	0.01
USGS MAP	ROUTE N F.	BR	7.60	2.15	0.15	0.03	0.05	0.00
			7.90	2.10	0.10	0.10	0.03	0.00
SUPPLEMENTAL DATA		BR	8.20	2.15	0.15	0.25	0.05	0.01
			8.50	2.15	0.15	0.25	0.05	0.01
			8.80	2.10	0.10	0.07	0.03	0.00
DATE NT	0.0105	W	9.10	2.00	0.00	0.00	0.00	0.00
TENSION	17.5		10.00	1.85	0.00	0.00	0.00	0.00
			11.00	1.65	0.00	0.00	0.00	0.00
CHANNEL PROFILE DATA		1 G	11.70	1.40	0.00	0.00	0.00	0.00
			13.00	0.80	0.00	0.00	0.00	0.00
SLOPE	0.026	S	14.10	0.50	0.00	0.00	0.00	0.00

CHECKED BY: DATE

TOTALS 0.71 0.46

ASSIGNED TO: DATE



FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER
CONSERVATION BOARD

LOCATION INFORMATION

STREAM NAME Lake Catherine Creek CROSS-SECTION NO 1
 CROSS-SECTION LOCATION 200 yds up of Forest road
40° 45.7270 107° 25.2638
 DATE 10/16/94 OBSERVERS James A. Henderson
 LEGAL DESCRIPTION SECTION N10 SECTION 6 TOWNSHIP 9 (N)S RANGE 89 E(W) PM
 COUNTY Hart WATERSHED Rocky Mountain WATER DIVISION 6 DOW WATER CODE 21185
 MAP(S) USGS USFS Road + N.E.

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION ☒ YES ☐ NO METER TYPE Marsh McBurney
 METER NUMBER 3010 DATE RATED 10/16/94 CALIB/SPIN sec TAPE WEIGHT 0.0106 lbs/foot TAPE TENSION 7.5 lbs
 CHANNEL BED MATERIAL SIZE RANGE 3/4 to cobbles PHOTOGRAPHS TAKEN ☒ YES ☐ NO NUMBER OF PHOTOGRAPHS 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
☒ Tape @ Stake LB	0.0	4.90
☒ Tape @ Stake RB	0.0	4.89
☐ WS @ Tape LB/RB	0.0	4.83 / 6.11
☐ WS Upstream	11.5'	6.84
☐ WS Downstream	7'	7.33

SLOPE $1.49/18.5 = 0.026$

LEGEND
 Stake ☒
 Station ☐
 Photo ☐
 Direction of Flow

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED ☒ YES ☐ NO DISTANCE ELECTROFISHED 200 ft FISH CAUGHT ☒ YES ☐ NO WATER CHEMISTRY SAMPLED YES/NO

SPECIES (FILL IN)

CRN YOY

LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1 0 1 9, 2 0 2 9, ETC)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	>15	TOTAL
		25	1	1													-

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME

COMMENTS

0.3 ft of a 1/2 inch flow (2.393 cfs)
many YOY seen but not counted

DISCHARGE/CROSS SECTION NOTES

STREAM NAME Little Rock Creek CROSS-SECTION NO 1 DATE 10/16/97 SHEET 1 OF 1

BEGINNING OF MEASUREMENT 00 AT STAKE EDGE OF WATER LOOKING DOWNSTREAM LEFT/RIGHT Gage Reading 0.21 TIME 13:42

Features	Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec)	Area (ft ²)	Discharge (cfs)
	S	0		.5							
	G	1		1.3							
		1.3		1.95							
		3		1.95							
W		3.4	.3	2.00	0					0	0
		4.0	.45	2.05	.05				0	.023	0
		4.3	.30	2.15	.10				0	.030	0
		4.6	.30	2.15	.10				.51	.030	.015
		4.9	.30	2.20	.20				.16	.060	.010
		5.2	.30	2.15	.15				.74	.045	.033
		5.5	.30	2.15	.15				1.17	.045	.053
		5.8	.30	2.10	.10				.91	.030	.027
		6.1	.30	2.2	.20				1.11	.060	.067
		6.4	.30	2.15	.15				1.07	.045	.075
		6.7	.30	2.15	.15				.67	.045	.076
		7.0	.30	2.20	.20				.43	.060	.086
		7.3	.30	2.15	.15				.35	.045	.011
		7.6	.30	2.15	.15				.53	.045	.001
		7.9	.30	2.10	.10				.10	.030	.003
RR		8.2	.30	2.15	.15				0	.045	0
		8.5	.30	2.15	.15				.25	.045	.011
		8.8	.30	2.10	.10				.07	.030	.002
W		9.1	.15	2.0	0						0
		10.0		1.85							
		11		1.65							
G		11.7		1.40							
		12		0.8							
S		14.1		0.6							



Little Cottonwood Creek

Oct 10, 1955

1/20/57

- COLORADO WATER CONSERVATION BOARD
- INSTREAM FLOW / NATURAL LAKE LEVEL PROGRAM
- STREAM CROSS-SECTION AND FLOW ANALYSIS

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 104

```

STREAM NAME      LITTLE COTTONWOOD CK
XS LOCATION      AT FS BOUNDARY BELOW RESERVOIR
XS NUMBER        7

```

DATE 10/10/97
OBSERVERS FSPHGPFLN, UPPENDAHIL, TA

1/4 SEC
SECTION
INP
RANGE
FM

COUNTY	MOFFAT
WATERSHED	FORTIFICATION CK
DIVISION	6
DOW CODE	21185

USGS MAP FREEMAN RESERVOIR
USFS MAP ROUTE N F

SUPPLEMENTAL DATA

*** NOTE ***

Leave TAPE WT and TENSION
at defaults for data collected

TAPER WT 0 0106 with a survey level and rod
TENSION 17

CHANNEL PROFILE DATA

S:OPF. 0 000

INPUT DATA CHECKED BY DATE

ASSIGNED TO DATE

```

STREAM NAME      LITTLE COTTONWOOD CK
XS LOCATION      AT FS BOUNDARY BELOW RESERVOIR
XS NUMBER        2

```

INPUT DATA # DATA POINTS= 32

VALUES COMPUTED FROM RAW FIELD DATA

FEATURE		VERT	WATER	
	DIST	DEPTH	DEPTH	VEL
S	0 00	1 00	0 00	0 00
1 G	0 30	1 05	0 00	0 00
	1 00	1 20	0 00	0 00
	2 00	1 20	0 00	0 00
	3 00	1 20	0 00	0 00
W	4 00	1 20	0 00	0 00
	4 30	1 30	0 05	0 00
	4 60	1 40	0 15	0 00
	4 30	1 40	0 15	0 00
	5 20	1 45	0 20	0 00
	5 50	1 50	0 30	0 00
	5 80	1 50	0 25	0 03
	6 10	1 60	0 40	0 04
	6 40	1 65	0 45	0 38
	6 70	1 65	0 40	0 35
	7 00	1 60	0 55	1 33
	7 30	1 75	0 50	1 45
	7 60	1 80	0 55	1 17
	7 90	1 70	0 45	1 30
	8 20	1 65	0 45	1 17
	8 50	1 60	0 35	0 99
	8 60	1 55	0 35	0 46
	9 10	1 50	0 25	0 02
	9 40	1 40	0 15	0 00
	9 70	1 35	0 10	0 00
	10 00	1 30	0 05	0 00
W	10 40	1 25	0 00	0 00
1 G	11 00	1 05	0 00	0 00
	12 00	0 80	0 00	0 00
	13 00	0 70	0 00	0 00
S	13 60	0 75	0 00	0 00

WETTED PERIM	WATER DEPTH	AREA (Am)	Q (Cm)	1/Q CELL
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.30	0.05	0.01	0.00	0.00
0.32	0.15	0.04	0.00	0.00
0.30	0.15	0.05	0.00	0.00
0.30	0.20	0.06	0.00	0.00
0.32	0.30	0.09	0.00	0.00
0.30	0.25	0.07	0.00	0.00
0.32	0.40	0.12	0.00	0.00
0.30	0.45	0.13	0.05	4.20
0.30	0.40	0.12	0.04	3.40
0.34	0.55	0.17	0.12	18.00
0.30	0.50	0.15	0.22	17.90
0.30	0.55	0.17	0.19	15.90
0.32	0.45	0.13	0.18	14.40
0.30	0.45	0.13	0.16	12.00
0.30	0.35	0.11	0.10	8.50
0.30	0.35	0.11	0.05	4.00
0.30	0.25	0.07	0.00	0.00
0.32	0.15	0.04	0.00	0.00
0.30	0.10	0.03	0.00	0.00
0.30	0.05	0.02	0.00	0.00
0.40	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00

TOTALS --- -- -- -- --

6 51 0 55 1 03 1 22 2 00 00

(Max)

Manning's r. n.

U. 4854

STREAM NAME LITTLE COTTONWOOD CK
 XS LOCATION AT FS BOUNDARY BELOW RESERVOIR
 XS NUMBER 2

WATER LINE COMPARISON TABLE

WATER LINE	MEAS AREA	COMP AREA	AREA ERROR
1 01	1 83	4 18	128 2%
1 03	1 83	3 96	116 2%
1 05	1 83	3 75	104 4%
1 07	1 83	3 53	92 8%
1 09	1 83	3 32	81 3%
1 11	1 83	3 12	70 0%
1 13	1 83	2 91	58 9%
1 15	1 83	2 71	47 9%
1 17	1 83	2 51	37 1%
1 19	1 83	2 32	26 5%
1 21	1 83	2 13	16 5%
1 22	1 83	2 06	12 4%
1 23	1 83	1 99	8 6%
1 24	1 83	1 92	4 7%
1 25	1 83	1 85	1 6%
1 26	1 83	1 79	-2 5%
1 27	1 83	1 72	-6 6%
1 28	1 83	1 66	-9 4%
1 29	1 83	1 60	-12 7%
1 30	1 83	1 54	-15 9%
1 31	1 83	1 48	-19 0%
1 32	1 83	1 37	-25 2%
1 33	1 83	1 26	-31 1%
1 37	1 83	1 16	-36 8%
1 39	1 83	1 06	-42 4%
1 41	1 83	0 96	-47 7%
1 43	1 83	0 87	-52 5%
1 45	1 83	0 78	-57 2%
1 47	1 83	0 70	-61 7%
1 49	1 83	0 62	-66 0%
1 51	1 83	0 55	-70 2%

WATERLINE AT ZERO

AREA ERROR = 1 254

STREAM NAME: LITTLE COTTONWOOD CK
 XS LOCATION: AT FS BOUNDARY BELOW RESERVOIR
 XS NUMBER: 2

GL = lowest Grassline elevation corrected for sag

STAGING TABLE *WL* = Waterline corrected for variations in field measured water surface elevations and sag

	DIST TO	TOP	AVG	MAX		WETTED	PERCENT	HYDR		AVG
	WATER	WIDTH	DEPTH	DEPTH	AREA	PERIM	WET PFR	RADIUS	FLOW	VELOCITY
	(FT)	(FT)	(FT)	(FT)	(SQ FT)	(FT)	(%)	(FT)	(CFS)	(FT/SEC)
GL	1.06	10.66	0.34	0.76	3.66	10.89	100.0%	0.34	2.76	0.75
	1.10	10.32	0.31	0.71	3.19	10.53	96.6%	0.30	2.74	0.70
	1.15	9.95	0.27	0.66	2.68	10.14	93.2%	0.26	1.72	0.64
	1.20	9.53	0.23	0.61	2.13	9.71	89.2%	0.23	1.21	0.56
WL	1.25	6.57	0.28	0.56	1.82	6.74	61.9%	0.27	1.20	0.45
	1.30	6.81	0.26	0.51	1.52	6.97	54.8%	0.26	0.95	0.43
	1.35	5.32	0.23	0.46	1.25	6.47	50.5%	0.23	0.72	0.36
	1.40	4.88	0.20	0.41	0.99	6.02	46.1%	0.20	0.52	0.33
	1.45	4.13	0.19	0.36	0.77	4.76	39.1%	0.19	0.36	0.30
	1.50	3.80	0.15	0.31	0.57	3.92	36.0%	0.15	0.25	0.43
	1.55	3.02	0.13	0.26	0.40	3.11	28.6%	0.13	0.16	0.49
	1.60	2.49	0.11	0.21	0.26	2.56	23.5%	0.10	0.09	0.34
	1.65	1.92	0.08	0.16	0.15	1.99	16.2%	0.08	0.04	0.26
	1.70	1.18	0.07	0.11	0.08	1.73	11.3%	0.07	0.02	0.21
	1.75	0.90	0.03	0.06	0.03	0.93	8.6%	0.03	0.00	0.16
	1.80	0.17	0.01	0.01	0.00	0.18	1.7%	0.00	0.00	0.05

7/3/11
 11:11 AM

LITTLE COTTONWOOD CR
AT FS BOUNDARY BELOW RESERVOIR
2

SUMMARY SHEET

RECOMMENDED INSTREAM FLOW
=====

FLOW (CFS):

PERIOD

● 2017 年 12 月 1 日起，所有在境内销售的新能源汽车，其动力电池系统能量密度必须达到 150Wh/kg 以上。

... AGENCY

DATE

DATE:

PROOF SHEET

LOCATION INFORMATION

INPUT DATA # DATA POINTS= 31

		FEATURE	DIST	VERT DEPTH	WATER DEPTH	VEL	A	Q	TACH TO WATER
STREAM NAME	LITTLE COTTONWOOD CK								
XS LOCATION	AT FS BOUNDARY BELOW RESERVOIR								
XS NUMBER	2	S	0.00	1.00	0.00	0.00	0.00	0.00	0.00
		1 G	0.30	1.35	0.00	0.00	0.00	0.00	0.00
DATE	10/16/97		1.00	1.20	0.00	0.00	0.00	0.00	0.00
OBSERVERS	ESPEGREN, OPPENDAH, TA		2.00	1.20	0.00	0.00	0.00	0.00	0.00
			3.00	1.20	0.00	0.00	0.00	0.00	0.00
1/4 SEC		W	4.00	1.25	0.00	0.00	0.00	0.00	0.00
SECTION			4.30	1.30	0.05	0.00	0.01	0.00	1.25
TWE			4.60	1.40	0.15	0.00	0.05	0.00	1.26
RANGE			4.90	1.40	0.15	0.00	0.05	0.00	1.26
RM			5.20	1.45	0.20	0.00	0.06	0.00	1.26
			5.50	1.55	0.30	0.00	0.09	0.00	1.26
COUNTY	MOFFAT		5.80	1.50	0.25	0.00	0.07	0.00	1.26
WATERSHED	FORTIFICATION CK		6.10	1.50	0.40	0.00	0.10	0.00	1.26
DIVISION	6		6.40	1.65	0.45	0.25	0.13	0.05	1.21
DOW CODE	21185		6.70	1.65	0.40	0.35	0.12	0.04	1.26
			7.00	1.80	0.55	1.33	0.17	0.22	1.20
USGS MAP	FREEMAN RESERVOIR		7.30	1.75	0.50	1.45	0.15	0.22	1.25
USFS MAP	ROUTE N F		7.60	1.80	0.55	1.17	0.17	0.19	1.26
			7.90	1.70	0.45	1.30	0.13	0.18	1.25
SUPPLEMENTAL DATA			8.20	1.55	0.45	1.17	0.13	0.16	1.21
*****			8.50	1.60	0.35	0.99	0.11	0.10	1.25
			8.80	1.55	0.35	0.46	0.11	0.05	1.21
TAPE WT	0.0106		9.10	1.50	0.25	0.02	0.07	0.00	1.20
TENSION	17		9.40	1.40	0.15	0.00	0.04	0.00	1.20
			9.70	1.35	0.10	0.00	0.03	0.00	1.25
CHANNEL PROFILE DATA			10.00	1.30	0.05	0.00	0.02	0.00	1.25
*****		W	10.40	1.25	0.00	0.00	0.00	0.00	0.00
SLOPE	0.008	1 G	11.00	1.05	0.00	0.00	0.00	0.00	0.00
			12.00	0.80	0.00	0.00	0.00	0.00	0.00
			12.00	0.70	0.00	0.00	0.00	0.00	0.00
CHECKED BY	DATE	S	13.60	0.75	0.00	0.00	0.00	0.00	0.00
ASSIGNED TO	DATE								
TOTALS							1.80	1.22	



FIELD DATA FOR INSTREAM FLOW DETERMINATIONS



COLORADO WATER
CONSERVATION BOARD

LOCATION INFORMATION

STREAM NAME Little Cottonwood CK CROSS-SECTION NO 2
 CROSS-SECTION LOCATION @ FS boundary Below Reservoir
 DATE 10/16/97 OBSERVERS Esperanza, Upendahl, Te
 LEGAL DESCRIPTION 1/4 SECTION CE SECTION 1 TOWNSHIP 9 (N) S RANGE 6
 COUNTY Mo. WATERSHED Four Forks of the WATER DIVISION 6 90 E/W PM 6
 MAP(S) USGS USFS Timpani Lake Rocky NE DOW WATER CODE 21185

SUPPLEMENTAL DATA

SAG TAPE SECTION SAME AS DISCHARGE SECTION YES NO NO METER TYPE analog
 METER NUMBER 30713 DATE RATED 10/16/97 CALIB/SPIN sec TAPE WEIGHT 60/106 TAPE TENSION 14 lbs
 CHANNEL BED MATERIAL SIZE RANGE silt Boulder PHOTOGRAPHS TAKEN YES NO NO NUMBER OF PHOTOGRAPHS 3

CHANNEL PROFILE DATA

STATION	DISTANCE FROM TAPE (ft)	ROD READING (ft)
☒ Tape @ Stake LB	0.0	4.47
☒ Tape @ Stake RB	0.0	3.98
☐ WS @ Tape LB/RB	0.0	4.25 / 4.23
☐ WS Upstream	11'	4.60
☐ WS Downstream	15'	4.80

SLOPE $1.20/24 = 0.008$

LEGEND
 Stake ☒
 Station ☐
 Photo ☐
 Direction of Flow

SKETCH

AQUATIC SAMPLING SUMMARY

STREAM ELECTROFISHED YES NO NO DISTANCE ELECTROFISHED 100 ft FISH CAUGHT YES NO NO WATER CHEMISTRY SAMPLED YES NO NO

LENGTH - FREQUENCY DISTRIBUTION BY ONE-INCH SIZE GROUPS (1 0-1 9, 2 0-2 9, ETC.)

SPECIES (FILL IN)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	> 15	TOTAL

AQUATIC INSECTS IN STREAM SECTION BY COMMON OR SCIENTIFIC ORDER NAME

COMMENTS

DISCHARGE/CROSS SECTION NOTES

STREAM NAME

Little Cottonwood

CROSS-SECTION NO

2

DATE

8/14

SHEET *1* OF *1*

BEGINNING OF MEASUREMENT

EDGE OF WATER LOOKING DOWNSTREAM
(0.0 AT STAKE)

LEFT / RIGHT

Gage Reading

— ft

TIME

14:40

Features	Stake (S) Grassline (G) Waterline (W) Rock (R)	Distance From Initial Point (ft)	Width (ft)	Total Vertical Depth From Tape/Inst (ft)	Water Depth (ft)	Depth of Observation (ft)	Revolutions	Time (sec)	Velocity (ft/sec) At Point Mean in Vertical	Area (ft ²)	Discharge (cfs)
		0		1							
		.3		1.05							
		1		1.20							
		2		1.20							
		3		1.20							
W		4	.15	1.25	0						
		4.3	.30	1.3	.05						
		4.6	.30	1.4	.15						
		4.9	.30	1.4	.15						
		5.2	.30	1.45	.20						
		5.5	.30	1.55	.30						
		5.8	.30	1.50	.25						
		6.1	.30	1.60	.40						
		6.4	.30	1.65	.45						
		6.7	.30	1.65	.40						
		7.0	.30	1.80	.55						
		7.3	.30	1.75	.50						
		7.6	.30	1.80	.55						
		7.9	.30	1.70	.45						
		8.2	.30	1.65	.45						
		8.5	.30	1.60	.35						
		8.8	.30	1.55	.35						
		9.1	.30	1.80	.25						
		9.4	.30	1.40	.15						
		9.7	.30	1.35	.10						
		10.0	.30	1.30	.05						
W		10.4	.50	1.25	0						
L		11		1.05							
		12		1.80							
		13		.70							
S		13.6		.75							

TOTALS

End of Measurement

Time

14:45

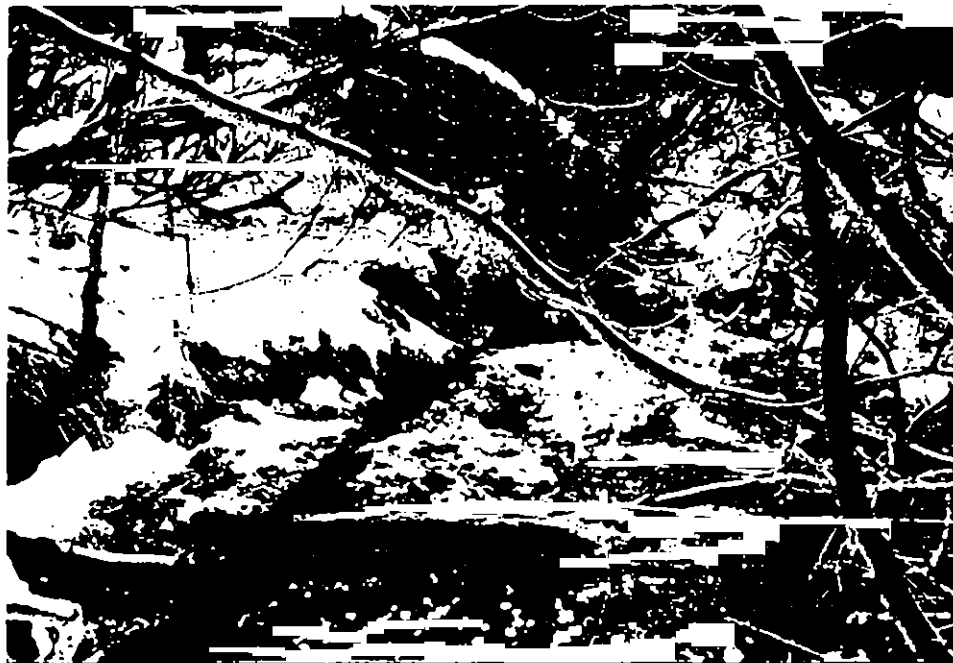
Gage Reading

— ft

CALCULATIONS PERFORMED BY

CALCULATIONS CHECKED BY

1.2372

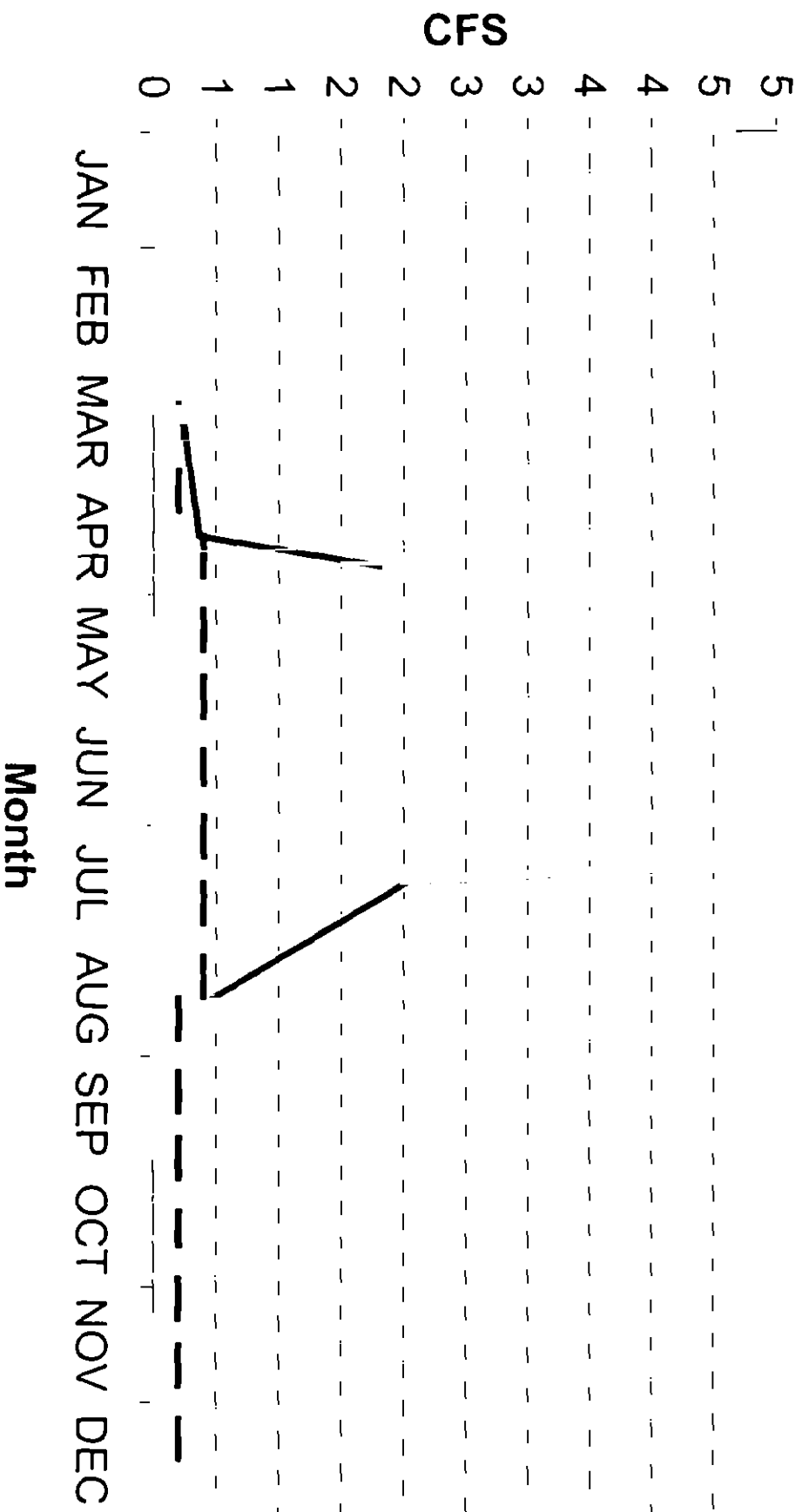


WATER	WATERNAME	AT(COQ	SAMPDAT	SPEC	COMM
66705	FREEMAN RESERVOIR	15 B6	8/2/1981	CRN	CO RIVER CUTTHROAT
66705	FREEMAN RESERVOIR	15 B6	8/2/1981	MAC	LAKE TROUT (MACKINAW)

APPENDIX – C

Water Availability Analysis

Estimated Stream Flow in Little Cottonwood Creek



Station Name MUDK FISH C NR RUFFALO PASS CO
 Station ID 5230750
 Param STREAM FLOW CFS
 State Mean
 State CO
 County ROUTT
 Latitude 40 29 54
 Longitude 106 41 30
 Elevation
 Start Year 1984
 End Year 1995
 Num Years 12
 Area 1.37 sq miles

	January	February	March	April	May	June	July	August	September	October	November	December
# Days	341	310	341	341	341	330	341	341	330	341	330	341
Avg Day	0.205	0.192	0.228	0.228	1.55	11.77	25.68	5.06	0.486	0.377	0.358	0.315
Max Day	0.45	0.5	0.7	0.7	66	56	97	65	2.8	3.2	3.1	1.4
Min Day	0	0	0.03	0.07	0.22	0.5	0.12	0.07	0.08	0.11	0.11	0
# Months	11	11	11	11	11	11	11	11	11	11	11	11
Sliver Month	0.106	0.11	0.11	0.11	2.41	1.53	12.25	7.51	0.223	0.183	0.424	0.172
Skew Month	0.661	1.18	1.18	1.18	2.93	0.241	-0.367	2.54	0.165	-0.281	0.583	0.411
Min Month	0.052	0.054	0.075	0.075	0.26	1.8	6.42	0.295	0.136	0.113	0.172	0.120
Max Month	0.426	0.453	0.474	0.474	8.54	24.41	42.13	25.9	0.831	0.577	1.36	0.194
Exceedences												
1%	0.45	0.5	0.652	0.652	29.1	44.59	79.7	57.54	2.16	2.34	2.66	1.1
5%	0.4	0.44	0.479	0.479	4.7	34	57.1	21.9	1.2	0.94	1.4	0.755
10%	0.34	0.32	0.35	0.35	3	26	50	14	0.947	0.8	1.19	0.69
20%	0.28	0.27	0.28	0.28	1.6	23	42	5	0.6	0.51	0.93	0.6
50%	0.200	0.170	0.200	0.200	0.360	1.00	25.000	1.700	0.380	0.230	0.340	0.200
80%	0.1	0.12	0.15	0.15	0.25	1.42	7.5	0.56	0.25	0.16	0.19	0.24
90%	0.031	0.04	0.11	0.11	0.23	0.45	3.1	0.39	0.15	0.13	0.16	0.23
95%	0.01	0.03	0.07	0.07	0.19	0.37	1.8	0.22	0.12	0.09	0.13	0.15
99%	0	0	0.054	0.054	0.07	0.302	0.65	0.144	0.09	0.08	0.114	0.101

Exceedences January	February	March	April	May	June	July	August	September	October	November	December
1%	1.68	1.87	2.44	108.75	166.13	297.84	215.21	8.07	8.74	5.94	4.11
5%	1.49	1.64	1.78	11.56	127.06	214.89	96.79	4.68	3.51	5.23	2.82
10%	1.27	1.20	1.31	11.21	102.37	180.85	52.34	3.14	2.54	4.45	2.58
20%	1.05	1.01	1.05	5.98	83.95	156.95	18.69	2.24	1.91	3.45	2.24
50%	0.75	0.64	0.75	1.35	26.53	93.43	6.35	1.42	0.93	1.27	1.42
80%	0.37	0.45	0.56	0.97	5.31	28.03	2.09	0.93	0.50	0.71	1.12
90%	0.12	0.15	0.41	0.86	1.68	11.54	1.46	0.60	0.40	0.60	0.71
95%	0.03	0.11	0.26	0.71	1.38	4.73	0.87	0.45	0.24	0.49	0.75
99%	0.00	0.01	0.20	0.26	1.13	3.21	0.54	0.34	0.30	0.43	0.39

Station Name GRANITE C NR Bill FALO PASS, CO
 Station ID 9238770
 Param STRM AM FLOW CFS
 Statistic Mean
 State CO
 County ROUTT
 Latitude 40 26 35
 Longitude 106 41 31
 Elevation 9645
 Start Year 1966
 End Year 1995
 Num Years 12
 area 2.62 sq miles

	January	February	March	April	May	June	July	August	September	October	November	December
# Days	341	310	341	330	341	330	341	341	330	341	330	341
Avg Day	0.462	0.468	0.56	2.13	17.66	42.26	9.64	1.55	1.06	1.19	0.9	0.641
Max Day	0.9	0.76	1.6	40	80	126	69	7.5	6.5	5.5	2.7	1.2
Min Day	0.17	0.15	0.13	0.16	0.31	2.8	0.96	0.46	0.41	0.26	0.24	0.17
# Months	11	11	11	11	11	11	11	11	11	11	11	11
SDev Month	0.183	0.17	0.294	2.83	12.08	17.62	9.83	0.864	0.473	0.825	0.319	0.277
Skew Month	-0.408	-0.64	2.73	-0.041	-0.041	0.231	1.71	0.794	0.678	0.639	0.125	0.191
Min Month	0.196	0.178	0.19	0.333	2.4	17.18	2.07	0.75	0.515	0.422	0.393	0.214
Max Month	0.729	0.706	1.16	10.2	24.35	71.4	32.97	2.95	2.05	2.5	1.47	1.15
Frequency												
1%	0.19	0.76	1.6	35	75.18	103	61.54	6.54	5.44	4.96	2.21	1.2
5%	0.78	0.72	1.2	8.1	32	87.5	26.85	4.39	2.4	2.79	1.6	1.2
10%	0.7	0.64	0.978	3.5	45	76	29.8	3.3	1.9	2.4	1.4	1
20%	0.636	0.64	0.74	2	35.8	63	14	2.04	1.3	2	1.2	0.916
50%	0.47	0.48	0.53	0.72	8.65	49	4.6	1.1	0.82	0.73	0.8	0.63
80%	0.23	0.27	0.24	0.44	1.92	17	1.9	0.682	0.52	0.48	0.49	0.402
90%	0.19	0.23	0.191	0.32	0.9	10	1.3	0.61	0.48	0.43	0.43	0.221
95%	0.19	0.18	0.18	0.26	0.601	7.3	1.11	0.56	0.46	0.41	0.37	0.21
99%	0.17	0.16	0.14	0.23	0.404	3.34	0.984	0.498	0.43	0.314	0.278	0.184
January	1.63	1.38	2.90	63.55	136.50	187.01	111.82	11.87	9.88	9.01	4.01	2.18
5%	1.42	1.31	2.18	14.71	94.41	158.87	70.52	7.97	4.35	5.07	2.90	2.18
10%	1.27	1.25	1.78	6.35	81.70	137.99	34.10	5.99	3.45	4.36	2.54	1.82
20%	1.16	1.16	1.34	3.63	65.00	114.26	25.42	3.78	2.36	3.63	2.18	1.66
50%	0.85	0.87	0.96	1.31	15.70	72.62	8.35	2.00	1.49	1.33	1.45	1.14
80%	0.42	0.49	0.44	0.60	3.49	30.67	3.45	1.24	0.94	0.87	0.89	0.73
90%	0.34	0.42	0.35	0.58	1.63	18.16	2.36	1.11	0.87	0.78	0.78	0.40
95%	0.34	0.33	0.33	0.47	1.05	13.25	2.02	1.02	0.84	0.74	0.67	0.38
99%	0.31	0.29	0.25	0.42	0.73	6.52	1.79	0.89	0.72	0.57	0.50	0.33

Little Cottonwood Creek Analysis
 Basin Area 1.42 sq mi

	January	February	March	April	May	June	July	August	September	October	November	December
MO Fk Fish C	0.20	0.17	0.20	0.36	7.10	25.00	1.70	0.38	0.25	0.34	0.38	0.30
Granite Creek	0.21	0.18	0.21	0.37	7.36	25.91	1.76	0.39	0.26	0.35	0.39	0.31
	0.47	0.48	0.53	0.72	8.65	40.00	4.60	1.10	0.82	0.73	0.80	0.63
	0.24	0.24	0.27	0.36	4.36	20.14	2.32	0.55	0.41	0.37	0.40	0.32
Average	0.22	0.21	0.24	0.37	5.86	23.03	2.04	0.47	0.34	0.36	0.40	0.31
	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.2

Precipitation
Yampa-59265

1984	16.75	93.6%
1985	19.45	108.7%
1986	16.03	89.6%
1987	13.23	74.0%
1988	18.22	101.8%
1989	18.32	102.4%
1990	no data	
1991	19.73	110.3%
1992	16.53	92.4%
1993	16.46	92.0%
1994	no data	
long-term ave	17.89	
	17.19111	96.1%

Station **GRANITE C NR BUFFALO PASS, CO.**
 Parameter **STREAM FLOW CFS**
 Year **1984-1995**
 State **CO**
 County **ROUTT**

ID **09238770**
 Statistic **Mean**
 Latitude **40 29 35**
 Longitude **106 41 31**
 Elevation **9875 00**
 Drainage Area **2 82**

Monthly Statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
# Days	341	310	341	330	341	330	341	341	330	341	330	341	4017
Avg Day	0.468	0.468	0.560	2.13	17.69	42.26	9.64	1.55	1.06	1.19	0.900	0.641	6.54
Max Day	0.900	0.760	1.60	40.00	80.00	126.0	69.00	7.50	6.50	5.50	2.70	1.20	126.0
Min Day	0.170	0.150	0.130	0.180	0.310	2.80	0.960	0.460	0.410	0.260	0.240	0.170	0.130
# Months	11	11	11	11	11	11	11	11	11	11	11	11	11
SDev Month	0.183	0.170	0.294	2.83	12.08	17.82	9.83	0.864	0.473	0.825	0.379	0.277	1.12
Skew Month	-0.349	-0.408	0.640	2.73	-0.091	0.231	1.71	0.794	0.678	0.639	0.125	0.191	0.091
Min Month	0.196	0.178	0.140	0.333	2.40	17.18	2.07	0.750	0.510	0.422	0.395	0.214	5.01
Max Month	0.729	0.706	1.16	10.20	34.35	71.40	32.97	2.95	2.05	2.50	1.47	1.15	8.21
Exceedences													
1%	0.900	0.760	1.60	35.00	75.18	103.0	61.59	6.54	5.44	4.96	2.21	1.20	73.83
5%	0.760	0.720	1.20	8.10	52.00	87.50	38.85	4.39	2.40	2.79	1.60	1.20	44.00
10%	0.700	0.690	0.978	3.50	45.00	76.00	29.80	3.30	1.90	2.40	1.40	1.00	24.00
20%	0.638	0.640	0.740	2.00	35.80	63.00	14.00	2.08	1.30	2.00	1.20	0.916	4.00
50%	0.470	0.480	0.530	0.720	8.65	40.00	4.60	1.10	0.820	0.730	0.800	0.630	0.800
80%	0.230	0.270	0.240	0.440	1.92	17.00	1.90	0.682	0.520	0.480	0.490	0.402	0.480
90%	0.190	0.230	0.191	0.320	0.900	10.00	1.30	0.610	0.480	0.430	0.430	0.221	0.360
95%	0.190	0.180	0.180	0.260	0.601	7.30	1.11	0.560	0.460	0.410	0.370	0.210	0.230
99%	0.170	0.160	0.140	0.230	0.404	3.59	0.984	0.488	0.430	0.314	0.278	0.184	0.180

Station **MD FK FISH C NR BUFFALO PASS, CO.**
 Parameter **STREAM FLOW CFS**
 Year **1984-1995**
 State **CO**
 County **ROUTT**

ID **09238750**
 Statistic **Mean**
 Latitude **40.29 54**
 Longitude **106 41 30**
 Elevation
 Drainage Area **1 37**

Monthly Statistics

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
# Days	341	310	341	330	341	330	341	341	330	341	330	341	4017
Avg Day	0 205	0 192	0 228	1 55	11 77	25 68	5 06	0 486	0 377	0 558	0 437	0 315	3 90
Max Day	0 450	0 500	0 700	66 00	56 00	97 00	65 00	2 80	3 20	3 10	1 40	0 570	97 00
Min Day	0	0	0 030	0 070	0 290	0 500	0 120	0 070	0 080	0 110	0 170	0	0
# Months	11	11	11	11	11	11	11	11	11	11	11	11	11
SDev Month	0 106	0 110	0 110	2 41	7 63	12 25	7 51	0 223	0 183	0 424	0 172	0 078	0 774
Skew Month	0 681	1 18	1 18	2 93	0 241	-0 362	2 56	0 165	-0 281	0 983	0 411	0 129	-0 208
Min Month	0 062	0 054	0 075	0 060	1 80	6 42	0 295	0 126	0 110	0 172	0 203	0 194	2 55
Max Month	0 426	0 453	0 474	8 56	24 41	42 13	25 90	0 827	0 577	1 38	0 727	0 449	4 94
Exceedences													
1%	0 450	0 500	0 652	29 10	44 59	79 70	57 59	2 16	2 34	2 66	1 10	0 550	50 00
5%	0 400	0 440	0 479	4 70	34 00	57 50	25 90	1 20	0 940	1 40	0 755	0 519	28 00
10%	0 340	0 320	0 350	3 00	29 00	50 00	14 00	0 947	0 800	1 19	0 690	0 450	13 00
20%	0 280	0 270	0 280	1 60	23 00	42 00	5 00	0 600	0 510	0 930	0 600	0 390	1 86
50%	0 200	0 170	0 200	0 360	7 10	25 00	1 70	0 380	0 250	0 340	0 380	0 300	0 350
80%	0 100	0 120	0 150	0 260	1 42	7 50	0 560	0 250	0 160	0 190	0 300	0 240	0 190
90%	0 031	0 040	0 110	0 230	0 450	3 10	0 390	0 160	0 130	0 160	0 230	0 190	0 150
95%	0 010	0 030	0 070	0 190	0 370	1 80	0 220	0 120	0 090	0 130	0 200	0 150	0 100
99%	0	0	0 054	0 070	0 302	0 860	0 144	0 090	0 080	0 114	0 190	0 104	0 020

APPENDIX – D
Diversion Records

WD	ID	WRNAME	STRTYPE	WRSTRNO	WRSTRNAME	CTY	Q10	Q40	Q160	SEC	TS	RNG	PM	USETYPE	DCRAMT	DCRUNITS	ADJTTYPE	ADJDATE	PADJDATE	APRODATE	ORDNO	ADMINNO	PRIORNO	CANO	SEQNO	PLANS	ALTERID	COMMENT
44	856	ALISPAW SPG	4		47 LITTLE COTTONWOOD CK	41	NW	SW	12	9 N	90 W	S	9	0.017 C	S,C	26664	26298	10552	0	44559.28763				W0331-72	1		0	
44	856	ALISPAW SPG	4		47 LITTLE COTTONWOOD CK	41	NW	SW	12	9 N	90 W	S	9	0.017 C	S,C,AB	26664	26298	10552	0	44559.28763				W0331-72	2		0	
44	542	BAKER COTTONWOOD D	1		47 LITTLE COTTONWOOD CK	41	NE	NE	20	9 N	90 W	S	189	2.2 C	S	12688	12570	842	0	30831.19101	195			CA0692	1		0	0 ABANDONED 10/14/1980
44	542	BAKER COTTONWOOD D	1		47 LITTLE COTTONWOOD CK	41	NE	NE	20	9 N	90 W	S	189	13.0 C	S,C	12688	12570	842	0	30831.19101	195			CA0692	2		0	0
44	542	BAKER COTTONWOOD CK	1		47 LITTLE COTTONWOOD CK	41	NE	NE	20	9 N	90 W	S	189	2.2 C	S,TF	12688	12570	842	0	30831.19101	195			CA0692	3		0	440099
44	542	BAKER COTTONWOOD D	1		47 LITTLE COTTONWOOD CK	41	NE	NE	20	9 N	90 W	S	189	13.0 C	S,C,AB	12688	12570	842	0	30831.19101	195			84CW0071	4		0	0 ABANDONED 1.3 CFS (84CW71)
44	542	BAKER COTTONWOOD D	1		47 LITTLE COTTONWOOD CK	41	NE	NE	20	9 N	90 W	S	189	2 C	S	26449	22160	14001	0	40421.32261	12			CA2259	5		0	0
44	542	BAKER COTTONWOOD D	1		47 LITTLE COTTONWOOD CK	41	NE	NE	20	9 N	90 W	S	189	3 C	S,C	26449	22160	14001	0	40421.32261	0			CA2259	6		0	0 DILIGENCE 88CW93, 92CW34
44	542	BAKER COTTONWOOD D	1		47 LITTLE COTTONWOOD CK	41	NE	NE	20	9 N	90 W	S	189	3 C	S,C,AB	26449	22160	14001	0	40421.32261	0			92CW0034	7		0	0 ABAND 3.0 CFS 4/6/2000
44	1390	BAYSINGER SPRING NO 2	4		47 LITTLE COTTONWOOD CK	41	NW	NW	28	9 N	90 W	S	19	0.045 C	S	33969	33803	32888	0	51864.51149				92CW0020	1		0	
44	998	DRY COTTONWOOD DITCH	1		47 LITTLE COTTONWOOD CK	41	SW	SW	1	9 N	90 W	S	1	2.33 C	S	4242	4183	-2829	0	22444.15432	NONE				1		0	
44	998	DRY COTTONWOOD DITCH	1		47 LITTLE COTTONWOOD CK	41	SW	SW	1	9 N	90 W	S	1	6.67 C	S	26449	22160	19998	0	40421.38259	28			CA2259	2		0	
44	1998	DRY COTTONWOOD DITCH 2	1		47 LITTLE COTTONWOOD CK	41	NE	NE	3	8 N	90 W	S	1	2.33 C	S,AP	4242	4183	-2829	0	22444.15432	NONE				1		0	440099
44	1998	DRY COTTONWOOD DITCH 2	1		47 LITTLE COTTONWOOD CK	41	NE	NE	3	8 N	90 W	S	1	6.67 C	S,AP	26449	22160	19998	0	40421.38261	28			CA2259	2		0	440099
44	3687	DRY COTTONWOOD RES	3		47 LITTLE COTTONWOOD CK	41	SW	SE	11	9 N	90 W	S	1	53.33 A	S	4242	4183	-2009	0	22444.16252	NONE			CA0012	1		0	
44	3738	FREEMAN RESERVOIR	3		47 LITTLE COTTONWOOD CK	41	NW	SW	6	9 N	89 W	S	56	137.59 A	S	26449	22160	22298	0	41559	48			CA2259	1		0	
44	2076	GRANDMAW WYATTS SPG	4		47 LITTLE COTTONWOOD CK	41	SW	NW	11	9 N	90 W	S	891	0.022 C	S	29220	28855	1948	0	47116.20209				79CW114	1		0	
44	817	JOHNSON & WYATT ENL D	1		47 LITTLE COTTONWOOD CK	41	NE	NE	11	9 N	90 W	S	1	0.6 C	S,CA	13634	13064	2385	0	31325.20646	120A			79CW113	3		0	
44	817	JOHNSON & WYATT ENL D	1		47 LITTLE COTTONWOOD CK	41	NE	NE	11	9 N	90 W	S	1	1.25 C	S	13634	13064	2385	0	31325.20646	120A			CA0692	1		0	
44	817	JOHNSON & WYATT ENL D	1		47 LITTLE COTTONWOOD CK	41	NE	NE	11	9 N	90 W	S	1	0.67 C	S,C	13634	13064	2385	0	31325.20646	120A			CA0692	2		0	
44	4380	LITTLE BLACK RES	3		47 LITTLE COTTONWOOD CK	41	NW	SE	9	9 N	90 W	S	X	250 A	S,C	29951	29586	29859	0	48120				81CW0272	1		0	0 DILIGENCE 88CW17
44	4380	LITTLE BLACK RES	3		47 LITTLE COTTONWOOD CK	41	NW	SE	9	9 N	90 W	S	X	250 A	S,C,AB	29951	29586	29859	0	48120				81CW0272	2		0	0 DILIGENCE 88CW17, ABANDONED 250 AF ON 4/6/90
44	3696	LITTLE COTTONWOOD CK RES	3		47 LITTLE COTTONWOOD CK	41	NE	SE	9	9 N	90 W	S	1	433.63 A	S,C	13634	13064	3483	0	31325.21744	120H			CA0692	1		0	
44	3696	LITTLE COTTONWOOD CK RES	3		47 LITTLE COTTONWOOD CK	41	NE	SE	9	9 N	90 W	S	1	433.63 A	S,C,AB	13634	13064	3483	0	31325.21744	120H			84CW0071	3		0	0 84CW71 ABANDONED 433.63 AF
44	3696	LITTLE COTTONWOOD CK RES	3		47 LITTLE COTTONWOOD CK	41	NE	SE	9	9 N	90 W	S	1	46.38 A	S	13634	13064	3483	0	31325.21744	120H			CA0692	1		0	
44	697	MCDONALD & HALL D	1		47 LITTLE COTTONWOOD CK	41	SE	NE	20	9 N	90 W	S	1	0.6 C	S	13634	13064	2817	0	31325.21071	120C			CA0692	1		0	
44	697	MCDONALD & HALL D	1		47 LITTLE COTTONWOOD CK	41	SE	NE	20	9 N	90 W	S	1	0.5 C	S,C	13634	13064	2817	0	31325.21071	120C			CA0692	4		0	
44	697	MCDONALD & HALL D	1		47 LITTLE COTTONWOOD CK	41	SE	NE	20	9 N	90 W	S	1	0.5 C	S,CA	13634	13064	2817	0	31325.21071	120C			W0476-73	6		0	
44	697	MCDONALD & HALL D	1		47 LITTLE COTTONWOOD CK	41	SE	NE	20	9 N	90 W	S	19	1.9 C	S	27029	26664	26789	0	46500					3		0	
44	698	MCDONALD DITCH	1		47 LITTLE COTTONWOOD CK	41	SW	NE	9	9 N	90 W	S	1	1.25 C	S	13634	13064	2687	0	31325.20948	120B			CA0692	1		0	
44	698	MCDONALD DITCH	1		47 LITTLE COTTONWOOD CK	41	SW	NE	9	9 N	90 W	S	1	0.25 C	S,AB	13634	13064	2687	0	31325.20948	120B			84CW0071	3		0	0 ABANDONED .25CFS 84CW71
44	698	MCDONALD DITCH	1		47 LITTLE COTTONWOOD CK	41	SW	NE	9	9 N	90 W	S	19	5.6 C	S	22180	18034	21058	0	39319	85			CA1278	2		0	
44	698	MCDONALD DITCH	1		47 LITTLE COTTONWOOD CK	41	SW	NE	9	9 N	90 W	S	1	5.6 C	S,C	22180	18034	21058	0	39319	85			CA1278	4		0	
44	698	MCDONALD DITCH	1		47 LITTLE COTTONWOOD CK	41	SW	NE	9	9 N	90 W	S	1	5.6 C	S,CA	22180	18034	21058	0	39319	85			CA1278	5		0	
44	3394	VISITANER RES 73	3		47 LITTLE COTTONWOOD CK	41	NE	SW	9	9 N	90 W	S	9	1 A	S	30316	29951	21388	0	48212.39649				82CW0236	1		0	
44	3396	VISITANER RES 74	3		47 LITTLE COTTONWOOD CK	41	SE	SW	9	9 N	90 W	S	9	1 A	S	30316	29951	17361	0	48212.35612				82CW0236	1		0	
44	3396	VISITANER RES 75	3		47 LITTLE COTTONWOOD CK	41	NE	SE	9	9 N	90 W	S	9	1 A	S	30316	29951	20301	0	48212.35661				82CW0236	1		0	
44	3397	VISITANER RES 76	3		47 LITTLE COTTONWOOD CK	41	NE	SE	9	9 N	90 W	S	9	1.5 A	S	30316	29951	18851	0	48212.37111				82CW0236	1		0	
44	3398	VISITANER RES 77	3		47 LITTLE COTTONWOOD CK	41	NE	NW	10	9 N	90 W	S	9	3 A	S	30316	29951	14449	0	48212.3371				82CW0236	1		0	
44	3399	VISITANER RES 78A	3		47 LITTLE COTTONWOOD CK	41	SE	NW	10	9 N	90 W	S	9	3 A	S	30316	29951	14842	0	48212.33103				82CW0236	1		0	
44	3400	VISITANER RES 78B	3		47 LITTLE COTTONWOOD CK	41	SW	SW	10	9 N	90 W	S	9	1 A	S	30316	29951	21804	0	48212.40065				82CW0236	1		0	
44	3401	VISITANER RES 79	3		47 LITTLE COTTONWOOD CK	41	NW	NE	15	9 N	90 W	S	9	2 A	S	30316	29951	14882	0	48212.33143				82CW0236	1		0	
44	3402	VISITANER RES 80	3		47 LITTLE COTTONWOOD CK	41	SW	NW	15	9 N	90 W	S	9	1 A	S	30316	29951	21050	0	48212.39311				82CW0236	1		0	
44	3403	VISITANER RES 81	3		47 LITTLE COTTONWOOD CK	41	SW	NE	15	9 N	90 W	S	9	1 A	S	30316	29951	23944	0	48212.42306				82CW0236	1		0	
44	3404	VISITANER RES 82	3		47 LITTLE COTTONWOOD CK	41	NE	SE	15	9 N	90 W	S	9	1 A	S	30316	29951	17411	0	48212.35671				82CW0236	1		0	
44	3405	VISITANER RES 83	3		47 LITTLE COTTONWOOD CK	41	NE	SW	15	9 N	90 W	S	9	5 A	S	30316	29951	13029	0	48212.3129				82CW0236	1		0	
44	3379	VISITANER RES 94	3		47 LITTLE COTTONWOOD CK	41	NE	SW	26	9 N	90 W	S	9	1 A	S	30316	29951	20318	0	48212.38579				82CW0237	1		0	
44	3380	VISITANER RES 95	3		47 LITTLE COTTONWOOD CK	41	NE	NW	26	9 N	90 W	S	9	1 A	S	30316	29951	21082	0	48212.39343				82CW0237	1		0	
44	3381	VISITANER RES 96	3		47 LITTLE COTTONWOOD CK	41	NE	SE	26	9 N	90 W	S	9	1 A	S	30316	29951	18791	0	48212.37051				82CW0237	1		0	

December 19, 2005		WD ID#		Water Right Name		Strut		Stream		WD Headset		PA 10:11		COMMENT		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#		WD ID#	
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Structure Name: JOHNSON & WYATT ENL D**Water District: 44 ID Number: 817**

Source LITTLE COTTONWOOD CK @ Mile 176 08
 Location: Q160 Q40 Q10 Section Twnshp Range PM
 NE NE 11 9 N 90 W S

Acres Irrigated 53
 CIU A

Distance from section lines From N/S line From E/W line
 UTM Coordinates (NAD 83) Northing (UTM y) 4515000 4 Easting (UTM x) 293594 1 GPS
 Latitude/Longitude (decimal degrees) 40 7601 -107 4453
 Measuring Device/Recorder 2 FT PARSHALL

Contact: JOHNSON, HARLEY Phone
 Address: 2180 WEST JORDAN UTAH 84084 Cell Phone
 E-mail

Water Rights Summary	Total Decreed Rate(s)	Abs	1 3100	Cond..	0 6100	AP/EX	0 0000
	Total Decreed Volume(s)	Abs.	0 0000	Cond	0 0000	AP/EX	0 0000

Water Rights – Transactions

Seq #	Case Number	Adjudication Date	Appropriation Date	Admin Number	O #	Priority Number	Decreed Amount	Adj. Type	Uses	Comments
1	CA0692	4/29/1937	7/12/1906	31325 20646 0		120A	1 25 C	S	1	
2	CA0692	4/29/1937	7/12/1906	31325 20646 0		120A	0 67 C	S,C	1	
3	79CW0113	4/29/1937	7/12/1906	31325 20646 0		120A	0 06 C	S,CA	1	

Diversion Summary in Acre-Feet - Total Water through Structure

IYR	FDU	LDU	DWC	Max Q	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Total
1942	06/01	06/25	25	2	0	0	0	0	0	0	0	96 6	0	0	0	0	96 6
1943	05/20	06/30	42	3	0	0	0	0	0	0	71 4	178	0	0	0	0	250
1947	07/20	08/20	32	0 5	0	0	0	0	0	0	0	0	11 9	19 8	0	0	31 7
1960	05/28	06/14	18	3	0	0	0	0	0	0	20 8	40 7	0	0	0	0	61 5
1975	06/12	07/16	35	2	0	0	0	0	0	0	0	75 4	63 5	0	0	0	139
1976	07/06	07/25	20	1	0	0	0	0	0	0	0	0	39 7	0	0	0	39 7
1978	06/17	07/17	31	1	0	0	0	0	0	0	0	27 8	33 7	0	0	0	61 5
1979	06/11	07/23	43	1	0	0	0	0	0	0	0	36 7	22 8	0	0	0	59 5
1980	06/14	07/24	41	2	0	0	0	0	0	0	0	67 4	95 2	0	0	0	163
1981	05/01	06/24	55	1	0	0	0	0	0	0	61 5	47 6	0	0	0	0	109
1982	05/26	06/21	27	1 3	0	0	0	0	0	0	15 5	54 2	0	0	0	0	69 6
1983	06/10	08/31	80	1	0	0	0	0	0	0	0	41 7	55 5	38 7	0	0	136
1984			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	06/01	06/18	18	1	0	0	0	0	0	0	0	35 7	0	0	0	0	35 7
1986	06/01	07/17	47	1	0	0	0	0	0	0	0	48 4	10 1	0	0	0	58 5
1987	06/01	06/15	15	1	0	0	0	0	0	0	0	29 8	0	0	0	0	29 8
1989	05/12	05/29	18	1	0	0	0	0	0	0	35 7	0	0	0	0	0	35 7
1990	05/01	05/16	16	1	0	0	0	0	0	0	31 7	0	0	0	0	0	31 7
1991	06/01	06/11	11	1	0	0	0	0	0	0	0	21 8	0	0	0	0	21 8
1992	05/25	06/11	18	1	0	0	0	0	0	0	13 9	21 8	0	0	0	0	35 7
1993	06/10	07/01	22	1 5	0	0	0	0	0	0	0	62 5	0 46	0	0	0	62 9
1994	04/30	06/05	37	1 5	0	0	0	0	0	2 98	92 2	14 9	0	0	0	0	110
1995	07/27	08/08	13	1	0	0	0	0	0	0	0	0	9 92	10 9	0	0	20 8
2000	06/03	06/12	10	1 32	0	0	0	0	0	0	0	26 2	0	0	0	0	26 2
Minimum				0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum				3	0	0	0	0	0	2 98	92 2	178	95 2	38 7	0	0	249
Average				1 2967	0	0	0	0	0	0 12	14 3	38 6	14 3	2 89	0	0	70 2

Diversion Comments

Structure Name: JOHNSON & WYATT ENL D**Water District: 44 ID Number: 817**

IYR	NUC Code	Acres Irrigated	Comments
1942		100	
1943		50	
1944		50	
1945		100	
1946		100	
1947		100	
1948	No information available		
1959			
1960		100	
1972	Water available, but not taken		
1973	Water available, but not taken		
1974	Structure not usable		
1975		80	
1976		80	
1977	No water available		
1978		80	
1979		80	
1980		80	
1981		80	
1982		80	
1983		80	
1985		80	
1987		80	
1988	Water available, but not taken	0	
1989		80	
1990		80	
1991		80	
1992		80	
1993		80	
1994		80	
1995		80	
1996	Water available, but not taken		
1997	Water available, but not taken		
1998	Water available, but not taken	0	
1999	Water available, but not taken	53	
2000		53	
2001	No water available	0	
2002	No water available	0	
2003	No water available	0	
2004	Water available, but not taken	0	

Structure Name: MCDONALD DITCH**Water District: 44 ID Number: 698**

Source LITTLE COTTONWOOD CK @ Mile 173.24
 Location Q160 Q40 Q10 Section Twnshp Range PM
 NE SW 9 9 N 90 W S

Across Irrigated 101
 CIU A

Distance from section lines From N/S line From E/W line
 UTM Coordinates (NAD 83) Northing (UTM y) 4514663.4 Easting (UTM x) 289739.1 GPS
 Latitude/Longitude (decimal degrees): 40.7561 -107.4908

Measuring Device/Recorder 2 FT METAL

Contact VISINTAINER, DEAN Phone
 Address CRAIG COLO Cell Phone
 E-mail

Water Rights Summary	Total Decreed Rate(s)	Abs	12.2000	Cond	0.0000	AP/EX	0.0000
	Total Decreed Volume(s)	Abs	0.0000	Cond	0.0000	AP/EX	0.0000

Water Rights -- Transactions

Seq #	Case Number	Adjudication Date	Appropriation Date	Admin Number	O #	Priority Number	Decreed Amount	Adj Type	Uses	Comments
1	CA0692	4/29/1937	5/10/1907	31325 20948	0	120B	1.25 C	S	1	
3	84CW0071	4/29/1937	5/10/1907	31325 20948	0	120B	0.25 C	S,AB	1	ABANDONED 25CFS 84CW71
4	CA1278	9/1/1960	8/26/1957	39319 00000	0	85	5.6 C	S,C	1	
2	CA1278	9/1/1960	8/26/1957	39319 00000	0	85	5.6 C	S	19	
5	CA1278	9/1/1960	8/26/1957	39319 00000	0	85	5.6 C	S,CA	1	

Diversion Summary in Acre-Feet - Total Water through Structure

IYR	FDU	LDU	DWC	Max Q	Nov	Dec	Jan	Feb	Mar.	Apr	May	June	July	Aug	Sept	Oct	Total
1942	05/19	06/25	38	19	0	0	0	0	0	0	49.0	91.6	0	0	0	0	141
1943	05/10	06/20	42	2	0	0	0	0	0	0	87.3	79.3	0	0	0	0	167
1946	05/01	06/15	46	2	0	0	0	0	0	0	89.3	29.8	0	0	0	0	119
1947	06/20	10/31	134	2	0	0	0	0	0	0	0	43.6	122	122	119	122	532
1960	05/28	06/14	18	15	0	0	0	0	0	0	10.9	27.8	0	0	0	0	38.7
1961	05/27	05/27	1	3.9	0	0	0	0	0	0	7.74	0	0	0	0	0	7.74
1962	05/15	06/14	31	4	0	0	0	0	0	0	126	90.8	0	0	0	0	218
1963	05/14	06/17	35	5.86	0	0	0	0	0	0	168	37.2	0	0	0	0	206
1964	06/15	07/08	24	4	0	0	0	0	0	0	0	126	56.5	0	0	0	183
1965	06/03	06/29	27	2.5	0	0	0	0	0	0	0	130	0	0	0	0	130
1966	05/06	06/11	37	2.1	0	0	0	0	0	0	82.9	10.9	0	0	0	0	93.8
1967	05/20	06/12	24	2.8	0	0	0	0	0	0	66.6	65.3	0	0	0	0	132
1968	06/01	08/01	62	2.1	0	0	0	0	0	0	0	107	44.6	0.99	0	0	154
1969	05/26	07/01	37	2.8	0	0	0	0	0	0	33.3	111	0.99	0	0	0	146
1970	05/28	07/09	43	2.9	0	0	0	0	0	0	23.0	172	47.0	0	0	0	243
1971	06/08	07/05	28	3.2	0	0	0	0	0	0	0	129	4.96	0	0	0	135
1972	05/25	06/21	28	3.2	0	0	0	0	0	0	44.4	89.7	0	0	0	0	134
1973	06/11	06/28	18	5	0	0	0	0	0	0	0	178	0	0	0	0	179
1974	04/25	06/30	67	3.53	0	0	0	0	0	42.0	217	197	0	0	0	0	457
1975	05/22	07/16	56	8.2	0	0	0	0	0	0	69.4	273	260	0	0	0	603
1976	06/02	07/25	54	3	0	0	0	0	0	0	0	172	65.5	0	0	0	238
1977	04/25	06/06	43	3.2	0	0	0	0	0	30.9	53.1	7.86	0	0	0	0	91.9
1978	06/12	08/10	60	2.32	0	0	0	0	0	0	0	82.2	33.5	4.96	0	0	121
1979	06/08	09/06	91	3.25	0	0	0	0	0	0	0	125	52.6	30.7	5.95	0	215
1980	06/04	07/08	35	1.5	0	0	0	0	0	0	0	80.3	21.8	0	0	0	102
1982	05/26	07/21	57	4	0	0	0	0	0	0	47.6	238	166	0	0	0	452
1983	06/15	07/28	44	4	0	0	0	0	0	0	0	126	70.4	0	0	0	197

Structure Name: MCDONALD DITCH

M A M J J A S D

Water District: 44

ID Number: 698

1984			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	06/10	06/19	10	3	0	0	0	0	0	0	0	59.5	0	0	0	0	59.5
1986	05/10	06/22	44	2	0	0	0	0	0	0	87.3	87.3	0	0	0	0	175
1987	05/02	06/10	40	3	0	0	0	0	0	0	154	21.8	0	0	0	0	177
1988	05/07	06/22	47	2.5	0	0	0	0	0	0	123	76.4	0	0	0	0	200
1989	04/14	05/26	43	2	0	0	0	0	0	67.4	103	0	0	0	0	0	171
1990	04/07	06/10	65	3	0	0	0	0	0	142	134	99.2	0	0	0	0	288
1991	04/30	06/17	49	3	0	0	0	0	0	59.5	152	26.8	0	0	0	0	185
1992	04/13	06/15	64	1.3	0	0	0	0	0	44.6	78.6	38.7	0	0	0	0	162
1993	05/05	06/28	55	5	0	0	0	0	0	0	267	69.4	0	0	0	0	337
1994	04/09	06/08	61	10	0	0	0	0	0	436	202	28.8	0	0	0	0	667
1995	04/10	05/19	25	12	0	0	0	0	0	261	222	0	0	0	0	0	484
1996	04/08	06/12	66	12	0	0	0	0	0	547	491	95.2	0	0	0	0	1135
1997	04/12	06/09	59	12	0	0	0	0	0	452	497	58.2	0	0	0	0	1008
1998	04/25	06/23	60	10.34	0	0	0	0	0	123	484	140	0	0	0	0	747
1999	04/23	06/11	36	10.34	0	0	0	0	0	164	229	109	0	0	0	0	503
2000	04/26	06/09	45	5.02	0	0	0	0	0	49.8	123	4.46	0	0	0	0	177
2001	04/20	06/07	49	2.9	0	0	0	0	0	63.3	137	6.94	0	0	0	0	207
2002	03/29	05/24	57	2.09	0	0	0	0	12.4	124	91.9	0	0	0	0	0	228
2003	04/27	06/18	53	2.65	0	0	0	0	0	21.0	156	52.4	0	0	0	0	230
2004	04/18	06/02	46	2.48	0	0	0	0	0	63.9	123	4.92	0	0	0	0	192
Minimum			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum			12	0	0	0	0	0	12.4	547	497	273	260	122	119	122	1134
Average			4.0288	0	0	0	0	0	0.26	55.0	105	77.5	19.7	3.33	2.60	2.56	266

Diversion Comments

IYR	NUC Code	Acres Irrigated	Comments
1942		100	
1943		70	
1944		70	
1945		70	
1946		100	
1947		100	
1948	No information available		
1959	No information available		
1960		125	
1963			
1964			
1966		80	
1967		80	
1968		80	
1970		80	
1971		80	
1972		80	
1973		80	
1974		80	
1975		80	
1976		107	
1977			
1978		107	
1979		107	
1980		107	
1981	Water available, but not taken		

Structure Name: MCDONALD DITCH**Water District: 44 ID Number: 698**

1982	100
1983	100
1985	108
1987	200
1988	200
1989	200
1990	200
1991	200
1992	200
1993	200
1994	200
1995	200
1996	101
1997	101
1998	101
1999	101
2000	101
2001	101
2002	101 shut this ditch off 5-24-02
2003	101
2004	101

Structure Name: FREEMAN RESERVOIR**Water District: 44 ID Number: 3738**

Source LITTLE COTTONWOOD CK @ Mile 177.41
Location Q160 Q40 Q10 Section Township Range PM
SW NW 6 9 N 89 W S

Acres Irrigated
CIU A

Distance from section lines From N/S line From E/W line
UTM Coordinates (NAD 83) Northing (UTM y) 4515362.4 Easting (UTM x) 295218.3 Spotted from PLSS quarters
Latitude/Longitude (decimal degrees) 40.7637 -107.4262

Measuring Device/Recorder

Contact COLO DOW Phone
Address Cell Phone
E-mail

Water Rights Summary	Total Decreed Rate(s)	Abs	0.0000	Cond	0.0000	AP/EX	0.0000
	Total Decreed Volume(s)	Abs	137.0900	Cond	0.0000	AP/EX	0.0000

Water Rights -- Transactions

Seq #	Case Number	Adjudication Date	Appropriation Date	Admin. Number	O #	Priority Number	Decreed Amount	Adj. Type	Uses	Comments
1	CA2259	5/30/1972	10/14/1963	41559	00000	0	48	137.09 A S	56	













Little Cottonwood Creek
7/26/05





Little Cottonwood Creek
Freeman Reservoir
7/26/05

