1303 STATE OF COLORADO
DEPARTMENT OF LAW

AGRICULTURAL ENGINEERING STUDY
SOUTHERN UTE & UTE MOUNTAIN
UTE INDIAN RESERVATIONS

McELMO WATERSHED

FINAL REPORT

DESIGN & COST ESTIMATE FOR
OFF-FARM IRRIGATION FACILITIES &
PIA DETERMINATION

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FINAL REPORT

McELMO WATERSHED

D.1 GENERAL

The purpose of this task report is to present the methodology for determining practicably irrigable acreage (PIA) for the McElmo Watershed in the Ute Mountain Ute Indian Reservation. The test for PIA requires that the revenues exceed the cost. The land under consideration when cropped and irrigated must return sufficient net positive income to pay for the costs of providing irrigation water to the farm headgate. In order to determine PIA it is necessary to conceptually design an irrigation transmission system to deliver water to the farm headgate for each arable parcel. The annualized cost of the off-farm irrigation water transmission system is compared to the net positive income (payment capacity) of the parcel.

Arable lands were identified by Stoneman and Landers. Potential crops, irrigation water requirements, on-farm irrigation systems cost, and other related agronomic information were prepared by Boyle and presented in Task A and B reports. Economic methodology and net agricultural returns were prepared by Western Research Corporation.

This preliminary PIA analysis compares the preliminary net agricultural return with the cost of water delivery from the primary water source to the parcel headgate. For this preliminary analysis, the highest net agricultural return for each climatic zone is used.

Off-farm irrigation transmission facilities were conceptually designed for those parcels with preliminary payment capacities greater than the off-farm water pumping costs. The pumping cost was re-evaluated, added to the facilities cost, and compared to the preliminary payment capacity.

To complete the PIA analysis, the cropping pattern and payment capacities were reviewed by the economist taking into account the practicality of the cropping pattern for the particular parcel and any agronomic costs that might be particular to the parcel. Several iterations of this process between the economist and the engineer were sometimes necessary in order to develop the most economical parcel and facilities layout. Those parcels that still exhibited positive residual payment capacity after these further analyses were then determined to be practicably irrigable.

D.2 SELECTION OF PARCELS FOR OFF-FARM DESIGN

Parcels to be considered for PIA analysis were identified in the Task B Report along with on-farm irrigation costs. The Task B report identified irrigation costs for handmove sprinkler, sideroll sprinkler, gravity (furrow or basin), center pivot, and center pivot with sprinkler in the corners. Computer tabulation compared on-farm irrigation costs to the crop payment capacity for an alfalfa/barley crop rotation.

The first step in making this task analysis was determination of the

presently irrigated lands on Ute Mountain Ute Indian lands. W. W. Wheeler & Associates, Inc., hydrology consultant, identified from aerial photographs and other information available to them the lands presently irrigated and provided to Boyle a marked print of the base map. The amount of irrigated acreage was then planimetered from the base map and tabulated.

For the remaining irrigable parcels, an analysis was made to determine the residual water payment capacity when only the off-farm static pumping lift costs where added to the on-farm costs identified in Task B. Based on the elevation of the nearest water supply and the elevation of the highest point in each parcel, the static lift to serve the parcel was calculated using the computer program developed for the Task B report. The power cost to lift the annual water requirement to each field was then calculated assuming a 75 percent pumping plant efficiency which is a conservatively high assumption; and a field delivery pressure of 60 psi for all but gravity irrigated fields.

It should be noted that the parcel water payment capacity residual analysis (Appendix D) was slightly modified from the analysis presented in the Task B draft report. Land leveling costs for gravity irrigated fields were not included in the Task B on-farm costs. The Task B report, however, estimated land leveling quantities in the range of one foot average cuts at a cost of $0.50 to $1.00 per cubic yard. As a conservatively low estimate, an average

6-inch cut at $0.50 per cubic yard for a total cost of $403 per acre was assumed for this Task D analysis. Amortizing this cost at 8-3/8 percent interest over 50 years gives a cost of $34.40, or in round numbers, $35 per acre. This cost was then included in the on-farm costs for gravity irrigation.

D.3 OFF-FARM IRRIGATION TRANSMISSION SYSTEM COST

D.3.1 General

The off-farm irrigation transmission facilities will generally consists of transmission pipelines, pumping stations, and diversion facilities. Roads for access to pump stations; rights-of-way; and the extension of electrical power services to pumping stations were not included in the cost analysis. Costs for those items included are based on experience with similar facilities. All costs are then amortized using a discount rate of 8-3/8 percent over a 50 year project life.

D.3.2 Pumping Stations

Pump station costs were estimated using an equation which considers flow and horsepower as variables. The equation is based on Boyle's experience with various size agricultural pump stations which include pump motor, pump structure, valves, surge control, and power panel. The equation is:

$$\text{Cost } (\$) = 2441(GPM)^{0.41} + 150(HP)^{1.05}$$

where GPM is the system flow rate in gallons per minute and HP is the gross horsepower.

D.3.3 Pipelines

The cost of pipelines is estimated based on experience in water transmission pipeline work. The least cost type of pipe material for the various diameters is reflected in the estimate. Pipeline costs have been compared with pipeline cost estimates from the United States Bureau of Reclamation (USBR) Dolores Project as well as the Animas-La Plata Definite Plan Report. Installed estimated pipeline costs are shown in Table D.1.

D.3.4 River Diversion Structures

River diversion structures were included for parcels over 30 acres. The diversion structure would be constructed across the river to form a pool of water with sufficient depth for the pump to draw from. A weir type diversion structure consists of a 4 foot high wall with a footing and riprap on each side for stability and protection from ice damage. The estimated cost of the structure is $210 per foot. The diversion structure was estimated to be 50 feet long for the McElmo Creek.

It may not be practical to build a massive diversion to serve a small parcel. A farmer farming a small parcel with low flow requirements would probably have a simple temporary diversion which could be nothing more than a berm graded across the river with a backhoe or dozer to form a shallow pool for his pump to take suction from if flows in the stream are low. If stream flows were too large to allow

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TABLE D.1
PIPELINE COSTS

Pipe Diamet. (inch)	Installed Cost - $/ft 1/					
	100 psi	150 psi	200 psi	250 psi	300 psi	350 psi
4	10.50	11.00	11.50	12.00	12.50	13.00
6	12.00	12.50	13.00	14.00	14.50	15.00
8	15.50	16.00	17.00	17.50	18.50	20.00
10	20.00	21.00	22.50	23.50	25.00	26.50
12	24.00	26.50	28.50	31.00	33.00	35.00
14	28.50	32.00	35.00	38.00	41.00	44.00
15	31.00	34.50	38.50	42.50	45.50	49.00
16	34.00	37.50	42.00	46.00	50.00	54.00
18	41.00	45.00	50.00	54.00	59.50	65.00
20	48.50	53.00	58.00	63.50	69.00	75.00
21	50.50	55.50	60.50	66.00	71.50	77.00
24	62.00	69.00	75.50	82.00	88.50	95.50
27	75.50	82.00	88.50	96.50	104.00	112.00
30	89.50	96.50	103.00	111.00	120.00	128.50
33	104.50	111.00	116.50	126.50	137.50	148.50
36	115.50	122.00	130.50	142.00	155.00	166.00

1/ Unit construction cost including 10% allowance for appurtenances.

installation of a temporary diversion, a low flow could most likely be pumped without a diversion.

The berm may require regrading several times during the irrigation season. However, the overall cost of such diversions is minimal. The decision on the type and size of diversion will vary with each parcel and would require extensive review in the field. Therefore, in order to simplify the analysis it is assumed that no special diversion structure will be required for parcels of 30 acres or less.

In cases where several parcels can be served from one diversion and the combined acreage is over 30 acres, the cost of the diversion is divided between the parcels in proportion to parcel acreage. This approach is believed to be conservative (in favor of generating PIA) and realistic for this type of analysis.

D.3.5 Other Costs

Annual maintenance of major facilities including pipelines, pump stations, and river diversions is estimated at 0.5 percent of the initial construction cost.

The cost of electrical energy is assumed to be $0.068605/KWhr for the Southern Ute area and $0.065039/KWhr for the Mountain Ute area. These are commercial user rates being charged during the first half of 1985. A detailed discussion of the power costs was previously provided.

D.3.6 Other Costs not Included

Other known costs which could be considered are costs for access roads to the pump stations, right-of-way costs where pipelines or pump stations may be on non-Indian land, and costs to provide electric power service to the pump station. These costs are either minor and/or difficult to estimate with available information. Therefore, for these preliminary analyses, they have not been considered at this time.

The cost of power line extensions to serve pumping facilities could be quite high, especially if three phase power is required. Three phase power will be required for pump stations over 25 horsepower.

D.4 PRELIMINARY PRACTICABLE IRRIGABLE ACREAGE

D.4.1 Existing Irrigated Lands

Lands currently irrigated are assumed to be PIA requiring no further evaluation. No currently irrigated acreage was found in the McElmo Watershed.

D.4.2 Water Supply

An examination of the hydrology data for the McElmo Creek shows that there is insufficient virgin flow during the summer irrigation periods to serve the potential arable lands directly from the river. However, no PIA acreage was discovered in the McElmo Watershed. Therefore, it was not necessary to perform any operational studies

involving storage reservoirs.

D.4.3 Cropping Pattern

For the preliminary analysis of PIA, a cropping pattern with the highest net agricultural returns was used. Table D.2 identifies this cropping pattern as well as the net agricultural return. Lands in the McElmo Watershed were located within climatic Zones D and E.

D.4.4 Preliminary PIA Analysis

A preliminary PIA analysis was performed comparing a parcel's payment capacity with a preliminary estimate of the cost to pump water from the river to the parcel. This preliminary water cost was based on the static pumping lift (the difference in elevation from the water surface in the river to the elevation of the parcel) for gravity irrigated fields or plus a field delivery pressure of 60 psi for sprinkler irrigation. Detailed tabulations of the analysis are shown in Appendix D.1. Table D.3 identifies only those parcels with a positive residual payment capacity requiring further consideration. A total of 13 parcels covering 495 acres showed an initial positive residual payment capacity.

An off-farm irrigation transmission system was designed for those parcels showing an initial positive residual payment capacity. Those calculations are shown in Appendix D.2 and summarized in Table D.4. Parcels with an initial positive payment capacity after comparing the residual payment capacity to the cost of water were

TABLE D.2
PRELIMINARY CROPPING PATTERN

Climatic Zone	Elevation Range, ft.	Crop Mix 1/	Maximum Net Agricultural Return 2/ $/ac/yr
A	<5,000	Corn, Soybeans	375
B	5,000-5,400	Corn, Soybeans	330
C	5,400-5,800	Corn, Soybeans	285
D	5,800-6,200	Alfalfa, Malt Barley	270
E	6,200-6,600	Alfalfa, Malt Barley	240
F	6,600-7,000	Alfalfa, Malt Barley	210
G	7,000-7,400	Alfalfa, Malt Barley	185
H	7,400-7,800	Alfalfa, Malt Barley	160
I	7,800-8,200	Grass Hay, Pasture	85
J	>8,200	Grass Hay, Pasture	70

1/ Cropping mix and maximum net agricultural return provided by Western Research Corporation, April 11, 1986.

2/ Maximum net agricultural returns do not include on-farm irrigation costs.

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TABLE D.3
PARCELS WITH PRELIMINARY RESIDUAL PAYMENT CAPACITY
(Considering pumping only)

Parcel No.	Gross Acres	Prelim. Residual Payment Capacity ($/ac/yr) Hndmve.1/	Sdroll.2/	Grav.3/	Cntrpvt.4/	Cpvt/Hmv.5/
Mc001	13	7	-55	-30		
Mc002	73	44	29	-12	-61	-53
Mc003	6	12	-135	-13		
Mc004	13	3	-60	-36		
Mc005	16	10	-39	-28		
Mc006	31	30	2	-15		
Mc007	44	81	65	31	-64	-56
Mc008	7	17	-112	-9		
Mc009	48	55	39	3	-83	-75
Mc010	12	21	-46	-16		
Mc011	46	26	11	-27	-112	-105
Mc014	66	21	6	-36	-92	-84
Mc015	120	68	58	14	22	25

1/ Hndmve - Handmove sprinkler, on-farm irrigation system.

2/ Sdroll - Sideroll sprinkler, on-farm irrigation system.

3/ Grav - Gravity on-farm irrigation systems.

4/ Cntrpvt - Center pivot sprinkler, on-farm irrigation system.

5/ Cpvt/hmv - Center pivot sprinkler, on-farm irrigation system with hand move in the corners.

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TABLE D.4
SUMMARY OF OFF-FARM IRRIGATION WATER COST

Parcel No.	Gross Acres	Net Acres 1/	Pay.Cap. $/ac/yr 2/	Water Cost $/ac/yr	Residual Pay.Cap. $/ac/yr
Mc001	13	13	170	664	-494
Mc002	73	72.2	197	401	-204
Mc003	6	6	131	1,181	-1,050
Mc004	13	13	171	676	-505
Mc005	16	16	179	689	-510
Mc006	31	31	193	480	-287
Mc007	44	43.5	197	509	-312
Mc008	7	7	138	632	-494
Mc009	48	47.5	197	462	-265
Mc010	12	12	168	611	-443
Mc011	46	45.5	197	597	-400
Mc014	66	65.3	197	595	-398
Mc015	120	118.8	195	464	-269

1/ Parcel net acres for irrigation system resulting in the highest payment capacity. See Appendix D.1.

2/ Highest preliminary payment capacity from Appendix D.1.

initially identified as practicably irrigable.

Instead of designing individual lines of supply to each of these parcels, a single pipeline from McElmo Creek was sized to serve all parcels. The per acre cost of this single transmission line was compared to the residual preliminary payment capacity of each parcel. The analysis for these parcels showed that no parcels had a remaining positive payment capacity.

D.4.5 Practicably Irrigable Acreage Determination

No lands were identified as PIA in the McElmo Watershed.

APPENDIX D.1

PRELIMINARY PIA ANALYSIS

APPENDIX D.1
LEGEND

Parcel I.D.: M04-Mc-01, "M04" = Ute Mountain Ute Sheet 4; "Mc" = McElmo Watershed; "01" = parcel number.

Field Size: Gross size of parcel in acres.

Reduction Factor: Acreage reduction factor discussed in Task A Report.

Net Acreage: The product of field size times reduction factor.

Elevation High and Low: The maximum and minimum elevation within the parcel.

Climatic Zone: Discussed in Task A Report and determined by the parcel's elevation.

Irrigation System Type: Type of on-farm irrigation system.

- HNDMVE - Handmove sprinkler
- SDROLL - Side roll sprinkler
- GRAV - Gravity
- CNTRPVT- Center pivot sprinkler
- CPVT/HMV- Center pivot with handmove

Net Feet: The unit net average irrigation water requirement for the parcel in acre-feet per acre.

Irrigation Efficiency: Irrigation efficiency discussed in Task A Report.

Applied: The unit gross on-farm average irrigation water requirement in acre-feet per acre.

Preliminary Net Ag Return: The preliminary net agricultural return not including the on-farm irrigation system or off-farm irrigation water transmission/distribution system.

Capital: The amortized capital cost per acre per year for the on-farm irrigation system (at 8 3/8% for 50 years) from Task B Report.

Maintenance: The per acre per year maintenance cost of the on-farm irrigation system from the Task B Report.

Labor: The per acre per year labor cost for operation of the on-farm irrigation system from the Task B Report.

Pumping: The per acre per year cost of providing additional on-farm pumping to meet the higher pressure requirements of the center pivot irrigation system.

Preliminary Payment Capacity: The preliminary net ag. returns minus the on-farm irrigation capital, maintenance, labor, and pumping cost in dollars per acre.

Water Source Elevation: The water source diversion point nominal elevation.

Static Lift: The difference in elevation of the parcel's high elevation and and water source elevation in feet.

Annual Power Cost/Acre: The cost of electrical energy per acre per year to serve the parcel considering only the static lift in the case of gravity irrigation or the static lift plus 139 ft. (60 psi) for all types of sprinkler irrigation.

Residual Preliminary Payment Capacity: The result of the preliminary payment capacity minus the annual power cost for pumping at the water supply source in dollars per acre.

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PRELIMINARY PIA ANALYSIS
McElan Watershed

PARCEL I.D.	ACREAGE: FIELD SIZE (ACRES)	ACREAGE: REDUCTION FACTOR	ACREAGE: NET ACREAGE	ELEVATION: HIGH	ELEVATION: LOW	CLIMATIC ZONE	WATER REQUIREMENTS PER ACRE: IRRIG. SYSTEM TYPE	NET FEET	IRRIG. EFF.	APPLIED	PRELIMINARY ANNUAL PAYMENT CAPACITY PER ACRE: PRELIMINARY NET AG. RETURN	ON-FARM IRRIG. COSTS: CAPITAL	MAINT.	LABOR	PUMPING	PRELIM. PAYMENT CAPACITY	PRELIM. OFF-FARM WATER COST: WATER SOURCE ELEV.	STATIC LIFT	ANNUAL POWER COST/ACRE	RESIDUAL PRELIM. PAYMENT CAPACITY
M04-Mc-001	13	1	13	6160	6120	D	HNDMVE	1.94	.7	2.77	$ 270	$ 55	$ 8	$ 34	$ 0	$ 170	5670	490	$ 163	$ 7
M04-Mc-001	13	1	13	6160	6120	D	SDROLL	1.94	.7	2.77	$ 270	$ 104	$ 33	$ 24	$ 0	$ 107	5670	490	$ 163	$-55
M04-Mc-001	13	1	13	6160	6120	D	GRAV	1.94	.65	2.98	$ 270	$ 120	$ 8	$ 34	$ 0	$ 106	5670	490	$ 136	$-30
M04-Mc-002	73	.99	72.2	6120	6030	D	HNDMVE	1.94	.7	2.77	$ 270	$ 34	$ 4	$ 33	$ 0	$ 197	5670	450	$ 152	$ 44
M04-Mc-002	73	.99	72.2	6120	6030	D	SDROLL	1.94	.7	2.77	$ 270	$ 55	$ 16	$ 16	$ 0	$ 182	5670	450	$ 152	$ 29
M04-Mc-002	73	.99	72.2	6120	6030	D	GRAV	1.94	.65	2.98	$ 270	$ 115	$ 6	$ 33	$ 0	$ 113	5670	450	$ 125	$-12
M04-Mc-002	73	.83	60.8	6120	6030	D	CNTRPVT	1.94	.75	2.58	$ 270	$ 111	$ 44	$ 6	$ 25	$ 81	5670	450	$ 142	$-41
M04-Mc-002	73	.98	71.7	6120	6030	D	CPVT/HNV	1.94	.74	2.61	$ 270	$ 103	$ 39	$ 10	$ 25	$ 90	5670	450	$ 144	$-53
M04-Mc-003	6	1	6	5990	5960	D	HNDMVE	1.94	.7	2.77	$ 270	$ 86	$ 14	$ 37	$ 0	$ 131	5670	320	$ 119	$ 12
M04-Mc-003	6	1	6	5990	5960	D	SDROLL	1.94	.7	2.77	$ 270	$ 190	$ 67	$ 28	$ 0	$-16	5670	320	$ 119	$-135
M04-Mc-003	6	1	6	5990	5960	D	GRAV	1.94	.65	2.98	$ 270	$ 150	$ 13	$ 30	$ 0	$ 75	5670	320	$ 89	$-13
M04-Mc-004	13	1	13	6180	6120	D	HNDMVE	1.94	.7	2.77	$ 270	$ 55	$ 8	$ 34	$ 0	$ 171	5670	510	$ 168	$ 9
M04-Mc-004	13	1	13	6180	6120	D	SDROLL	1.94	.7	2.77	$ 270	$ 104	$ 33	$ 24	$ 0	$ 107	5670	510	$ 168	$-60
M04-Mc-004	13	1	13	6180	6120	D	GRAV	1.94	.65	2.98	$ 270	$ 120	$ 8	$ 34	$ 0	$ 106	5670	510	$ 142	$-36
M04-Mc-005	16	1	16	6180	6120	D	HNDMVE	1.94	.7	2.77	$ 270	$ 49	$ 6	$ 34	$ 0	$ 179	5670	510	$ 168	$ 10
M04-Mc-005	16	1	16	6180	6120	D	SDROLL	1.94	.7	2.77	$ 270	$ 89	$ 27	$ 24	$ 0	$ 128	5670	510	$ 168	$-39
M04-Mc-005	16	1	16	6180	6120	D	GRAV	1.94	.65	2.98	$ 270	$ 113	$ 7	$ 34	$ 0	$ 114	5670	510	$ 142	$-28

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PRELIMINARY PIA ANALYSIS
McElmo Watershed

PARCEL I.D.	ACREAGE: FIELD SIZE (ACRES)	ACREAGE: REDUCTION FACTOR	ACREAGE: NET ACREAGE	ELEVATION: HIGH	ELEVATION: LOW	CLIMATIC ZONE	WATER REQUIREMENTS PER ACRE: IRRIG. SYSTEM TYPE	WATER REQUIREMENTS PER ACRE: NET FEET	WATER REQUIREMENTS PER ACRE: IRRIG. EFF.	WATER REQUIREMENTS PER ACRE: APPLIED	PRELIMINARY ANNUAL PAYMENT CAPACITY PER ACRE: PRELIMINARY NET AG. RETURN	ON-FARM IRRIG. COSTS: CAPITAL	ON-FARM IRRIG. COSTS: MAINT.	ON-FARM IRRIG. COSTS: LABOR	ON-FARM IRRIG. COSTS: PUMPING	PRELIM. PAYMENT CAPACITY	PRELIM. OFF-FARM WATER COST: WATER SOURCE ELEV.	PRELIM. OFF-FARM WATER COST: STATIC LIFT	PRELIM. OFF-FARM WATER COST: ANNUAL POWER COST/ACRE	RESIDUAL PRELIM. PAYMENT CAPACITY
M04-Mc-006	31	1	31	6160	6060	D	HNDMVE	1.94	.7	2.77	$ 270	$ 36	$ 4	$ 34	$ 0	$ 193	5670	490	$ 163	$ 30
M04-Mc-006	31	1	31	6160	6060	D	SDROLL	1.94	.7	2.77	$ 270	$ 61	$ 17	$ 24	$ 0	$ 165	5670	490	$ 163	$ 2
M04-Mc-006	31	1	31	6160	6060	D	GRAV	1.94	.65	2.98	$ 270	$ 108	$ 5	$ 34	$ 0	$ 121	5670	490	$ 136	$-15
M04-Mc-007	44	.99	43.5	5980	5950	D	HNDMVE	1.94	.7	2.77	$ 270	$ 33	$ 4	$ 33	$ 0	$ 197	5670	810	$ 114	$ 81
M04-Mc-007	44	.99	43.5	5980	5950	D	SDROLL	1.94	.7	2.77	$ 270	$ 55	$ 16	$ 16	$ 0	$ 182	5670	810	$ 114	$ 65
M04-Mc-007	44	.99	43.5	5980	5950	D	GRAV	1.94	.65	2.98	$ 270	$ 111	$ 6	$ 33	$ 0	$ 118	5670	310	$ 84	$ 31
M04-Mc-007	44	.83	36.6	5980	5950	D	CNTRPVT	1.94	.75	2.58	$ 270	$ 133	$ 54	$ 8	$ 29	$ 44	5670	310	$ 108	$-64
M04-Mc-007	44	.98	43.2	5980	5950	D	CPVT/HMV	1.94	.74	2.61	$ 270	$ 125	$ 47	$ 13	$ 29	$ 53	5670	310	$ 109	$-56
M04-Mc-008	7	1	7	6000	5970	D	HNDMVE	1.94	.7	2.77	$ 270	$ 90	$ 12	$ 37	$ 0	$ 138	5670	330	$ 121	$ 17
M04-Mc-008	7	1	7	6000	5970	D	SDROLL	1.94	.7	2.77	$ 270	$ 172	$ 60	$ 28	$ 0	$ 8	5670	330	$ 121	$-112
M04-Mc-008	7	1	7	6000	5970	D	GRAV	1.94	.65	2.98	$ 270	$ 144	$ 12	$ 30	$ 0	$ 82	5670	330	$ 92	$-9
M04-Mc-009	48	.99	47.5	6080	6000	D	HNDMVE	1.94	.7	2.77	$ 270	$ 34	$ 4	$ 33	$ 0	$ 197	5670	410	$ 142	$ 55
M04-Mc-009	48	.99	47.5	6080	6000	D	SDROLL	1.94	.7	2.77	$ 270	$ 55	$ 16	$ 16	$ 0	$ 182	5670	410	$ 142	$ 39
M04-Mc-009	48	.99	47.5	6080	6000	D	GRAV	1.94	.65	2.98	$ 270	$ 111	$ 6	$ 33	$ 0	$ 117	5670	410	$ 114	$ 3
M04-Mc-009	48	.83	39.9	6080	6000	D	CNTRPVT	1.94	.75	2.58	$ 270	$ 138	$ 52	$ 8	$ 29	$ 49	5670	410	$ 132	$-83
M04-Mc-009	48	.98	47.1	6080	6000	D	CPVT/HMV	1.94	.74	2.61	$ 270	$ 122	$ 46	$ 12	$ 29	$ 58	5670	410	$ 134	$-73
M04-Mc-010	12	1	12	6100	6080	D	HNDMVE	1.94	.7	2.77	$ 270	$ 57	$ 8	$ 34	$ 0	$ 168	5670	430	$ 147	$ 21
M04-Mc-010	12	1	12	6100	6080	D	SDROLL	1.94	.7	2.77	$ 270	$ 109	$ 35	$ 24	$ 0	$ 100	5670	430	$ 147	$-46
M04-Mc-010	12	1	12	6100	6080	D	GRAV	1.94	.65	2.98	$ 270	$ 123	$ 8	$ 34	$ 0	$ 103	5670	430	$ 120	$-14

COLORADO UTE AGRICULTURAL ENGINEERING STUDY
PRELIMINARY PIA ANALYSIS
McElmo Watershed

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PARCEL I.D.	ACREAGE: FIELD SIZE (ACRES)	ACREAGE: REDUCTION FACTOR	ACREAGE: NET ACREAGE	ELEVATION: HIGH	ELEVATION: LOW	CLIMATIC ZONE	WATER REQUIREMENTS PER ACRE: IRRIG. SYSTEM TYPE	WATER REQUIREMENTS PER ACRE: NET FEET	WATER REQUIREMENTS PER ACRE: IRRIG. EFF.	WATER REQUIREMENTS PER ACRE: APPLIED	PRELIMINARY ANNUAL PAYMENT CAPACITY PER ACRE: PRELIMINARY NET AG. RETURN	ON-FARM IRRIG. COSTS: CAPITAL	ON-FARM IRRIG. COSTS: MAINT.	ON-FARM IRRIG. COSTS: LABOR	ON-FARM IRRIG. COSTS: PUMPING	PRELIM. PAYMENT CAPACITY	PRELIM. OFF-FARM WATER COST: WATER SOURCE ELEV.	PRELIM. OFF-FARM WATER COST: STATIC LIFT	PRELIM. OFF-FARM WATER COST: ANNUAL POWER COST/ACRE	RESIDUAL PRELIM. PAYMENT CAPACITY
M04-Mc-011	46	.99	45.5	6190	6080	D	HNDMVE	1.94	.7	2.77	$ 270	$ 33	$ 4	$ 33	$ 0	$ 197	5670	520	$ 170	$ 26
M04-Mc-011	46	.99	45.5	6190	6080	D	SDROLL	1.94	.7	2.77	$ 270	$ 55	$ 16	$ 16	$ 0	$ 182	5670	520	$ 170	$ 11
M04-Mc-011	46	.99	45.5	6190	6080	D	GRAV	1.94	.65	2.98	$ 270	$ 111	$ 6	$ 33	$ 0	$ 118	5670	520	$ 145	$-27
M04-Mc-011	46	.83	38.9	6190	6080	D	CNTRPVT	1.94	.75	2.58	$ 270	$ 131	$ 53	$ 8	$ 29	$ 46	5670	520	$ 159	$-112
M04-Mc-011	46	.98	45.2	6190	6080	D	CPVT/HMV	1.94	.74	2.61	$ 270	$ 124	$ 47	$ 12	$ 29	$ 56	5670	520	$ 161	$-105
M04-Mc-012	6	1	6	6230	6200	E	HNDMVE	1.76	.7	2.51	$ 240	$ 86	$ 14	$ 34	$ 0	$ 105	5670	560	$ 164	$-59
M04-Mc-012	6	1	6	6230	6200	E	SDROLL	1.76	.7	2.51	$ 240	$ 190	$ 47	$ 25	$ 0	$-43	5670	560	$ 164	$-287
M04-Mc-012	6	1	6	6230	6200	E	GRAV	1.76	.65	2.7	$ 240	$ 150	$ 13	$ 27	$ 0	$ 48	5670	560	$ 141	$-93
M04-Mc-013	12	1	12	6300	6240	E	HNDMVE	1.76	.7	2.51	$ 240	$ 57	$ 8	$ 31	$ 0	$ 141	5670	630	$ 180	$-38
M04-Mc-013	12	1	12	6300	6240	E	SDROLL	1.76	.7	2.51	$ 240	$ 109	$ 35	$ 22	$ 0	$ 73	5670	630	$ 180	$-107
M04-Mc-013	12	1	12	6300	6240	E	GRAV	1.76	.65	2.7	$ 240	$ 123	$ 8	$ 31	$ 0	$ 76	5670	630	$ 159	$-82
M04-Mc-014	66	.99	65.3	6210	6040	D	HNDMVE	1.94	.7	2.77	$ 270	$ 34	$ 4	$ 33	$ 0	$ 197	5670	540	$ 176	$ 21
M04-Mc-014	66	.99	65.3	6210	6040	D	SDROLL	1.94	.7	2.77	$ 270	$ 55	$ 16	$ 16	$ 0	$ 182	5670	540	$ 176	$ 6
M04-Mc-014	66	.99	65.3	6210	6040	D	GRAV	1.94	.65	2.98	$ 270	$ 114	$ 6	$ 33	$ 0	$ 114	5670	540	$ 150	$-36
M04-Mc-014	66	.83	54.9	6210	6040	D	CNTRPVT	1.94	.75	2.58	$ 270	$ 117	$ 46	$ 7	$ 26	$ 72	5670	540	$ 164	$-92
M04-Mc-014	66	.98	64.8	6210	6040	D	CPVT/HMV	1.94	.74	2.61	$ 270	$ 168	$ 41	$ 11	$ 26	$ 81	5670	540	$ 166	$-84
M04-Mc-015	120	.99	118.8	6020	5920	D	HNDMVE	1.94	.7	2.77	$ 270	$ 37	$ 4	$ 33	$ 0	$ 195	5670	350	$ 126	$ 68
M04-Mc-015	120	.99	118.8	6020	5920	D	SDROLL	1.94	.7	2.77	$ 270	$ 52	$ 16	$ 16	$ 0	$ 184	5670	350	$ 126	$ 58
M04-Mc-015	120	.99	118.8	6020	5920	D	GRAV	1.94	.65	2.98	$ 270	$ 117	$ 6	$ 33	$ 0	$ 111	5670	350	$ 97	$ 14
M04-Mc-015	120	.83	99.9	6020	5920	D	CNTRPVT	1.94	.75	2.58	$ 270	$ 76	$ 29	$ 8	$ 18	$ 141	5670	350	$ 118	$ 22
M04-Mc-015	120	.98	117.9	6020	5920	D	CPVT/HMV	1.94	.74	2.61	$ 270	$ 71	$ 25	$ 8	$ 18	$ 145	5670	350	$ 119	$ 25