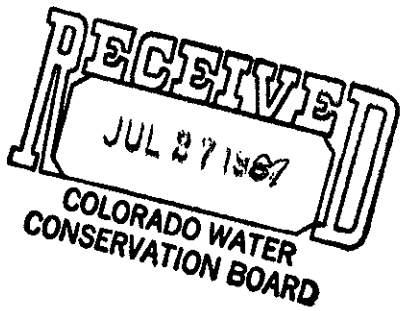
ECONOMIC ANALYSIS OF POTENTIALLY IRRIGABLE PARCELS IN THE ANIMAS AND FLORIDA WATERSHEDS

WESTERN RESEARCH CORPORATION
512 UNIVERSITY
LARAMIE, WYOMING 82070
(307) 742-8295



ECONOMIC ANALYSIS OF POTENTIALLY IRRIGABLE PARCELS IN THE ANIMAS AND FLORIDA WATERSHEDS

LEVEL B ANALYSIS
FINAL REPORT

Prepared for

State of Colorado
Department of Law

Prepared by

Western Research Corporation
512 University Avenue
Laramie, WY 82070

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1.0 Introduction

This report describes the Level B economic analysis of arable parcels in the Animas and Florida Watersheds that were preliminarily classified as practicably irrigable acreage (PIA) by Boyle Engineering. The purpose of the Level B economic analysis was to make any necessary adjustments in the Level A economic analysis to reflect the unique characteristics of individual parcels. The Level A economic analysis is described in a separate report entitled "Economic Analysis of Potentially Irrigable Acreage on the Southern Ute and Ute Mountain Ute Indian Reservations", Western Research Corporation, June, 1987. That report presents the results of crop budget analyses for 10 different climatic zones on the two reservations.

The Level B economic analysis includes three factors that were not considered in the Level A crop budget analyses. First, land classes (soil types) that may affect crop suitability were considered and changes in cropping patterns were made where indicated. Second, the Level B economic analysis incorporates land preparation charges for tree, brush and grass removal that will be necessary prior to irrigated agricultural use. Finally, the Level B economic analysis incorporates economies of scale and farm efficiency factors as they apply to on-farm costs and returns for individual parcels or groups of parcels. The methods used in making these adjustments are described below.

2.0 Soil Suitability

The Level A economic analysis considered several alternative

cropping patterns for each climatic zone, and derived an estimated repayment capacity based upon that cropping pattern that maximized on-farm returns. No distinctions were made between various land classes in developing the Level A repayment capacities. Instead, the favorable assumption was made that all parcels were capable of producing crops and yields associated with Class 1 soils.

In some cases, however, individual parcels are unsuitable for the cropping patterns associated with Class 1 soils. Thus, the first step in the Level B economic analysis was to substitute an appropriate cropping pattern, if necessary, based upon the land classification of the parcel under consideration. The crop suitability assessments were based upon the results of the agronomic study conducted by Boyle Engineering. Once an appropriate cropping pattern was substituted, on-farm returns were recalculated using the new cropping pattern, and appropriate adjustments were made to the repayment capacity estimate for the parcel.

3.0 Land Clearing and Preparation

The Level A economic analysis included the costs of seedbed tillage operations necessary to establish irrigated crops on untilled soil. The Level A analysis did not, however, include the costs of canopy and brush removal prior to seedbed preparation. These costs were omitted from the Level A analysis because they can vary from parcel to parcel depending upon the extent of canopy cover. To estimate canopy and brush removal costs, parcels were classified into one of three categories based upon the land classification analysis performed by Stoneman-Landers, Inc. These categories are:

- Category I - Land classifications identified by Stoneman-Landers, Inc. as having less than 10 percent tree cover. Parcels in this category were assumed to require no canopy removal, although removal of a medium growth of grasses and brush was assumed.
- Category II - Land classifications identified by Stoneman-Landers, Inc. as having 10 to 40 percent tree cover. Parcels in this category were assumed to require canopy removal on 25 percent of the parcel's acreage, along with grass and brush removal.
- Category III - Lands identified by Stoneman-Landers, Inc. as having more than 40 percent tree cover. Parcels in this category were assumed to require canopy removal on 70 percent of the parcel's acreage, along with grass and brush removal.

Estimates of the per acre costs of canopy, brush and grass removal were based upon data obtained from the U.S. Soil and Conservation Service, Durango, Colorado; Rick Gruen, CSU Ag Extension Agent; and other sources. The methods employed in estimating these costs are given in a memorandum by John Raines, Western Research Corporation, dated July 21, 1986. A copy of that memorandum is attached as Appendix A to this report.

The results of the canopy, grass and brush removal cost analysis are given in Table 3-1.

Table 3-1
Estimated Canopy and Brush Removal Costs
by Land Category

Land Category	Current Cost/Acre (1985 Dollars)	Annualized Cost/Acre
I	$35.00	$3.00
II	57.00	4.85
III	95.00	8.10

The second column of Table 3-1 is the estimated current cost per acre for each clearing operation. The third column gives annualized cost estimates over 50 years with an 8 3/8 percent discount rate. The latter figures were used in adjusting preliminary repayment capacities since they are also annualized.

It should be noted that the costs given in Table 3-1 do not include costs for unskilled labor. This adjustment was made because land clearing and preparation costs were assumed to be a construction activity. The U.S. Water Resources Council (WRC) Principles and Guidelines (1983) allow for the use of a zero opportunity cost for unskilled labor in construction activities on water projects if the project area is one of high unemployment. For purposes of this analysis, it was assumed that the high unemployment assumption holds.

It should be noted that land leveling costs are not explicitly addressed in either the Level A or Level B economic analyses. The costs necessary to adapt an appropriate irrigation technology to the

contours of the parcel were incorporated in the agricultural engineering analysis conducted by Boyle Engineering.

4.0 Farm Efficiency Adjustments

The Level A analysis crop budgets assume farm efficiencies equal to that of a contiguous 1016 acre operation. That is, it was assumed that at least 1016 acres could be farmed using one equipment complement stored in a central equipment warehouse without excessive transportation costs. In the Level B economic analysis, two types of farm efficiency adjustments were made for certain parcels. The first adjustment was for economies of scale where there were fewer than 600 acres of current or newly irrigated new acreage that could be farmed as one unit. The 600 acre cutoff figure was used because economies of scale decline rather steeply below this point.

A second type of adjustment for some parcels involved transportation costs for on-farm equipment. These adjustments were made in cases where isolated parcels could not be easily served out of a central equipment warehouse. In cases where individual parcels were more than five miles from the assumed location of a central equipment warehouse, an additional transportation charge was incorporated for transporting equipment to and from a central location. The effects of these adjustments on the parcels identified as preliminary PIA in the Animas and Florida Watersheds are given in the following sections.

5.0 Results of Level B Analysis for Animas and Florida Watersheds

Boyle Engineering's Task D and E Report for the Animas and

Florida Watersheds, dated May, 1986, identifies six parcels as having preliminary repayment capacities high enough to justify water delivery charges. All of these parcels are currently unirrigated, but show the potential for having the benefits of irrigation exceed the costs of converting them to irrigated agricultural use.

Five of these parcels are in the Animas Watershed, and constitute a total of approximately 374 acres. In addition, Boyle Engineering identified an additional 313 acres of currently irrigated lands in the Animas Watershed, bringing the total potential PIA in that watershed to approximately 687 acres. (Table D.8, Animas and Florida Watersheds Task D and E Report, Draft No. 2, Boyle Engineering Corporation, May, 1986.) Only one 29 acre unirrigated parcel was classified as potential PIA in the Florida Watershed. However, Boyle Engineering also identified approximately 700 acres of currently irrigated lands in the Florida Watershed, bringing total potential PIA to 729 acres in that watershed. Thus, there is enough irrigated or potentially irrigable land in each watershed to achieve economies of scale similar to the 1016 acre operation assumed in the Level A analysis.

The potentially irrigable parcels in both watersheds are listed in Table 5-1, along with a description of the characteristics of each parcel. The first four columns of Table 5-1 give the parcel number, net irrigable acres, land class and climatic zone descriptions for each parcel. The fifth column of Table 5-1, entitled "Cropping Pattern Suitability", provides an indication of whether the cropping pattern that maximizes repayment capacity is suitable for the land class of the individual parcel under consideration. Column six of

TABLE 5-1

Level B Economic Analysis
Animas and Florida
Watersheds

PARCEL DESCRIPTION							ANNUAL RETURNS				
Parcel #	Net Acres	Land Class	Climatic Zone	Cropping Pattern Suitability	Tree Canopy	Distance from Warehouse	Preliminary Repayment Capacity	Land Clearing Adjustment	Cropping Pattern Adjustment	Farm Efficiency Adjustment	Residual Repayment
A18	32.0	2A	D	Suitable	< 10%	< 5 mi.	$ 10.00	- $3.00	$ 0.00	$ 0.00	$ 7.00
A36	108.9	4A	D	Not Suitable	< 10	< 5	41.00	- 3.00	- 115.00	0.00	- 77.00
A41	30.0	4NHAB	D,E	Suitable	< 10	< 5	5.00	- 3.00	0.00	0.00	2.00
A46	44.5	2A	E	Suitable	< 10	< 5	5.00	- 3.00	0.00	0.00	2.00
A49	158.7	4NU/3N	E	Suitable	< 10	< 5	48.00	- 3.00	0.00	0.00	45.00
F10	29.0	3K	E	Suitable	< 10	< 5	4.00	- 3.00	0.00	0.00	1.00

Source: Western Research Corporation, November 1986

Table 5-1 provides a description of the percentage amount of tree canopy on each parcel, and column seven provides a description of the parcel's distance from the theoretical central location of a farm equipment warehouse. The remaining columns in Table 5-1 describe any adjustments that were made to preliminary repayment capacity to reflect each parcel's characteristics.

Parcel A18, consisting of 32 net acres, was judged suitable for the alfalfa, malt barley cropping pattern that maximizes net returns for climatic zone D (Table D.3, Animas and Florida Watersheds Task D and E Report, Draft No. 2, Boyle Engineering Corporation, May, 1986.) Its tree canopy cover is less than 10 percent, and its location is within five miles of a theoretically placed central equipment warehouse. Therefore, the only repayment capacity adjustment made for parcel A18 was a three dollar minimum land clearing charge for brush and grass removal. That charge reduced the preliminary repayment capacity by three dollars, but the parcel is still classified as potential PIA.

Parcel A36, consisting of 109 net acres, was judged not suitable for alfalfa and barley production because of its 4A land classification. Based upon the results of the agronomic study, class 4A lands are suitable only for native hay production. As a result, the preliminary repayment capacity for Parcel A36 was reduced by one hundred fifteen dollars to reflect the lower on-farm returns that would result from native hay production. (The basis for that calculation is described in Appendix B to this report.) That reduction, combined with a three dollar annualized clearing cost,

resulted in a negative residual repayment capacity for Parcel A36. It should not be considered further as potential PIA.

Parcels A41, A46 and A49 were all judged suitable for the alfalfa, malt barley cropping rotation that maximizes repayment capacity. All are located within five miles of a central equipment warehouse location, and have less than 10 percent tree canopy. Thus, the only repayment capacity adjustments for these parcels was a minimum three dollar annualized land clearing adjustment. After this adjustment, all three of these parcels retained positive repayment capacities, and remain as potential PIA.

After eliminating Parcel A36 from consideration, the total of currently irrigated and potentially irrigated acreage in the Animas Watershed is approximately 578 acres. This figure is slightly below the assumed cutoff of 600 acres needed to achieve the economy of scale assumptions employed in the Level A economic analysis. Since the figure is so close to the cutoff, however, no further adjustments were made.

The economies of scale assumed in the Level A economic analysis should be achievable in the Florida Watershed, since there are approximately 700 acres of currently irrigated land in proximity of Parcel F10. This parcel is less than five miles from a theoretical central warehouse location, and contains less than 10 percent tree canopy. The three dollar clearing cost adjustment reduced the four dollar preliminary repayment capacity to one dollar. Nevertheless, this parcel still retains positive repayment capacity and should be considered potential PIA.

6.0 Summary of Level B Analysis for Animas and Florida Watersheds

The Level B economic analysis of potentially irrigable parcels in the Animas and Florida Watersheds resulted in the elimination of Parcel A36 from further consideration. Four other parcels in the Animas Watershed, totaling approximately 265 acres, show positive residual repayment capacity after the Level B analysis. Similarly, Parcel F10, constituting 29 acres in the Florida Watershed, also retains positive repayment capacity.

Prior to finalizing PIA recommendations for these parcels, an on-site inspection should be made to determine whether the assumptions made concerning their characteristics are accurate.

APPENDIX A

Estimation of Clearing and Grubbing Costs

MEMORANDUM

TO: Ute Economic Analysis File

FROM: John Raines, Western Research Corporation

DATE: July 21, 1986

RE: Clearing and Grubbing

1.0 Introduction

WRC's crop budgets include seed bed tillage operations specific to each crop being grown. However, they do not include any canopy and brush clearing costs required prior to preparation for crop production. Land leveling costs are assumed to be negligible or incorporated into the costs of developing the specific irrigation system to be used on the parcel and are not included in the clearing costs or crop budgets.

This memorandum describes the land cover class assumptions, analytical methodology, and clearing costs by land cover class. The clearing costs are annualized assuming 8.375 percent interest over a 50 year project life.

2.0 Methodology

A. Classes of Land Cover

Three land cover classes are described by the amount of juniper and pinion pine tree cover on the parcel:

- I - less than 10 percent tree cover
- II - 10 to 40 percent with an average of 25 percent tree cover
- III - more than 40 percent with an average of 70 percent tree cover

All uncanopied rangeland is assumed to be covered with light to medium growth of grasses and brush.

B. Costs of Brush and Tree Cover Removal

(1) Brush: according to Rick Gruen, CSU Ag Extension agent and Dan Linn, Soil Conservation Service, Durango, the common method for clearing grasses and brush in the area includes three operations; chemical spraying, root plowing and chopping. The per acre costs for these operations are as follows:

- chemical spraying
  - Aerial custom rate - $ 4.00/acre
  - 2 quarts 2,4-D - 8.25/acre
- plow, 14"- 16" deep - 10.00/acre
- brush chopper - 20.00/acre

$42.25/acre

(2) Tree Cover:

- crew comprised of 4 laborers, 2 dozer operators, and 1 foreman
  - Laborers-4 X $5.00/hr. X 1.2 overhead = $24.00/hr.
    2 acres/hr. accomplishment rate $ 12.00/acre
  - Foreman- 1 X $5.00/hr. X 1.2 overhead = $6.00/hr.
    2 acres/hr. accomplishment rate 3.00/acre
  - (dozer operators included in custom rate)
- custom rental rate with operator
  - $85/hr., assume 2 dozers required at
    2 acres/hr. accomplishment rate 85.00/acre

$100.00/acre

3.0 Costs by Land Cover Class

A. Labor costs included:

	Current per acre	Annualized per acre
I	$ 42	$ 3.60
II	67	5.75
III	112	9.60

B. Partial labor costs excluded:*

	Current per acre	Annualized per acre
I	$ 35	$ 3.00
II	57	4.85
III	95	8.10

* Assumes unskilled labor valued at zero opportunity cost.

APPENDIX B

Revised Repayment Calculations for Parcel A36, Animas Watershed

Revised Repayment Calculations for Parcel A36, Animas Watershed

The cropping pattern that maximizes repayment capacity for land parcels in climatic zone D is an alfalfa and malt barley rotation. Parcel A36 in the Animas Watershed, however, is considered suitable only for native hay production because of its 4A land classification. Thus, it was necessary to develop a revised repayment estimate for that parcel. During the Level A economic analysis, native hay budgets were developed for climatic zones F through J. Production costs for a similar cropping pattern in zone D were estimated using a linear regression curve fitted by the least squares technique to the cost data derived for zones F through J. The results of the regression analysis are depicted in Table B-1.

The agronomic study of the reservations indicates that native hay yields of 3.5 tons per acre and a pasture carrying capacity of 6.0 animal unit months (AUM) could be expected for parcels in climatic zone D. Table B-2 shows production costs, gross returns and net returns for these yield levels on a native hay operation consisting of 75 percent baled hay and 25 percent pasture. The overall net return of $141.27 per acre was increased by 10 percent to allow for the possibility of higher returns under ideal conditions. The resulting estimate of $155.00 per acre is $115.00 lower than the alfalfa, malt barley return of $270.00.

TABLE B-1

Native Hay/Pasture Yields and Production Cost Estimates

	Climatic Zone					
	J	I	H	G	F	D
Native Hay Yield						
Tons	2.3	2.5	2.7	2.9	3.1	3.5
AUM	1.5	2.5	3.0	4.0	4.5	6.0
Ton equivalent	2.9	3.5	3.9	4.5	4.9	5.9
Production Cost	$101.27	$111.54	$115.92	$120.71	$128.34	$140.34[a]
Pasture Yield						
AUM	7.5	9.0	10.0	11.0	12.5	15.0
Production Cost	$ 73.22	$ 79.76	$ 84.79	$ 88.92	$ 95.81	$107.13[b]

[a] Production cost for zone D estimated through a linear regression of the form

Cost = 12.6468 yield + 65.7275 with R^2 = 0.97911

[b] Production cost for zone D estimated through a linear regression where

Cost = 4.5265 yield + 39.2345 with R^2 = 0.99952

TABLE B-2

Revised Repayment Calculations for
Parcel A36, Animas Watershed

Crop	Cropping Pattern	Yield	Gross Returns	Production[c] Costs	Net Returns	Composite Net Returns
Native Hay	.75	3.5 Tons 6.0 AUM	$314.41[a]	$140.34	$174.07	$130.55
Pasture	.25	15.0 AUM	150.00[b]	107.13	42.87	10.72
Overall Net Return						$141.27[d]
Efficiency Adjustment Factor						1.10
Adjusted Net Return						$155.40

[a] Based upon 3.5 Tons of native hay at $72.69/ton and aftermath grazing valued at $60.00.

[b] Based upon 15.0 AUM at $10/AUM.

[c] Estimated through regression analysis of budgeted production costs for Zones F-J.

[d] Assumes the economies of scale of a 1,016 acre operation.