

Complete Except Map

**RANGE MANAGEMENT BRANCH
REPORT
L.M.U. NO. 1
MAY 1937**

D.G. Anderson

**D.G. ANDERSON
JR. RANGE EXAMINER**

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RANGE MANAGEMENT BRANCH REPORT

LAND MANAGEMENT UNIT NO. I

I. INTRODUCTION

A. Dates of Survey, Personnel of Party:

Land planning surveys on Land Management Unit No. 1 (Kaibito Unit) were made between April 1 and June 5, 1937. This was an excellent time for making the surveys for it gave the survey party an opportunity to see in progress the long shift of population and livestock from winter to summer range, a condition which is especially pertinent to land planning in this area.

Personnel comprising Study Group "B" as follows:

Section of Agronomy - - - - -	H. M. Ivory
Section of Biology - - - - -	R. S. Neilson Asst. Chief of Party
Section of Conservation Surveys -	R. H. Kerr, L. A. Hill
Section of Engineering - - - -	C. L. Moyes
Section of Human Surveys - - -	J. N. Hadley
Section of Range Management -	D. G. Anderson Chief of Party
Section of Woodland Management -	R. S. Richardson

B. Location:

Land Management Unit No. 1 is located in the northwestern part of the Navajo Indian Reservation and comprises the northwestern part of the Western Navajo Jurisdiction. The Unit lies in Coconino County, Arizona, roughly between $110^{\circ} 45'$ and $111^{\circ} 30'$ west longitude and $36^{\circ} 15'$ and $37^{\circ} 00'$ north latitude. Kaibito, Arizona, the Unit Headquarters, is located approximately in the geographic center of the Unit.

C. Boundaries:

In general, the boundaries of the Unit are as follows: Beginning on the Colorado River at Lee's Ferry the Unit is bounded on the west by Echo Cliffs; on the south by the North boundary of Land Management Unit No. 3 along Crooked Ridge, Red Mesa, Little White Mesa and Blue Canyon; on the east by the west boundaries of Land Management Unit No. 4 and No. 2 along Blue Canyon, Black Mesa, and White Mesa; and on the north by Navajo Canyon and the Colorado River.

1. Boundary Changes:

Two boundary changes, both effective, were involved in this Unit. The first boundary change excluded the area between Echo Cliffs and Marble Canyon, and the area south of Crooked Ridge from the Unit. This area of 485,000 surface acres with 40,000 forage acres and a carrying capacity of 16,000 sheep units yearlong was added to Land Management Unit No. 3. The

change was proposed for reasons of usage, topography, and administration.

The second boundary change added to the original Unit 256,000 surface acres with 13,000 forage acres and a carrying capacity of 7200 sheep units yearlong. This area is located around Red Lake, Cow Springs, and Black Mesa, and was originally in Land Management Unit No. 3. Reasons for making this change were primarily usage and ease of administration from Kaibito rather than Tuba City.

D. Area:

The area of Land Management Unit No. 1 as compiled from the Range Management type maps is 1,035,540 surface acres. This figure includes the boundary changes as effective.

E. Roads, Schools, Hospitals, Etc.

The Tuba City-Kayenta road which crosses the southeastern portion of the Unit is the only road which is maintained at all seasons of the year. A bladed road also extends from Red Lake to Kaibito and Inscription House. Wagon trails and minor roads radiate from the main roads, so that nearly all the Unit is accessible to car.

The Tuba City-Kayenta telephone line crosses the southeastern portion of the Unit. Telephones are located at Red Lake, Kaibito and Cow Springs.

One day school is located at Kaibito.

The nearest hospital is at Tuba City. Field doctors and nurses from this hospital care for the medical needs of the Unit.

Trading posts within the area are located at Red Lake, Cow Springs, Kaibito, and Coppermine.

II. GENERAL DESCRIPTION

A. Climatology:

1. Elevation:

Elevation of the area varies from 7000 feet above sea level to 4600 feet on the Moencopi Wash. Average elevation over the area is approximately 6000 feet above sea level.

2. Precipitation:

Rainfall records applicable to this Unit are taken from Lee's Ferry, Tuba City and Kayenta. Average annual precipitation for these stations is 6.2, 6.9 and 8.3 inches, respectively.

3. Temperature:

Temperature records for the area were taken from the same climatological stations and show annual mean temperature of about 54° F, with a maximum of 114° F at Lee's Ferry and a minimum of -15° registered at both Kayenta and Tuba City.

4. Growing Season:

Killing frosts come as late as May 13 and as early as September 21, with an average growing season of 160 to 180 days.

B. Physical Geography:

1. Topography:

Topographically, the Unit is characterized by a broad, gently sloping, sandy plateau, broken by high mesas and deep canyons. The main topographical features of the area are: Echo Cliffs and Mormon Ridges to the west; Navajo Canyon and Glenn Canyon to the north; White Mesa, Kaibito Canyon and the head of Navajo Canyon on the east; and Black Mesa, Blue Canyon, and Wildcat Peak to the south.

2. Drainage and Run-off:

The northern part of the area is drained to the west by the Colorado River and its tributaries, Navajo Canyon and Kaibito Canyon. The eastern part of the area, Red Lake and Black Mesa, drains to the south through Blue Canyon and its tributaries. The entire area is in the Little Colorado and Colorado River watersheds. A large portion of the area to the south and west of Kaibito is of such a sandy nature that no run-off is to be expected.

3. Geology:

Practically all of this district is included in the Kaibito physiographic sub-province. The geological formations present are confined entirely to the Jurassic and Cretaceous and include the Navajo sandstone, Carmel, Entrada and Morrison formation of the Jurassic age and the Dakota, Mancos and Mesa

Verde formation of the Cretaceous age. The dominant formation is the Navajo sandstone which covers as much area in the Unit as all others combined.

Mr. Meeks, Junior Geologist, made the geological survey of the Unit.

4. Soils:

The majority of the soils of the Unit originate from sandstone and are highly susceptible to wind erosion when the vegetative cover has been partially or wholly removed. Soils are derived from the Navajo sandstone in the western half of the Unit, the Carmel formation in the north, the Entrada formation in the east, and scattered areas of Dakota sandstone and Mancos shales in the south and east. Soils of the latter classification are more susceptible to water erosion than the rest of the soils of the Unit.

Residual soils occupy the greater portion of the area and constitute the better class of grazing land.

5. Erosion:

Strong southwest winds, low rainfall, and light soils are responsible for the predominance of wind erosion. Partially stabilized sand dunes, ranging in depth from thirty-six inches to several feet, are common west of Kaibito. Small active sand dunes are sparsely distributed throughout the Unit, but are more frequent in the southern and southeastern portions of the Unit.

Extensive areas of barren sandstone dissected by deep

canyons are common to the north portions of the Unit. A shallow, severely wind blown, intermittent soil cover, spotted with accumulations of active dune sand, occupies the northwestern portion of the Unit.

Sheet and gully erosion prevail on the steep slopes of Black Mesa and White Mesa.

C. Vegetation:

Vegetation of the area is typical of the Upper Sonoran Zone. A few species typical of the Lower Sonoran Zone are present but in such limited quantities as to become unimportant. Species occurring in the area are as follows:

GRASSES

Blue Grama
Calleta grass
Spiny Muhley
3-Awn
Sand dropseed
Indian Rice
Black Grama
Saccaton

Bouteloua gracilis
Hilaria jamesii
Luhlenbergia pungens
Aristida spp.
Sporobolus cryptandrus
Oryzopsis spp.
Bouteloua eriopoda
Sporobolus aeroides

WEEDS

Russian thistle
Indian Wheat
Heath Aster
Sunflower
Lupine

Salsola pestifer
Plantago spp.
~~Leuceline~~ Aster
Helianthus spp.
Lupinus spp.

SHRUBS

Black brush
Chamise
Mormon tea
Sand sage
Snakeweed
Yellowbush
Rabbitbush
Winterfat
Cliffrose

Colcogyne ramosissima
Atriplex canescens
Ephedra spp.
Artemisia filifolia
Gutierrezia spp.
Chrysothamnus greenii
Chrysothamnus biglovi
Eurotia lanata
Cercocarpus stansburiana

TREES

Pinon
Juniper

Pinus edulis
Juniperus monosperma
Juniperus utahensis

In listing the above species an attempt was made to rank the various species according to abundance and importance.*

1. Vegetative types:

A table showing graphically the percentage and importance of the various vegetative types found in the area follows:

(See Page 9)

*Note: The figures obtained here for cultivated area were based on compilation of range type maps and include all land under fence adjacent to cultivated lands. They also include some area that was cultivated at the time the Extensive Grazing Survey was made of the area but which is now abandoned land, but may be farmed in future years. The Section of Agronomy reports 803 acres actually cultivated on the area.

Type	Surface Acres	Percent of Area	Forage Acres	Carrying Capacity S.No.	Pct. of C.C.
1. Grassland	249,094	24.05	38,713	185,822	45.26
4. Sagebrush	37,789	3.65	3,982	19,114	4.65
5. Browse	342,911	33.11	22,709	109,003	26.54
7. Waste	54,700	5.28			
8. Barren	32,213	3.11			
9. Woodland	317,107	30.63	20,149	96,715	23.85
Cultivated*	1,726	.17			
Total	1,035,540	100	85,553	410,654	100

2. Woodland Areas:

Woodland and browse each make up one-third of the area; grassland, one-fourth; waste and barren land, one-twelfth; and cultivated, less than one-eighth of one percent. Carrying capacity figures show a different relationship. Although grassland comprises only one-fourth of the area, it makes up 45% or nearly one-half of the carrying capacity. Browse and woodland each comprise about one-third of the area, but each makes up approximately one-fourth of the carrying capacity. This indicates a relatively low carrying capacity for woodland and browse types, and a relatively high average carrying capacity for grassland types. The entire area is in a low rainfall belt and a high

carrying capacity range over the entire area could not be expected.

3. Condition of Vegetation:

For the most part vegetation of the area has been over-used for so many years that a partial to severe depletion has resulted. Remaining palatable plants have lost a great deal of their vitality. Only relatively small amount of volume growth is forthcoming. A large area north of the Coppermine is exception. Here, condition of vegetation is good with, in most cases, adequate cover.

4. Poisonous Plants:

Poisonous plant species found in this area include loco, lupine, larkspur, isoconia, greasewood and cocklebur. Loco, lupine and larkspur are widespread over the area and are fairly abundant in the western part of the Unit, but are not causing severe death loss in livestock. Isoconia, greasewood and cocklebur are localized in alluvial valley floors.

As a whole, only small death losses were reported for the area and poisonous plant eradication is not at present economically feasible.

D. Water Developments:

Water development in this Unit is the most important problem facing range management plans. During the survey 125 water

supplies and developments were located, classified as follows:

- 20 permanent developed springs
- 9 permanent undeveloped springs
- 6 temporary undeveloped springs
- 6 temporary shallow wells
- 20 permanent shallow wells
- 3 permanent reservoirs
- 19 temporary reservoirs
- 32 reservoirs that are dry practically all the time
and cannot be counted on to furnish any live-
stock water.
- 4 drilled wells
- 1 drilled well (water supply gone dry)
- 2 shallow wells with windmills
- 3 permanent or nearly permanent streams

125 Total

Total permanent supplies	61
Total temporary "	31
Total undependable "	33

On this classification there is some kind of water supply or development on an average of every 8284 acres, a dependable supply, temporary or permanent, on an average of every 11,256 acres, and a permanent supply on an average of every 16,876 acres.

To apply an average figure for area in which water supplies are found in this Unit is very misleading. Whereas the developments as shown on the Vegetative Type map are rather uniformly scattered over the area, nearly all the permanent water is located in the central portion of the Unit (around Kaibito, Red Lake and Cow Springs). A very large area in the western portion of the Unit around the Coppermine and Kle Chee

is practically without water of any kind. Antelope reservoir and a few temporary wells in sandstone pockets furnish all the water available. To look at the distribution of developments on a map is misleading for it is in this area that so many charco types of reservoirs are constructed, nearly all of which have never caught water and which are located in sandy drainages where runoff is only slight in the heaviest of rainstorms.

The area north of Kaibito around Ste Skizzie is similar in that water is only of a temporary nature and not adequate to care for the needs of the livestock. An area on Black Mesa is likewise characterized by inadequate water.

In order to correct the condition of water in this Unit three drilled wells, ten reservoirs and detailed geological surveys on the Ste Skizzie and Coppermine areas are proposed. Geological approval has been obtained on two drilled well locations and if water is obtained in these locations further detailed study might reveal other possible locations. If the wells prove to be dry, detailed study on rock slopes for the purpose of selecting cement or masonry dam sites is recommended. If water cannot be obtained in this area a change in the range management plan will be necessary, using those areas only when snow is on the ground.

E. Biological Aspects:

1. Rodents:

Heavy infestations of prairie dogs exist in approximately 200,000 acres in the following parts of the Unit: South of Kaibito along the Kaibito-Gap road; along the Kaibito-Red Lake road; and north of Kaibito in the area between Kaibito Canyon and Navajo Canyon. This entire area is good range land, and rodent control is recommended to prevent further range depletion.

The principal rodent over the entire Unit is the kangaroo rat, though less abundant and more widespread, damaging vegetation severely only in restricted areas around Red Lake. Ground squirrels and miscellaneous mice make up the remainder of the rodents in the area and damage is restricted to farm areas. (For further information see Biology Report.)

2. Predators:

Predatory animals in the Unit are coyotes and bobcats, with an occasional mountain lion. No losses were reported during the survey, but losses are often reported by the Indians. Predatory control is not recommended at present, but may be necessary in the future. (See Biology Report)

3. Livestock Pests and Diseases:

Scabies is effectively controlled by dipping. No cases of scab have been reported for this Unit for three years. Lice and ticks are quite prevalent, but are controlled to some

degree by dipping. Re-infection by using old bedding grounds and bedding in the same corral for long periods of time can be corrected by proper animal husbandry practices.

Grub-in-the-head is present, but not in large quantities, and causes only slight damage.

Screw worms are not reported.

Other livestock pests include the heel fly and bot fly. (See Biology Report.)

F. General Range Conditions:

There is adequate feed in the western portion of the Unit because of adequate rainfall and lack of permanent water. In the eastern portion of the Unit, because of adequate permanent water and in some instances very light and spotted rainfall, there is practically no available forage at the present time.

Feed over the entire Unit was coming good because of the heavy snowfall last winter. The Indians report more moisture in the soil this spring than any time for the same period in ten or fifteen years. Range soils are rather evenly distributed according to class over the entire Unit. High carrying capacity land in the north and west portions of the Unit are under, proper or moderately over-utilized, whereas the central and eastern portions are severely over-grazed (see Utilization Map). Range soils are in general very sandy and precaution of over-grazing should be taken to avoid consequent wind erosion that accompanies

range depletion.

The area as a whole is quite accessible to livestock, but is so sandy as to cause difficulty in car travel in dry weather. White Mesa and canyons running into Navajo Canyon are accessible only by stock trails and tend to segregate portions of the Unit.

There are probably more large owners of sheep in this Unit than in any other on the Reservation. Several herds number more than 2000 head.

G. Chief Values of the Land:

Of the total area, 1,035,540 acres in this Unit, 8.39% or 86,913 acres are classified as waste or barren and have no significant value from a resource standpoint. Thirty per cent or nearly one-third of the area is woodland, with stands of pinon and juniper. This furnishes posts, poles and fuel and comprises the forest resources of the Unit. There is at present 800 acres of farm land with only a small area of potential land. The entire area remaining has as its chief value range land. Forested areas throughout the Unit are of dual purpose, furnishing wood and wood products and also forage for livestock production. Range soils in the area are divided as follows: Class A, 20,000 acres; Class B, 370,000 acres; Class C, 300,000 acres; and Class D, 130,000 acres, and Class E 215,000 acres.

III. PAST AND PRESENT USE OF LAND

Because of its remote location and early addition to the Navajo Indian Reservation, the factor of white man usage in the area is a negligible factor. There is little land suitable for cultivation because of a lack of water for irrigation, either strict irrigation or flood irrigation. The land has been used primarily for grazing and bands of true Navajo sheep are to be found in the area practically uninfluenced by other breeds. When selecting stock to use in breeding experiments at the Navajo Sheep Breeding Experiment Station at Ft. Wingate, stock in this area and near Navajo Mountain were selected because of the little influence of other breeds of sheep. The herds had been maintained as in their original state because of remote location on the Reservation.

In the future the chief value of the land will be grazing and watershed values, the latter being significant over only a small portion of the area because of the sandy texture of the soil with a consequent very minor run-off.

A. Carrying Capacity:

The present carrying capacity for the Unit is 34,221 sheep units yearlong.*

*The forage acre requirement of 2.5 forage acres per sheep unit yearlong was used in computing the carrying capacity of the area, except in the buck pasture, where a forage acre requirement of 3 forage acres per sheep unit yearlong was used.

B. Season of Use:

The forage of the area is such that it can be grazed as yearlong range. There are, however, factors of water and cultivation that modify the usage at present. With the development of water of a permanent nature in the Coppermine Area, near Tsai Skizzie, and northeast of Kaibito the area can be used as yearlong range. The plan for seasonal use is dependent upon water development. If permanent water cannot be developed, the north and western portions of the Unit will of necessity become only winter range. (For description of livestock water see "Water Developments")

C. Livestock Numbers:

Livestock numbers as compiled from 1936 dipping records are as follows:

Grown Livestock Converted to Sheep Units from 1936 Dipping Records
 (Recompiled from Mr. C. Maddox's records according to boundary changes)
 Number of Owners Listed, 273. Number of Bands Dipped, 154

Class of Stock	Number of Head	Number of Units	Percent of Units	% of Units per Class to total Units Run
Ewes	26,223	26,223	54.95	Sheep 64%
Wethers	3,973	3,973	8.31	
Bucks	416	416	.87	
Grown Sheep	30,612	30,612		
Nannies	4,000	4,000	8.37	Goats 9%
Billies	142	142	.30	
Wethers	145	145	.30	
Grown Goats	4,237	4,237		
Cows	977	3,903	8.17	Cattle 10%
Bulls	71	284	.59	
Steers	96	384	.81	
Grown Cattle	1,144	4,576		
Mares	617	3,085	6.45	Horses 17%
Stallions	63	315	.66	
Geldings	723	3,615	7.56	
Mules & burros	264	1,320	2.76	
Grown Horses	1,667	8,335		
Total	37,710	47,810	100.	100

1936 Increase	Number of Head	Percent Crop Based on Grown Stock per Class
Lambs	13,024	43%
Kids	2,201	51%
Calves	468	41%
Colts	227	14%

Total grown sheep units run in 1936	47,810
Carrying Capacity sheep units yearlong	34,221
Number of sheep units overstocked	13,589
Percent overstocked	39.7%
Base Preference number	125

The 1936 dipping records had to be recompiled in order to obtain any idea of the stocking of the Unit after the boundary changes were made. This recompilation is accurate only to a certain degree and chance for error is great because of the large number of original dipping vat records that gave inadequate description of the range used by the band. The records will have to be corrected by the 1937 dipping vat records.

During the survey livestock movements were obtained, giving an estimate of the stocking of the Unit. From figures derived from this source 38,500 sheep and goats, 1,140 horses, mules and burros, and 1,960 cattle were enumerated. This figure is somewhat low, especially as far as horses are concerned. From field observation horse population was estimated at 2,500 head, and cattle at 2,000. This makes a total stocking, using this basis, of approximately 59,000 sheep units.

Until more accurate counts on livestock are obtained it will be very difficult to formulate plans for any program of livestock adjustment.

From the above figures one can see the present class of stock on the area. The livestock production enterprise is divided on an average for the whole area of sheep production, 64%; goat production, 9%; cattle production, 10%; and horse production, 17%. Since the above figures are low on horses, actual figures will lower the percentage of the other classes of livestock and raise

the figures on percentage of horses.

D. Utilization:

There is a very close relationship in this Unit between utilization and livestock water supplies. (See Map). In the central portion of the Unit around Kaibito, Cow Springs and Red Lake severe to very severe over-utilization is present. In the area to the west of Kaibito there is practically no water and usage is limited to the winter season. Here large areas exhibit proper utilization or, in many cases, under-utilization. In the areas around permanent water an abundance of unpalatable plants are present. Utilization has been severe enough to have twenty to forty percent or more of these unpalatable plants consumed by livestock. Trading posts and cultivated areas around Red Lake, Cow Springs and Kaibito have augmented the overstocked condition of these ranges during the summer months.

E. Distribution and Livestock Movements:

Concentration of livestock is of a seasonal nature. During summer months when temporary water is not available and farms are being cultivated, there is a serious concentration of livestock around Kaibito, Red Lake and Cow Springs. During the winter months the livestock are rather evenly distributed over the entire Unit.

There are two sections of boundaries on the Unit where

none too definite an economic or geographic line could be followed. There will be some crossing over of livestock from one Unit to another. Between Units No. 1 and 3 there will be some crossing over of livestock, but this shift should be only slight and compensatory. The same condition exists between Units No. 1 and 2, at Blue Lake and north of Cow Springs. Only actual application of the boundaries as they exist for a time and observations as to results will be the deciding factor in determining the need and desirability of making changes in the boundaries at these points. From all information available at the present time the boundaries are as suitable as can be established in regard to livestock shifts.

Movements of livestock within the Unit are an important problem facing land planning. There is a constant shift of livestock from Kle Chee and the Coppermine to Kaibito, Red Lake and Cow Springs. Distances of forty to sixty miles are not uncommon. Reasons for shift are primarily from summer to winter forage and to permanent water supplies and farms in the summer.

Development of permanent water in the Coppermine area and precaution against letting livestock concentrate around agricultural land will do much to remedy the present condition and decrease trailing of livestock from the central and eastern part of the Unit to the western part, with the consequent trampling and destruction of forage.

There is a definite tendency for livestock to concentrate around permanent water more than is necessary, especially around the new drilled wells. This not only puts an undue load on the range adjacent to these supplies, but in many cases uses more water than can be efficiently produced. For instance, while constructing the ram pasture, thousands of sheep were shifted to the area. They not only overgrazed the adjacent range with needless trampling of forage, but also kept the storage tank dry so that sheep were dependent upon immediate wind for water. In many cases this meant a herd did not receive adequate water for several days at a time.

F. Animal Husbandry Practices:

1. Selection:

In the larger herds selection is good for the most part. A large number of rather good breeding herds were noted during the survey. The smaller herds were of a distinct inferior quality and market type and, in many cases, retrogressive selection in the breeding herds is being practiced. Principal reason for this is the sale of the heavier lambs. The condition can be remedied to some extent by regulated breeding season so that lambs are of a uniform age.

Cattle as a whole are only of medium good type and quality and although a few individuals of good market type were seen, many were of an inferior grade.

Horses vary from very good individuals to a large number of small, scrubby "Indian ponies". The majority of the horses fall in the latter class.

2. Bucks and Bulls:

Bucks of good quality and market type are to be found on the area but continual improvement of the market type will be necessary in a range management program. The larger owners in the area have as a rule bucks of better body conformation and market type than the smaller owners. Larger owners also give more attention to the care of their rams than do the smaller owners.

Bulls in the area as a whole are rather good in quality and market type but many are old and of little value. Bulls are not given any special care during the winter and fall and are not in good serviceable condition at breeding time. As a result, there is a lower calf crop and many young calves are held over until the following fall for sale.

3. Breeding and Lambing:

The breeding season is yearlong, as is the lambing season. The majority of lambs come between January 15 and April 15. Too frequently there comes a cold spell of weather with a consequent large death loss among the lambs. There is little green feed in the area before April 15th. Lambing should not begin before this time. Preferably, lambing season should begin on an average of April 20. A lack of green feed and cold weather often result in

small stunted lambs, an undesirable market product.

Calves come at all seasons of the year, making a varied calf crop in age and size. For the most part the cattle are not marketed in this area as yearlings or older which to some degree compensates for the uneven age of calves in the fall.

4. Docking and Castrating:

Most lambs are docked too long, giving an undesirable shaggy appearance to the lamb. Lambs are as a rule not castrated at an early enough age.

5. Shearing:

Hand shearing is the universal practice over the area. No power shearing plants are at present available. Few fleeces are tied. It is a common practice to pick a sandy spot in which to shear and to bury the wool in damp sand so that it will absorb moisture and other waste materials to increase the weight of the wool. This not only makes an undesirable product but on the whole reduces the value per pound of Indian wool. To correct this improper practice central shearing plants should be constructed.

Fleeces are light and shearing takes place about six weeks to two months too early. Shearing should not take place until about June 1. A large amount of the slipping of the wool in the spring is not due to shedding, as is the common belief, but to lambing during severe weather conditions.

6. Herding:

Close herding and trailing of herds is a common practice throughout the Unit, especially in the smaller bands. Larger bands are herded more nearly in the proper manner. Herds are corraled early at night and held in corrals late in the morning. Use of the same corral for extended periods of time, even with the larger bands, is universally practiced. Goats present are more numerous in the smaller herds of sheep than in the larger herds. Much trampling of vegetation because of the presence of goats results from this practice. General herding practices among the larger herds, with the exception of use of bed-grounds over long periods of time, were far above the reservation average.

Education for correction of improper practices is needed.

7. Salting:

The practice of furnishing salt to livestock is none too prevalent in this Unit. There are some large stock owners that buy salt especially for their horses, but for the most part the smaller owners depend upon salt plants as their supply of livestock salt. Salt bush species are not abundant in this area and water for the most part is not alkaline enough to greatly reduce the salt requirements of stock. Salt requirement for sheep is 5 to 6 pounds per year; for cattle about 25 to 30 pounds. Using this figure, 75 to 100 tons of stock salt are required in the Unit. From reports obtained from traders by the Section of Human Surveys, only 10-1/4 tons of salt were sold in this Unit in the

past year. This is only a small fraction of the amount needed by the livestock. Saltbush is unable to furnish the deficiency and as a result serious depletion of chamise and other salt species has resulted.

8. Supplemental Feeding:

Supplying livestock with additional feed grown on farm land is only a small item. Some quantities of hay are fed to horses but, as agricultural land is limited, nearly all supplemental feed has to be imported to the area. With practically no potential agricultural land available for production of forage crops and a high freight rate for imported supplemental feed, supplemental feeding, except as is now practiced, will never be an important feature in the management of this Unit.

IV, RANGE MANAGEMENT OBJECTIVES

Primary range management objectives in the Unit should include:

- A. A livestock adjustment to present estimated maximum carrying capacity of the Unit as compiled from information obtained by the Extensive Grazing Survey of the area 1935.
- B. Development of water and maintenance of existing supplies and other range improvements which will result in the most beneficial and economical use of the grazing resources of the area.
- C. Distribution of livestock over the area which will result in efficient use of the available forage.

D. Allowance of enough horses to meet the needs of the people. The sparse population and sandy nature of the terrain increase the need for horses.

E. Demonstration and education of proper range management and animal husbandry practices so that increased monetary income may be realized per animal unit from the livestock production operation.

V. PLANS AND RECOMMENDATIONS

A. Proper Class of Stock:

Either sheep or cattle should be used to stock the area.

B. Proper Season of Use:

The area is to be stocked on a yearlong basis provided water can be developed so that this can be accomplished. If water cannot be developed the range management plans will have to be altered so as to use the area most efficiently. As a large area with a relatively high carrying capacity is without water at present, and possibilities of development are not too favorable, a further reduction in livestock may become necessary in order that the land adjacent to permanent water is not severely overstocked with consequent range depletion.

C. Proper Distribution:

Distribution of stock is again influenced by water development. With further water developments the

WR_____

will be corrected to a certain degree. Proper herding methods will aid in correcting poor distribution. Special care should be taken to avoid concentration of livestock around agricultural areas, most of which are already in a seriously depleted condition. Range adjacent to permanent water should be used only when temporary water is not available. Livestock should be scattered over the entire area as uniformly as water and forage permit.

D. Proper Numbers of Stock:

The carrying capacity of the area is 34,221 sheep units yearlong or 410,654 sheep months. The area is to be stocked not to exceed this carrying capacity.* Even though a total carrying capacity is reached not in excess of the above numbers, numbers of stock for each sub-unit and even smaller areas should be constantly watched so as to conform to the carrying capacity of that sub-unit or smaller area.

E. Livestock Adjustments:

Reduction of livestock should begin with horses. Enough horses to meet the needs of the people but none in excess should be left. It is deemed advisable to leave six horses per family or eight to ten horses per consumption group where such group is large. Least desirable horses first.

Second should be cull and unproductive stock, old cows, steers, unserviceable bulls, old smooth or broken-mouth ewes,

*The carrying capacity of the area was computed on a basis of $2\frac{1}{2}$ forage acres per sheep unit yearlong (1 cow is equivalent to 4 sheep units, and 1 horse is equivalent to 5 sheep units.)

wethers, undesirable rams.

Third should be goats.

Fourth should be productive stock but of undesirable quality and market type, taking into account age and body conformation.

It must be borne in mind that to avoid serious economical handicap to the already marginal and sub-marginal producers that adjustment of livestock must take place in the larger herds.

F. Proper Animal Husbandry:

1. Breeding:

A ram pasture is already constructed at Kaibito. Breeding dates should be from November 20 to January 5, so lambing season will begin April 20. At a rate of three bucks per one hundred ewes there will be approximately 700 bucks needed. This requirement has been met in the carrying capacity of the ram pasture. At present there is an inadequate number of rams. Rams of improved quality should be purchased to replace the inferior rams and to provide adequate sires.

Bulls should be culled and individuals of improved quality and market type imported into the area.

2. Shearing:

Shearing should start not earlier on an average than June

1. Central shearing pens at Antelope reservoir, the Coppermine, Kaibito, Red Lake and Cow Springs should be constructed so that proper shearing and proper handling of the wool will be made pos-

sible. Education of proper shearing methods, sorting and tying the fleeces should be carried out.

3. Herding:

Education and demonstration as to proper herding methods should be carried out. When the herds are so small that they cannot be efficiently or economically bedded out, a multiple corral system of bedding out should be started. Close herding, trailing, and herding from the rear instead of from the front of the herd are practices to be stopped.

G. Range Improvements:

Proposed water developments are seriously needed. Constant observation by the District Supervisor and his assistants as to further possible water development is necessary.

H. Livestock Population Records:

Information compiled from the 1937 dipping vat records will give a rather accurate count on sheep and goats for the area. It will be necessary for a cattle and horse round-up in order to obtain accurate information on numbers of those classes of stock.

Constant observation and check on livestock numbers will be necessary to give necessary information for range management planning.

RANGEMANAGEMENT PLAN

The area has been subdivided into five divisions or sub-units, according to topography, drainage and economic conditions. The tabular range management plan for the area follows:

Tabular Range Management Plan Land Management Unit No. I.					
Sub-Unit	Surface Acres	Forage Acres	Carrying Capacity S.U. Yl.	Carrying Capacity S.No.	Season of Use
1. Kle Chee	200,510	13,426	5,370	64,440	Yearlong
2. Coppermine	247,965	24,387	9,755	117,060	"
3. Kaibito	111,341	6,949	2,780	33,360	"
4. Tse Skizzie	131,117	11,893	4,727	57,084	"
5. Red Mesa	72,079	8,973	3,589	43,068	"
Cow Springs	177,676	11,878	4,751	57,012	"
Black Mesa	78,501	6,208	2,483	29,796	"
6. Buck Pasture	16,351	1,839	700 (Rams)	7,350	1-6/11-20
Total	1,035,540	85,553	34,186		

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LIVESTOCK MOVEMENTS

By A. B. Sombrero

The livestock movements in Lard Managerent Unit No. 1 were obtained primarily by Albert E. Sombrero. The movements were obtained by questioning Indians.

Write-ups are made for each hogan visit and placed on a livestock movement map in order that present movements might be studied and an idea as to present need for boundary changes in the Unit might be obtained.

The numbers of write-up and numbers of sheep, cattle and horses all correspond with numbers on the livestock movement map.

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RANGE IMPROVEMENT SURVEY

Land Management Unit No. I

Part of the area included in this Unit was originally in L. M. U. No. 3. The survey of that area was conducted in December, 1936 and January, 1937. Maintenance proposed at that time has been completed on many of the projects.

During the survey each separate water supply, dipping vat, etc. was described according to standard procedure and recommendation for development and maintenance work were made.

The following pages include the description of the various range improvements and recommendations.

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Unit #1

1A-1 4/24/37
Spring - Permanent - ECW
111 00 x 36 45 10 1/2 S x 1 1/2 W
Kaibito Trading Post and Dipping Vat
2 - 16' concrete troughs. Flow about 3/4 gallons per minute.
Range and accessibility: Poor
Water needed especially during dipping time.
Recommendations: None

1A-2 4/21/37
Spring - Permanent - ECW
111 00 x 36 30 9 1/2 S x 4 1/4 W
Flow about 3/4 gallons per minute. 2 - 20' small concrete
troughs. Undeveloped spring in canyon also.
Poor range.
Good. New job of pouring troughs. Good condition.
Recommendations: None

1A-3 4/24/37
Spring - Permanent - Undeveloped 2 1/2 mi. N. of Kaibito in Kaibito Wash.
111 00 x 36 45 8 1/4 S x 4 3/4 W
Flow of about 1/2 gallon per minute. Breaks out under rock
ledge.
Range and accessibility: Poor
Can be used by making temporary dams in wash to back up water.
Recommendations: None

1A-4 4/24/37
Spring - Permanent - U. S. I. Irrigation
111 00 x 36 45 7 3/4 S x 4 3/4 W
1 miles NW of 1A-2
Flow about 1/8 gallon per minute. Cribbed with rock. 1 - 10'
concrete trough.
Flow too small to warrant further work.

1A-5 5/18/37
Spring - Permanent - Irrigation
111 00 x 36 45 6 3/4 S x 2 3/4 W
2 - 20' concrete troughs. Flow about 1/2 to 3/4 gallon per
minute.
Range and accessibility: Good
Recently repaired by Mr. Bettz. Good condition.
Recommendations: None

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1A-5 5-18-37
Spring - Permanent - Irrigation
111 00 x 36 45 6 3/4 S x 2 3/4 W
2 - 20' concrete troughs. Flow about 1/2 to 3/4 gallon per
minute.
Range and accessibility: Good
Recently repaired by Mr. Bettz. Good condition.
Recommendations: None

1A-5a 5-18-37
Spring - Permanent - Irrigation
111 00 x 36 45 5 S x 5 3/4 W
Flow about 1/4 to 1/2 gallon per minute. 1 - 20' concrete trough.
Range and accessibility: Fair.
Recently checked by maintenance crew.
Recommendations: None

1A-6 4-21-37
Reservoir - Temporary - ECW
111 00 x 36 45 1 1/4 S x 1 1/4 W
Has 4' water now. Will hold 10'. Capacity 4 acre ft. Desilting
plot fenced.
Range and accessibility: Good.
Desilting plot fence in poor state of repair at tank.
Recommendations: Repair fence.

1A-7 4-24-37
Reservoir - Temporary - Natural
111 00 x 36 45 3/4 S x 1/4 W
NE Cor.
Has 1' water now. Ample capacity. Has had water 4' about 4 acre
feet.
Range and accessibility: Excellent.
Good condition.
Recommendations: None.

1A-8 4-21-37
Reservoir - Temporary - ECW
111 00 x 37 00 15 3/4 S x 1/8 W
Dry now. Sandy drainage. Dam ripped and fenced. Has never
held more than 4' water.
Range and accessibility: Good.
Will hold 10' water. Capacity 2 acre ft.
Recommendations: Diversion ditch above dam where draw fans out.

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WR. 800

1A-9 4-21-37
Reservoir - Temporary - ECW
111 00 x 36 45 16 S x 4 W
Dry now. Long, sandy drainage. Has had 3' water. Capacity 1/2
acre ft. Dam riprapped on both sides.
Range and accessibility: Good
Not dependable for livestock water.
Recommendations: None

1A-10 4-21-37
Spring - Permanent - ECW
111 00 x 37 00 14 3/4 S x 6 W
111 00 x 37 00
2 miles south Tse Skizzie.
1 - 20' concrete trough. Flow 3/4 gallons per minute.
Range and accessibility: Poor.
Good condition.
Recommendations: None

1A-11 4-24-37
Project #122.39
Reservoir - Temporary (T-) - ECW
110 45 x 37 00 16 S x 8 1/2 W
12' fill. Sandy drainage. Dry now. 1 acre foot capacity. Has
caught 2' water.
Range and accessibility: Poor to fair.
Cannot be depended upon to furnish livestock water.
Recommendations: None.

1A-12 4-24-37
Spring - Permanent - ECW
110 45 x 37 45 1 3/4 S x 7 1/4 W
2 - 20' concrete troughs. Flow about 1/4 gallon per minute.
Range and accessibility: Poor.
Fair condition. Troughs in good condition.
Recommendations: None.

1A-13 4-24-37
Reservoir - Indian - Temporary
110 45 x 36 45 2 1/2 S x 7 W
Along trail into Navajo Canyon.
Has 2' water now. Will hold 3 1/2'. Rock drainage.
Range and accessibility: Poor.
Recommendations: None.

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WR 801

1A-14 4-24-37
Reservoir - ECW - Temporary
110 45 x 36 45 2S x 12 W
Washed out. About 60'. 10' fill required to replace dam.
Range and accessibility- Good FAF 20.
10' fill. Dam fenced. Spillway washed badly.
Recommendations: Replace dam. Rock sausage in wpillway. Desilt-
ing plot with spreading devices above dam.

1A-15 4-21-37
Reservoir - Temporary - ECW
110 45 x 36 45 4 S x 9 W
Charco type reservoir. Drainage sandy. About 3' water now. Will
hold 8'. Capacity 1/4 acre foot.
Range and accessibility: Good.
Good Condition.
Recommendations: None.

1A-16 4-21-37
Reservoir - Temporary - ECW
110 45 x 36 45 5 1/2 S x 11 3/4 W
Has 2' water now. Will hold 10'. Capacity 4 1/2 acre foot.
Sandy country. Dam fenced along top. Riprapped on both sides of
dam.
Desilting plot fenced. Dam blowing badly. Rock sausage in spill-
way.
Recommendations: None.
Range and accessibility: Good.

1 A-17 4-24-37
Well - Shallow- ECW - Permanent
110 45 x 36 45- 7 S x 12 3/4 W
Tne-ya-toh.
Masonry and concrete cribbed. Hand diaphragm pump and small 16'
concrete trough about 15' to water.
Range and accessibility: Good.
Good condition. Diaphragm pump hard to work but well in good con-
dition.
Recommendations: None.

1A-18 4-22-37
Well- Shallow - ECW - Permanent
110 45 x 36 45 10 1/4 S x 10 1/2 W
Masonry and concrete cribbed. Hand diaphragm pump. 1 - 16' small,
concrete trough.
Good range. Poor accessibility.
Good condition. About 6' to water. Water about 6' deep in well.
Trough is breaking and will have to be replaced ultimately.
Recommendations: None.

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53

WR: 802

1A-19 4-22-37
 Well - Shallow - ECW - Permanent
 111 00 x 36 45 10 1/4 S x 1/2 W
 Concrete and masonry cribbed with hand diaphragm pump and 10' small concrete trough.
 Range and accessibility: Poor to fair.
 Good condition. Water at 6'. About 4' water in well. Pump works well.
 Recommendations: None.

1A-20 4-20-37
 Reservoir - Temporary
 111 00 x 36 45 12 S x 6 1/4 W
 Dry now. Will hold 5' water. Charco type reservoir. Sandy drainage. Probably does not hold water more than 10% of the time.
 Range and accessibility: Over-utilized.
 Sand blowing in around dam.
 Recommendations: Drainage too sandy to warrant work on dam.

1A-21 4-19-37
 Well - Permanent - Indian
 111 00 x 36 45 15 3/4 S x 8 1/4 W
 About 6' to water. Cribbed with rock and juniper poles. 1 - 6' wooden trough and temporary earth tank above.
 Range and accessibility: Good.
 Construct concrete cribbing and 2 - 20' concrete troughs with diaphragm hand pump.
 Cost: 35.00
 120.00
 35.00
 190.00

1A-21a 5-10-37
 Well - Temporary - Irrigation
 111 00 x 36 45 15 1/2 S x 9 1/2 W
 Masonry crib about 8' deep. 2' in sand rock. Drains pocket in sand rock and furnishes water only a few months out of the year.
 Range and accessibility: Good.
 No troughs present.
 Recommendations: Too small a water supply to warrant further development.

1A-22 4-19-37
 Reservoir (T-) Temporary
 111 00 x 36 45 16 3/4 S x 8 1/4 W
 Dry now. Will hold 8' water. Capacity 20 acre feet.
 Range and accessibility: Good.
 Probably dry 95% of the time. Rather valueless as range water because of sandy drainage.
 Recommendations: None.

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1A-23

4-19-37

Windmill - Permanent - ECW

111 00 x 36 45

16 3/4 S x 13 3/4 W

18' windmill. 50,000 gal. storage tank and 2 - 20' small concrete troughs.

Range and accessibility: Good.

Tank has 2' water now. Troughs connected at top instead of bottom.

Recommendations: Put connection at bottom and pour troughs for buck pasture. Well needs to be deepened, or leathers replaced.

1A-24

2-19-37

Reservoir - Temporary - Natural

111 00 x 36 30

4 1/4 S x 14 W

Has 2' water now. Will hold 4'. Small rock drainage. Natural rock basin.

Range and accessibility: Good.

Recommendations: None.

1A-25

4-19-37

Windmill - Permanent - ECW

111 15 x 36 30

3 3/4 S x 3 3/4 W

18' windmill. 50,000 gallon steel rim storage tank. 2 - 20' small concrete troughs with float.

Range and accessibility: Good.

Tank full now. Poor concrete job.

Recommendations: 2 new 20' concrete troughs for buck pasture. 175' pipe.

1A-26

4-19-37

Reservoir - Temporary - Indian

111 00 x 36 45

14 1/2 S x 9 W

Nearly dry. Small slick rock drainage. Will hold 6' water.

Range and accessibility: Fair to good.

Wind blowing dam but too small a drainage to warrant further work.

Recommendations: None.

1A-27

4/23/37

Reservoir (T-) Temporary - ECW

111 00 x 36 45

14 S x 9 3/4 W

Dry now. Has caught about 3 1/2'. Will hold 10'. 14' fill, 4' freeboard. Good spillway. Small sand and rock drainage.

Range and accessibility: Good.

Cannot be counted on as a water supply for stock.

Recommendations: None.

55

WR 804

1A-28 4-23-37
Well - ECW - Permanent (Drilled)
11' 00 x 36 45 9 1/4 S x 10 1/4 W
Bert Tso's House
18' windmill with 50,000 gal. storage tank. 2 - 20' small concrete troughs.
Range and accessibility: Good.
Leaking around base of tank. About 1' water in tank.
Recommendations: Appears to need well deepened.

1A-29 4-23-37
Reservoir - Natural - Temporary
111 00 x 36 45 9 S x 10 3/4 W
Dry now. Will hold 4' water. Capacity 1/8 acre foot. Small sandy drainage.
Range and accessibility: Good.
Probably dry 90% of the time, only being filled with heavy rains.
Recommendations: None.

1A-30 4-23-37
Reservoir - Natural - Temporary (T-)
111 00 x 36 45 7 S x 7 1/2 W
Dry now. Will hold 3' water. Long, sandy drainage. Capacity 1/2 acre foot.
Range and accessibility: Poor to fair very sandy.
Cannot be depended upon for livestock water.
Recommendations: None.

1A-31 4-23-37
Reservoir - ECW - Temporary
111 00 x 36 45 1 1/2 S x 11 1/4 W
Dry now. Has had 6' water. Will hold 10'. Capacity 1 1/2 acre feet. Sandy drainage.
Range and accessibility: Good.
Probably dry most of time. No desilting plot fenced. Dam wrapped on both sides.
Recommendations: None.

1A-32 4-23-37
Reservoir - Temporary - ECW
111 15 x 36 45 1/2 S x 1 1/4 W
Has 4' water. Now 12' full. Spillway 50' wide. 3' freeboard. Capacity 1 1/2 acre feet.
Range and accessibility: Good.
Good condition. No desilting plot fenced but vegetation too sparse to warrant fencing.
Recommendations: None.

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56

WR 805

1A-33

5-7-37

Well - ECW - Permanent

111 00 x 36 45

14 3/4 S x 4 1/2 W

~~111 00 x 36 45~~

1 - 20' concrete trough. Concrete cribbed with hand diaphragm pump.

Range and accessibility: Poor to fair.

Handle to pump missing. Six feet to water in well. Has been an irrigation development.

Recommendations: Replace pump handle.

1A-34

5-7-37 ~~6-11-37~~

Reservoir - Temporary - ECW (T-)

111 00 x 36 45

15 1/2 S x 3 1/4 W

Desilting plot fenced. 4' freeboard. Capacity 3 acre feet. Sandy steep drainage. Has had 2 1/2' water.

Range and accessibility: Fair to good.

Has silted 3' and in sand will silt more. Makes a bog hazard.

Recommendations: No more work recommended for this project.

1A-35

5-7-37

Spring - Permanent - ECW

111 00 x 36 45

13 1/2 S x 2 1/4 W

1 - 20' small concrete trough. Flow about 1/4 gal. per minute.

Range and accessibility: Poor.

Good condition.

Water in draw has been recently diverted out of the spring.

Recommendations: None.

1A-36

5-7-37

Spring - Permanent - Undeveloped

111 00 x 36 45

14 S x 1 W

Flow about 1/2 to 3/4 gallons per minute on canyon bottom.

Range and accessibility: Poor.

Can be used by construction of small dams by Indians.

Recommendations: Canyon too deep to develop.

1A-37

5-7-37

Spring - Temporary - Undeveloped

111 00 x 36 45

12 1/2 S x 1/2 W

Flow merely a seep. Can be used in parts of year if dug out with shovel.

Range and accessibility: Poor in steep canyon.

Recommendations: None.

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WR 806

1A-38
Spring - Temporary - Undeveloped 5-7-37
110 45 x 36 45 12 1/2 S x 13 1/2 W
110
Flow about 1/4 gal. per minute. In deep canyon.
Range and accessibility: Very poor.
Recommendations: None. Too inaccessible and not needed.

1A-39 5-7-37
Reservoir - ECW - Temporary (T-)
111 00 x 36 45 17 S x 6 1/2 W
Dry now. Has had 2' water. Sandy drainage. Dam fenced. 3' free-
board. 2-acre ft. capacity.
Range and accessibility: Good
Dry probably 95% of the time and cannot be counted on to furnish
livestock water.
Recommendations: None.

1A-40 5-8-37
Reservoir - Indian - Temporary
111 00 x 36 30 1/4 S x 4 W
Dry now. Will hold 3 1/2' water. 1/2 acre-ft. capacity. Sandy
drainage.
Range and accessibility: Good.
No spillway. Little run-off to be expected. Old tank just below
has washed out.
Recommendations: See engineer. Gully control and erosion on farm
land.

1A-41 5-8-37
Reservoir - Temporary - ECW (T-)
111 00 x 36 30 4 S x 6 W
Charco type. Dry now. Has never had any water. Sandy drainage.
Accessibility: good. Range: fair.
Recommendations: No more development warranted.

1A-42 5-8-37
Reservoir - Natural - Temporary
111 00 x 36 30 5 1/4 S x 5 1/4 W
Has had 3' water. Catches in rainy weather. Holds water about 2
months in the summer.
Range and accessibility: Good.
Recommendations: None.

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WR. 807

1A-43 5-8-37
Well - Permanent - Irrigation
111 00 x 36 30 3 1/8 S x 2 1/4 W
Has concrete crib but no troughs or pump. Used for domestic use.
Range and accessibility: Poor.
No lid on well. Flow probably too small to warrant trough and pump.
Recommendations: None.

1A-44 5-8-37
Reservoir - Temporary - Indian
111 00 x 36 30 3 S x 2 1/4 W
Same as 1A-44
Has 2' water now. Capacity 1 acre-foot. Will hold 8 to 10' water.
Range and accessibility: Poor.
Needs dam built up where wagons have cut dam and dirt has sloughed off.
Recommendations: Repair dam. 100 yds. dirt @ 50¢. ---- \$50.00

1A-45 5-8-37
Reservoir - Natural - Temporary
111 00 x 36 30 3 S x 4 W
Dry now. Holds water about 6 weeks in summer.
Range and accessibility: Poor to good.
Capacity ample. Will eventually silt up. Too sandy to do any development.
Recommendations: None.

1A-46 5-8-37
Reservoir - Temporary - Indian
111 00 x 36 30 4 1/4 S x 2 1/2 W
Along Kaibito Road.
Dry now. Long dam. Will hold 6' water but is very shallow throughout.
Range and accessibility: Fair.
No spillway is provided and is in sandy drainage.
Recommendations: Too close to 1A-47 to warrant development.

1A-47 5-8-37
Project #19 J
Reservoir - ECW - Nearly permanent
111 00 x 36 30 4 3/4 S x 1/2 W
1 1/2 miles east of Kaibito Road.
Built in sandstone canyon. Is nearly full of water. About 20' deep.
Capacity about 6 acre-feet.
Range and accessibility: Poor to fair.

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WR 808

1

Dam needs to be raised and spillway fixed to carry more water. Water is clear with no silt and dam leaking some.

Recommendations: Raise dam and fix spillway to carry more water.

Cost: 100 yds. dirt @ 50¢, \$50. Excavation in spillway, \$75.

Total: \$125.00

1A-48

5-8-37

Spring - Permanent - Irrigation

110 45 x 36 30

2 1/4 S x 13 W

At Window

75 to 100' pipeline with masonry reservoir.

Accessibility, good. Range, fair.

Pipeline torn out. Tank filled with sand.

Recommendations: Betts?

1A-49

5-8-37

Well - Permanent - Irrigation

110 45 x 36 30

2 1/8 S x 13 1/8 W

In canyon at Window

Concrete and masonry crib. No trough or pump. For domestic use.

Range and accessibility: Poor.

Good condition. About 5' to water. 3' water in well.

Recommendations: None.

1A-50

5-8-37

Spring - Permanent - Undeveloped

110 45 x 36 30

1 3/4 S x 13 1/2 W

Same location as 1A-49

Flow about 1 1/2 gallons per minute down canyon.

Range and accessibility: Poor.

Can be used by scraping out holes in canyon floor.

Recommendations: No way to develop without a large maintenance cost on spring. No work recommended.

1A-51

5-8-37

Well - Permanent - ECW & Irrigation

110 45 x 36 30

1 1/4 S x 12 3/4 W

1/2 mile north of Window

Masonry crib and 1 - 20' small concrete trough. Hand diaphragm pump.

Range and accessibility: Good.

Good condition. About 4' to water and about 3' water in well.

Recommendations: None.

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60

WR 809

1A-52 5-8-37
Reservoir - Natural - Temporary (T-)
111 00 x 36 30 2 3/8 S x 1/2 W
Dry now. Will hold 6' when full. Sandy drainage.
Range and accessibility: Good.
Furnishes water about 3 weeks out of year.
Recommendations: Too sandy to warrant any development.

1A-53 5-8-37
Spring - Permanent - ECW
110 45 x 36 45 15 S x 13 3/4 W
1 - 20' trough. Flow about 2 gallons per minute.
Range and accessibility: Poor.
Good condition. Good water. Was not visited but information obtained from Mr. Betz.
Recommendations: None.

1A-54 12-17-36
Reservoir - Natural - Temporary
110 45 x 36 30 3 1/4 S x 7 1/2 W
Has about 3' water now. Will hold 7'.
Range and accessibility: Good to fair.
Capacity about 3 acre-feet.
Recommendations: None.

1A-55 12-17-36
Reservoir - Temporary - Natural
110 45 x 36 30 4 S x 7 3/4 W
Has about three feet of water now. Will hold 5'.
Range and accessibility: Good.
Good condition. Capacity about 5 acre-feet.
Recommendations: None.

1A-56 12-17-36
Reservoir - Natural - Temporary
110 45 x 36 30 4 1/2 S x 7 3/4 W
Has 2' water now. Will hold 6'. Capacity 1 acre-foot. Sandy drainage.
Range and accessibility: Fair to good.
Probably furnishes water 4 months out of year.
Recommendations: Too sandy to warrant work.

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WR 810

Spillway too small. 5' 1" freeboard. Dam riprapped on both sides.
Recommendations: Enlarge spillway. 200 yds. rock out of spillway.

1A-62 2-11-37
Spring - Permanent - Indian Service
110 45 x 36 30 5 3/4 S x 1/8 W
1 - 16 x 3 x 1 concrete trough. Flow about 1/4 gallon per minute.
Range and accessibility: Poor. On side of Black Mesa.
One corner of trough broken off so as to lower water level in
trough about 6".
Recommendations: Investigate possibilities of cleaning. Looks
like has been a larger flow of water. Fix trough!

1A-63 2-11-37
Reservoir - Temporary - Indian
110 45 x 36 30 5 1/2 S x 1/2 W
Dam about 12 to 14' high. Has about 3' water now. Sand and rock
drainage. Capacity 2 acre-feet.
Range and accessibility: Fair.
Good condition, but no spillway. Country very sandy and cost of
spillway that would hold would be prohibitive.
Recommendations: None.

1A-64 12-8-37
Spring - Permanent - Undeveloped
110 45 x 36 30 8 1/4 S x 1 3/4 W
Shown on maps but not visited.

1A-65 12-8-36
Spring - Temporary - Undeveloped
110 45 x 36 30 13 S x 3 W
Range and accessibility: Poor to fair.
Flow could not be determined. Dry from May to August.
Recommendations: No development.

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63.

WR 811

1A-66 12-8-36
Spring - Temporary - Undeveloped
110 45 x 36 30 13 S x 3 1/4 W
Range and accessibility: Poor to fair.
Flow could not be determined. Dry about three months from May to August.
Recommendations: No development.

1A-67 12-8-36
Spring - Temporary - Undeveloped
110 45 x 36 30 14 S x 5 W
Spring breaks out under waterfall and is used about 3 months of the year.
Range and accessibility: Poor.
Has to be dug out to be used.
Recommendations: Too small a flow of water to be developed.

1A-68 12-8-36
Reservoir - Temporary - ECW
110 45 x 36 30 12 1/2 S x 6 1/4 W
Dam 100 yds. long. Big fill. No desilting plot.
Range and accessibility: Good.
Has filled with silt and is bog hole. Will hold only 2' water.
Poor development for stock water. Too large a gully.
Recommendations: None.

1A-69 12-8-36
Project # 9 C
Well - Shallow - ECW
110 45 x 36 30 15 S x 8 W
Concrete trough, 20 x 1 x 1. Concrete & masonry cribbing. Hand suction (pump).
Range and accessibility: Fair.
Trough full of sand. Well filled with mud and handle to pump missing.
Recommendations: Clean well and install pump handle.

1A-70 5-13-37
Well - Permanent - Irrigation
110 45 x 36 30 17 1/4 S x 10 1/4 W
About 4' to water in well. 4' water. Concrete cribbing with no trough.
Range and accessibility: Poor.
Mr. Betz reports about 75 gallons a day flow in this well. Recently maintained.
Recommendations: Flow too small to warrant troughs.

1A-71 12-10-36
Spring - Permanent - ECW
110 45 x 36 30 14 1/2 S x 11 3/4 W
1 - 20' concrete trough. Flow about 1 gallon per minute.
Range and accessibility: Poor. Built on rocks.
Good. Good concrete job on troughs.
Recommendations: None.

1A-72 5-13-37
Well - Permanent - Irrigation
110 45 x 36 30 16 3/4 S x 12 3/4 W
Peach Tree Well
About 6' to water. 4' water in well. Masonry crib with wooden 8'
trough.
Range and accessibility: Poor. In orchard.
Just been overhauled by maintenance crew. Concrete slab on top
has just been installed.
Recommendations: None.

1A-73 12-3-36
Spring - Permanent - Irrigation
110 45 x 36 30 15 3/4 S x 13 W
1 - large 16' concrete trough. Flow about 1 gallon per minute or
less.
Range and accessibility: Poor.
Sand dunes coming in from west. Needs dirt cleaned out from around
troughs but this should be Indians' responsibility.
Recommendations: None.

1A-74 12-7-36
Spring - Permanent - ECW
110 45 x 36 15 1/4 S x 13 W
Has 2 small concrete 20' troughs. Flow about 2 gallons per minute.
Range and accessibility: Poor.
Good condition. Good concrete job.
Recommendations: None.

1A-75 12-7-36
Streams and Spring - Semi-permanent
110 45 x 36 15 3 S x 12 3/4 W
Red Lake drainage.
Spring breaks out and flows down canyon to Blue Canyon 6 months out
of year.
Range: Poor. Accessibility: Good.
Flow varies from one to five gallons per minute.
Recommendations: None.

1A-76 12-11-36
Well - Shallow - Permanent USIIV or ECW
110 45 x 36 15 3/4 S x 9 W
Masonry crib and 1 - 20x3x1 1/2 concrete trough.
Range and accessibility: Fair.
About 4 or 5 feet to water. Gully is cutting toward well.
Recommendations: Rock jetty to turn water away from trough and pump installed.

1A-77 12-11-36
Reservoir - Temporary - Indian
110 45 x 36 15 3/4 S x 8 7/8 W
Has 2' water now. Will hold 4'. Small rock drainage.
Range and accessibility: Poor to fair.
Dam badly trilled.
Recommendations: None.

1A-78 5-11-37
Well - Permanent - Irrigation
110 45 x 36 15 3/4 S x 8 7/8 W
Well above Res. 1A-77
Masonry cribbed. 4' to water and 3' water in well. No troughs.
Range and accessibility: Poor to fair.
Good condition. Recently repaired by maintenance crew.
Recommendations: Too close to other supplies and probably too small a flow to warrant troughs.

1A-79 12-11-36
Spring - Temporary - Undeveloped
110 45 x 36 15 3/4 S x 3 W
Breaks out below waterfall.
Range and accessibility: Fair to good.
Flow could not be determined. In canyon so the cost of development would be nearly prohibitive.
Recommendations: None.

1A-79a 5-13-37
Spring - Temporary - Undeveloped
110 45 x 36 30 17 S x 1 1/2 W
Holes dug in bottom of wash furnish livestock water for about 6 months out of the year.
Range and accessibility: Good.
Flow too small and in too rough a canyon to develop. Flow could not be determined.
Recommendations: None.

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WR 814

1A-80 12-11-36
Spring - Permanent - Undeveloped
110 30 x 36 15 1 1/4 S x 13 W
In Blue Canyon
Flow about 10 gallons per minute. Watering capacity ample.
Range and accessibility: Poor to fair range. Accessibility, poor.
Good condition.
Recommendations: None.

1A-81 5-12-37
Well - Permanent - Irrigation
110 45 x 36 30 12 1/4 S x 7 1/2 W
Not visited but said to be present by Mr. Betz. Concrete cribbed
with 1 - 20' concrete trough.
Range and accessibility: Fair.
Recently maintained.
Recommendations: None.

1A-82 12-17-36
Stream - Permanent -
110 45 x 36 15 6 S x 10 W
Blue Canyon
Has a nearly permanent flow varying from a few gallons to several
second feet.
Range and accessibility: Poor to fair.
Trails make the water accessible.
Recommendations: None.

1A-83 12-17-36
Spring - Permanent USI Ir.
110 45 x 36 15 5 S x 9 3/4 W
1 - 20 x 2 x 1 1/2 concrete trough.
Range and accessibility: Poor to fair.
No water is getting to trough. Pipeline and cribbing on spring
seem to be leaking.
Recommendations: Repair cribbing to put water in trough.

1A-84 2-18-37
Well - Permanent - Irrigation Ser.
111 00 x 36 30 12 1/4 S x 3 1/4 W
Masonry cribbed well and 1 concrete trough 20 x 2 x 3'.
Accessibility: good. Range: fair.
No pump. About 8' to water.
Recommendations: Install a hand suction pump.

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-18-
67

WR 815

1A-85 12-8-36
Reservoir - Indian - Temporary
111 00 x 36 30 10 1/4 S x 3 1/4 W
At Rat Spring
Small rock drainage. Dry now. Will hold 8' water. Capacity 3/4
acre-feet.
Range and accessibility: Fair.
No spillway.
Recommendations: Too small a drainage to warrant further develop-
ment.

1A-86 12-8-36
Project # 9 K
Spring - Permanent - ECW
111 00 x 36 30 10 1/4 S x 3 1/4 W
Rat Spring
1 - 20' large and 1 - 20' small concrete trough. Masonry cribbed
well.
Range and accessibility: Fair.
Faucet to aid in storage of water in cribbing. Flow 1 gallon per
minute.
Recommendations: None.

1A-87 12-8-36
Windmill - Permanent - Irrigation
110 45 x 36 30 12 S x 10 1/2 W
North windmill at Tonalea
10' mill. 10,000 gallon storage tank and 20' concrete trough.
Range and accessibility: Poor.
Good condition. Is pumping a good stream. Water piped to dipping
val. 1660 feet.
Recommendations: None.

1A-88 12-8-37
Windmill - Permanent - Irrigation
110 45 x 36 30 12 1/4 S x 10 1/2 W
South mill at Tonalea
10' windmill. 6' to water. 10,000 gallon concrete storage tank
and 20 - 20' concrete troughs.
Range and accessibility: Poor.
One leg of windmill bent. Windmill out of working condition.
Recommendations: Water is needed during dipping time. Replace
mill and repair well.
Cost: \$300.00

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WF 816

1A-89 5-12-37
Spring -- Stream - Permanent
110 45 x 36 30 1/2 S x 1 1/2 W
Spring with large flow down Cow Springs Canyon to Cow Springs Lake.
Range and accessibility: Fair to good.
Flow adequate to furnish plenty of livestock water. Dams are constructed in some places.
Recommendations: None.

1A-90 5-10-37
Spring - Undeveloped - Permanent
111 15 x 37 00 8 1/2 S x 4 1/2 W
1 mile NW of Klechee
Several holes dug out under a small ledge. As they are they are merely mud holes.
Range and accessibility: Poor.
Dead cow in main flow of water. Probably all combined would not make more than 1/2 gallon flow.

1A-91 5-10-37
Spring - Permanent - Irrigation & ECW - 6
111 15 x 37 00 10 S x 4 W
Klechee Spring.
Flow about 3/4 gallons per minute. 1 large 16' trough and 2 small 20' troughs.
Range and accessibility: Fair.
Irrigation trough badly broken. ECW troughs in good condition.
Appears that the cribbing is not catching all water.
Recommendations: Repair large trough or connect pipe to smaller troughs.

1A-92 5-10-37
Reservoir - Semi-permanent & ECW
111 15 x 37 00 16 S x 4 W
Antelope Reservoir
Has 4' water now about 3/4 acre-feet. Will hold 9' water. Capacity 3 or 4 acre-feet. Desilting plot fenced.
Range and accessibility: Good.
Spillway too small. Report this dam nearly washed out last year. Needs spillway widened to twice present width.
Recommendations: Widen spillway. Take fence out of water face of dam. Repair desilting plot fence and clean reservoir if possible.

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WR 817

1A-93 5-10-37
Reservoir - Temporary - Irrigation (T-)
111 15 x 37 00 16 S x 9 3/4 W
Dry now. Will hold 8' water. Has silted up about 3'. Cannot be
counted on as livestock water supply.
Range and accessibility: Good.
Silted up. Sandy drainage.
Recommendations: None.

1A-94 5-10-37
Reservoir - ECW - Temporary
111 15 x 37 00 13 1/2 S x 9 1/2 W
Has 6 to 8 feet water now. Will hold 15 to 18'. Capacity 4 acre
feet.
Range and accessibility: Fair.
Desilting plot fenced but stock have been in plot. Dam ripped.
Recommendations: Repair desilting plot fence.

1A-95 5-10-37
Reservoir - ECW - Temporary (T-)
111 15 x 36 45 1/4 S x 14 W
NW Cor.
Charco type reservoir. Dry now. Has had 3' water. Sandy drainage.
Capacity 1/8 acre-feet.
Range and accessibility: Good.
Cannot be counted on as a livestock water supply.
Recommendations: None.

1A-97 5-10-37
Reservoir - Temporary - ECW
111 15 x 36 45 5 S x 9 W
Charco type. Dry now. Has never caught any water. Rock bottom.
Sandy drainage.
Range and accessibility: Good.
Cannot be counted on to furnish livestock water.
Recommendations: None.

1A-96 5-10-37
Reservoir - Temporary - ECW
111 15 x 36 45 3 1/2 S x 11 3/4 W
Dry now. Charco type reservoir. Has never caught water. Sandy
drainage.
Range and accessibility: Good.
Cannot be depended on to furnish livestock water.
Recommendations: None.

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WR 818

LA-98 5-10-37
Reservoir - Temporary - ECW
111 15 x 36 45 10 1/4 S x 2 1/4 W
Dry now. Will hold 8' water. Has caught 2' water and silted up 2'.
Sandy drainage.
Range and accessibility: Good.
Cannot be depended upon as a livestock water supply. Too sandy.
Dam riprapped on both sides.
Recommendations: None.

LA-99 5-10-37
Reservoir - Temporary - ECW
111 15 x 37 00 3 3/4 S x 9 W
Charco type. Dry now. Has never caught water. Sandy drainage.
Capacity 7 3/8 acre-feet.
Range and accessibility: Good.
Cannot be depended upon as a livestock water supply.
Recommendations: None.

LA-100 5-12-37
Reservoir - Temporary - ECW
111 30 x 36 45 8 3/4 S x 2 1/2 W
Charco type. Dry now. Has had 2 feet water. 1/8 acre-ft. capacity. Sandy drainage.
Range and accessibility: Good.
Cannot be counted on as a livestock water supply.
Recommendations: None.

LA-101 5-12 37
Reservoir - Temporary - ECW
111 30 x 36 45 4 3/4 S x 4 W
Charco type. Dry now. Has never caught water. Sandy small drainage.
Range and accessibility: Good.
Cannot be depended upon to furnish any livestock water.

LA-102 5-12-37
Reservoir - Temporary - ECW
111 30 x 36 45 2 1/2 S x 5 W
Dry now. Has caught 1' water. Will hold 8'. Dam riprapped on both sides. Sandy drainage.
Range and accessibility: Good.
Cannot be depended upon for livestock water supply at any time.
Too sandy.
Recommendations: None.

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WR 819

1A-103 5-12-37
Reservoir - Temporary - ECW (T-)
111 15 x 37 00 15 1/2 S x 1 W
Dry now. Dam has caught only about 2' of water. Dam riprapped
on both sides. Sandy drainage.
Range and accessibility: Good.
Cannot be depended upon to furnish livestock water. No desilting
plot fenced.
Recommendations: None.

1A-104 5-19-37
Reservoir - Temporary - ECW (T-)
111 15 x 36 45 8 1/2 S x 9 1/2 W
1 1/2 miles east of Copper Mine.
Charco type. Dry now. Has never caught more than 1' of water.
Range and accessibility: Excellent.
Cannot be counted on to furnish livestock water.

1A-105 5-19-37
Well - Temporary - Indian
111 15 x 36 45 9 3/4 S x 10 W
Water at depth of about 6'. Drains rock pocket. Indians have
excavated hole to dip water out.
Range and accessibility: Fair to good.
Dry about half the time. Supply of water very small.
Recommendations: None.

1A-106 5-19-37
Well - Permanent
111 15 x 36 45 14 S x 11 W
Three wells, 2 concrete cribbed and 25 to 30' deep. One has
16' concrete trough. Pump broken. Dug in sandstone.
Range and accessibility: Fair.
Too deep to dip water and hand pump is difficult to operate.
Recommendations: See Meeks about possibilities of digging well
in between with windmill.

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WR 820

1A-107 5-19-37
Spring - Permanent - Undeveloped
111 15 x 36 45 13 1/4 S x 10 W
Dove Spring.
Flow only enough for domestic use. Rock wet for some distance.
Range and accessibility: Poor to fair.
Used for domestic purposes at present time.
Recommendations: Because of shortage of water in this area it would be advisable to develop to see if more water couldn't be found.

1A-108 5-19-37
Well - Indian - Temporary
111 15 x 36 45 15 S x 10 1/2 W
Indian dug well in rock. Drains small rock pocket. Dry about half the time.
Range and accessibility: Fair.
Flow too small to furnish a great deal of livestock water.
Recommendations: None.

1A-109 5-19-37
Reservoir - Temporary - ECW
111 15 x 36 45 11 1/4 S x 7 1/4 W
This charco could not be found although it was reported on ECW maps. If it is in existence it could not be depended upon for livestock water.

1A-110 5-19-37
Reservoir - Temporary - ECW (T-)
111 15 x 36 45 11 S x 6 W
This charco could not be located but was shown on maps. If it is ~~now~~ present, the area is too sandy to make a reservoir that could be depended upon for livestock water.
Recommendations: None.

1A-111 5-19-37
Well - Shallow - Temporary - ECW
111 30 x 36 45 9 S x 6 W
Concrete cribbed. About 8' deep. Dry now. Drains rock pocket.
1 - 20' concrete trough diaphragm pump.
Range and accessibility: Good.
Is a wet weather well and furnishes only a limited amount of water.
Recommendations: None.

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WR 821

1A-112 5-19-37
Well - Shallow - Temporary - ECW
111 30 x 36 45 11 1/2 S x 5 1/4 W
Concrete cribbed. 1 - 20' concrete trough about 5' to water.
Dry now.
Range and accessibility: Good.
Drains small rock pocket. Furnishes only a limited supply of water.
Dry about 50% of the time.
Recommendations: None.

1A-113 5-19-37
Spring - Permanent
111 30 x 36 45 14 1/4 S x 2 3/4 W
This spring was not found but was reported to have only a very
small flow of water.
Range and accessibility: Good.
Recommendations: none.

1A-114 5-19-37
Well - Temporary - ECW
111 15 x 36 30 1 1/4 S x 10 3/4 W
To-nilth-chonik
Concrete cribbed with 20' concrete trough and hand diaphragm pump.
About 25' to water.
Range and accessibility: Good to fair.
Water just below well tubing. Cannot be depended upon as live-
stock water supply from May to August.
Recommendations: None.

1A-115 5-19-37
Windmill - Permanent - ECW
111 15 x 36 30 7 S x 9 1/2 W
12' windmill, 50,000 gallon steel rim storage tank. 2 - 20' troughs
(concrete) with float.
Range and accessibility: Good.
Windmill pumping about 4 or 5 gallons per minute. Base of storage
tank not leaking.
Recommendations: Drill connection between troughs below top of
troughs so float valve can work on both troughs.

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WR 822

1A-116 5-19-37
Spring - Permanent - ECW
111 15 x 36 30 8 3/4 S x 13 W
Concrete and masonry cribbed with 2 - 20' concrete troughs.
200' pipeline.
Range and accessibility: Fair
Pipeline torn up and not usable. Flow of spring could not be determined.
Recommendations: Replace pipeline and clean spring.

1A-117 5-19-37
Well - Permanent - ECW
111 15 x 36 30 3 1/4 S x 5 1/4 W
About 8' to water. Masonry cribbed with hand diaphragm pump. No troughs present.
Range and accessibility: Good.
Flow could not be ascertained. Handle for pump missing. Flow probably too small to warrant troughs.
Recommendations: None.

1A-118 5-19-37
Well - Permanent - Shallow
111 15 x 36 30 1 3/4 S x 5 1/4 W
Not visited but shown on range maps.
Range and accessibility: Good to fair.
Recommendations: None.

1A-119 5-20-37
Well - Permanent - Irrigation
110 45 x 36 45 15 1/4 S x 11 W
Concrete cribbed with 20' concrete trough and hand diaphragm pump.
Range and accessibility: Good.
Good condition. Pump is working all right. About 4' to water in well.
Recommendations: None.

1A-120 5-19-37
Reservoir - Temporary - ECW
111 30 x 37 00 13 1/4 S x 14 1/4 W
Masonry dam, built up and rebuilt. Crack in dam causes it to leak.
Fair. range and accessibility.
Rock drainage. Difficult to get to for work because of sand.
Recommendations: Fix reservoir so it won't leak.

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WR 823

LAND MANAGEMENT UNIT /

Range Improvement Survey

II. Dipping Vats

Dipping vats are located at Kaibito and Red Lake. Vats outside the area having influence on the unit are located at Shonto and the Gap.

111° 00' 36° 45'. Kaibito Dipping Vat.

This vat is located at Kaibito Trading Post and was constructed by E. C. W. in 1935. Pens, corrals, grain pens, and 50' concrete vat are present and in good condition. Water supply for the vat is the day school well. The presence of this vat at this location is augmenting the wind erosion by concentration of livestock. Active sand dunes are present and encroaching upon the Kaibito Day School. Forage conditions are very poor in the area surrounding Kaibito.

Possibilities of obtaining a drilled well 7 miles north of Kaibito is reported. If a drilled well can be obtained here, the Kaibito vat should be moved.

110° 45' 36° 30'. Red Lake Dipping Vat.

The Red Lake dipping vat located at the Red Lake Trading Post is in fair condition. Corrals need repair, but the 50' concrete vat is in good condition. The area surrounding the vat is badly over-grazed, but moving the vat to an area where there is more feed is not recommended until the range management plan is effective so as not to deplete another area as is the Red Lake area.

111° 30' 36° 45' 7-3/4 S. x 1-7/8 W. at Proposed Well 1 A-151.

If this well is drilled and furnished water, the construction of a dipping vat here is recommended.

Estimated cost, \$2,000.00.

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WR 824

LAND MANAGEMENT UNIT NO. I
Range Improvement Survey
III. Fenced Areas

Fenced areas in the Unit include the Kaibito ram pasture, desilting plots on five reservoirs, and one R. M. S. plot.

The buck pasture is enclosed in S.C. S. 6-wire fence 22 miles long. 16,351 surface acres are included in the fence.

In 5 desilting plots enclosed by 6-wire fences approximately 150 acres are excluded from livestock.

One R. M. S. plot is located within the Unit ten miles southwest of Kaibito.

Approximately 16,500 acres are under fence at present, and only six fenced areas are proposed, one each at the following reservoirs are to serve as desilting plots: 1A-47, 1A-114, 1A-57, 1A-162, 1A-163, and 1A-164.

RANGE IMPROVEMENT SURVEY
IV. Stock Trails

Stock trails to White Mesa, Black Mesa, and across Navajo Canyon make the entire Unit accessible to livestock.

There are no more stock trails proposed for the area.

1A-57 12-17-36
Reservoir - Permanent
110 45 x 36 30 6 1/2 S x 6 3/4 W
Cow Springs Lake
Large area about 100 acres about 1 1/2 miles long. Shallow, fed
with springs.
Range and accessibility: Poor to fair.
Fair condition. Has about 4' water now.
Recommendations: None.

1A-58 2-11-37
Project #10 AA
110 45 x 36 30 6 1/4 S x 6 1/2 W
Concrete cribbing with hand suction pump. Frozen at time so could
not see in well or work pump.
Range and accessibility: Poor.
Domestic use only. No troughs.
Recommendations: Too close to permanent stream for livestock use.

1A-59 3-8-37
Spring - Permanent - Undeveloped
110 45 x 36 30 4 1/2 S x 5 W
Cow Springs Canyon
Flow about 1/4 second foot of water now.
Range and accessibility: Range depleted.
Recommendations: None.

1A-60 5-10-37
Spring - Permanent
110 45 x 36 30 1 1/4 S x 2 W
Badger Spring
2 - 20' concrete troughs. Flow about 1 and 1/2 gal. per minute.
Range and accessibility: Only fair.
Good condition. Permanent stream close to this spring. Flows
from about 2 miles north of spring to Cow Springs Lake.
Recommendations: Too close to running stream for further develop-
ment.

1A-61 2-11-37
Reservoir - Temporary
110 45 x 36 30 3 1/2 S x 1 3/4 W
Blue Lake
Covers about 40 acres when full. Dam about 10' high. Capacity
200 acre-feet.
Accessibility: Excellent. Range: Fair.

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WR 826

MAINTENANCE AND DEVELOPMENT PROJECTS
AT EXISTING SUPPLIES
Land Management Unit No. I.

(In order of priority.)

1A-23 Drilled Well E. C. W.
111° 00' 36" 45' 16-3/4" S. x 13-3/4" W.

Troughs recommended for the buck pasture have already been constructed and are in readiness for use.

This well is pumping only a very small amount of water. Well should be checked to see if it has sanded up or if it needs to be deepened. Cost, unknown.

1A-25 Drilled Well E. C. W.
111° 15' 36" 30' 3-3/4" S x 3-3/4" W.

Troughs at this windmill for use in the buck pasture were recommended and have already been constructed and are ready for use.

This well is pumping only a limited amount of water and should be checked to see if it has sanded up or if the well needs to be deepened. Cost: unknown.

1A-28 Drilled Well E. C. W.
111° 00' 36" 45' 9-1/4" S x 10-1/4" W.
(Bert Tso)

This windmill has never pumped adequate water. Leathers have been replaced from time to time with no results. Mr. Weeks advises to deepen this well 100 feet. Estimated cost, \$900.00.

1A-92 Reservoir nearly permanent.
(Antelope Reservoir.)
111° 15' 37" 00' 16" S. x 4" W. C. C. C.
122

This reservoir nearly washed out last year. The spillway needs to be widened.

400 yds. rock @ \$200 ----- \$800.00
Repair desilting plot fence - 15.00
\$815.00

1A-94 Reservoir
111° 15' 37" 00' 13-1/2" S. x 9-1/2" W.

Repair desilting plot fence -- \$35.00

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WR 827

1A-47

Reservoir E. C. W.
111° 00' 36" 30' 4-3/4" S. x 1/2" W.
(Frenchman's Reservoir)

This is nearly permanent and constructed in a sandstone canyon. The dam needs to be raised about 2' and a masonry wall constructed at spillway and down the side of dam to divert water. The reservoir is being filled with sand. A plot fenced to the west of the canyon will stop a great deal of sand from reaching the reservoir. The dam is seeping and the lower slope should be filled in to make it a 3 to 1 slope.

Estimated cost:	
45 yds. masonry -----	\$ 350.00
(Rock already at site.)	
700 yds. earth @ .50 -----	350.00
1 mi. fence -----	300.00
(80 acre desilting plot)	
	<u>\$ 1,000.00</u>

1A-34

Reservoir E. C. W.
111° 00' 36" 45' 15-1/2" S. x 3-1/4" W.

This reservoir filled for the first time this July. Reservoir holds about 20' water. Spillway washed badly. Recommendation: construct masonry wall to divert water.

22 1/2 yds. masonry @ \$15 -----	\$ 337.50
Remove 150 yds. dirt -----	112.50
	<u>\$ 450.00</u>

1A-14

Reservoir E. C. W.
110° 45' x 36° 45' 2" S. x 12" W.

This dam washed out. 60' of 11' fill is required to replace the structure or approximately 1,500 yds. In order to raise the dam 3' and insure its not washing out would require an additional 1,000 yds. of dirt. Approximately \$100 will be required to fix spillway so it will not cut out toward dam.

It is recommended that the dam be replaced and raised 2 or 3 feet and spillway repaired.

Estimated cost:	
2,500 yds. earth fill @ .35 -----	\$ 875.00
Repair spillway -----	100.00
Fence desilting plot 1 mi. @ \$300 --	300.00
	<u>\$ 1,275.00</u>

This estimate includes \$525 maintenance cost and \$750.00 development cost.

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WR 828

1A-6 Reservoir E. C. W.
111° 00' 36° 45' 1-1/4" S. x 1-1/4" W

The desilting plot fence on this reservoir is down in two or three places and needs repairing. Estimated cost, \$25.00.

1A-116 Spring E. C. W.
111° 15' 36° 30' 8-3/4" S x 13" W

Pipeline to this spring is washed out. Spring needs cleaning.
Replace pipeline 200' - 1" pipe @ .22 ----- 44.00
Clean spring ----- 21.00
\$65.00

1A-107 Spring Undeveloped (Dove Spring)
111 15' 36 45' 13-1/4" S. x 10" W

This spring is reported to be permanent, but only enough flow is now present for domestic use. This spring is recommended for excavation and if enough flow is obtained the spring should be developed for stock water.

4 yds. excavation in rock @ \$10 ----- \$40.00
50' - 1" pipe @ .22 ----- 11.00
Cribbing - 2 yds. @ \$15 ----- 30.00
2 troughs @ \$60 ----- 120.00
\$201.00

1A-120 Reservoir
111° 30' 37° 00' 13-1/4" S x 4-1/4" W

This reservoir was not visited during the survey, but it is reported to be leaking in the cement. When the sand is wet or frozen this should be checked and repaired. Cost unknown.

1A-91 Spring. Irrigation and E. C. W. (Kle Chee)
111° 15' 37° 00' 10" S x 4" W

Troughs at this spring are broken and need to be repaired. Storage of water during seasons when stock can obtain water elsewhere and have it when water is needed. A 50,000 gallon steel-rim storage tank is recommended.

Repair troughs ----- \$ 25.00
Storage tank ----- 625.00
Total -- \$650.00

1A-76.

Well, Irrigation Service
110° 45' 36" 15' 3/4" S. x 9" W.

Gully is cutting in toward this well. Recommended a rock jetty be constructed to turn water away.

40 yds. rock & wire @ \$4.00	----	\$160.00
Install hand pump	-----	35.00
		<u>\$195.00</u>

1A-21.

Well, Shallow, Indian
111° 00' 36" 45' 15-3/4" S. x 8-1/4" W.

This is a shallow well that appears to be nearly permanent, but with only a localized under-flow of water. It is recommended for development. At present there is a juniper log crib and no pump. Well should be tested for flow before development.

Estimated cost of development:		
3 yds. excavation @ \$1.50	-----	\$ 4.50
2 yds. masonry cribbing	-----	30.00
Hand diaphragm pump	-----	35.00
2 - 20' concrete troughs @ \$60	-	<u>120.00</u>
		\$189.50

1A-40.

Reservoir
111° 00' 36" 30' 1/4" S. x 4" W.

This reservoir is at the head of an actively cutting gully. It is proposed to raise the dam and make an equalizing reservoir out of this. In case this is done, an additional 2,500 cu. yds. storage will be added to the reservoir. For further description see Engineering report, L. M. U. No. I.

1A-69

Well E. C. W. 9 C
110° 45' 36" 30' 15" S. x 8" W.

Maintenance on this well recommended during the survey is already completed.

1A-83

Spring - Irrigation Service
110° 45' 36" 15' 5" S. x 9-3/4" W.

Maintenance work recommended during survey already completed.

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WR 830

1A-88

Windmill at Red Lake.
110° 45' 36" 30' 12-1/4" S. x 10-1/2" W.

Maintenance work recommended during survey is already completed.

82

WR 831

PROPOSED NEW DEVELOPMENTS

Land Management Unit No. I.

(Listed in order of Priority)

1A-151 Proposed Drilled Well.
111° 30' 36" 45' 7-3/4" S. x 1-7/8" W.

This location is about 5 miles west of the Copper-mine Trading Post and like 1A-150 is seriously needed as the entire area is without permanent water. This location has been approved by a geologist and is believed to be the best possibility for getting water in a well in this area. A well drilled about 10 miles northeast of this location proved dry at 1,360 feet. It would seem advisable to drill here. If water is obtained, further detailed study by a geologist might reveal other possibilities for obtaining water in drilled wells. If 1A-150 and 1A-151 prove to be dry wells, it will be necessary to make a detailed survey of rock slopes for masonry or cement dam sites in order that water can be developed so that this area of range land can be utilized.

Reports state that the mining company at the Copper mine is to drill a well somewhere in the vicinity of the Copper mine. Whether geological advice in this regard has been obtained or not is not known, but information as to the possibilities of drilled wells will be available after the well is drilled.

Estimated cost of drilling this well and installing windmill, 50,000 gallon steel-rim storage tank and troughs is \$5,500.00.

1A-150 Proposed Drilled Well
111° 15' 36" 45' 1" S. x 13" W.

Geological approval has been given this location for a drilled well. The area is without water, and reservoirs are not practical because of the sandy nature of the country. The well will have to be drilled about 800 feet. The entire area around the Coppermine is without permanent water, and this is one of two locations that are approved by a geologist.

Drilling the well, installing windmill, troughs, and 50,000 gallon storage tank will cost approximately \$5,500.00.

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WR 832

1A-154 Proposed Reservoir
111° 15' 36° 45' 17" S. x 5-1/2" W.

1A-155 Proposed Reservoir
111° 15' 36° 45' 10-1/2" S. x 3-3/4" W. C.C.C.

1A-156 Proposed Reservoir
111° 15' 36° 45' 9-1/2" S. x 5-1/2" W.

The above three developments are in an area where no water other than pot holes in the sand rock exists. These locations were picked merely from a distribution standpoint. Water is needed badly throughout the area and drilled wells are not possible from a geological standpoint. The area should be carefully covered, horseback and masonry or cement dam sites located.

Each reservoir should not cost more than \$1,500.00 or \$2,000.00.

1A-157 Proposed Reservoir
111° 00' 36° 45' 2" S. x 10-1/4" W.

There is no water other than potholes in the rocks. No suitable sight for a masonry dam could be found, but rock slopes might reveal a possible location upon detailed study done horseback. If a suitable sight is located, dam should be constructed. Cost should not exceed about \$1,500.00

1A-158 Proposed Reservoir
111° 00' 36° 45' 5" S. x 10-1/2" W.

Same description as 1A-157.
Estimated cost, \$1,500.

1A-159 Proposed Reservoir.
111° 00' 36° 45' 11" S. x 13" W.

Same description as 1A-157.
Estimated cost, \$2,000.00.

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WR 833

1A-161

Proposed Drilled Well
111° 00' 37° 00' 15-1/4" S. x 2" W.

*C.C.C.
Y. Masamichi*

Permanent water is badly needed in this area. No suitable location for a drilled well could be found, but detailed geological study of the area might possibly locate a suitable site. If such can be done, a well is recommended. Estimated cost, \$5,000.

If a drilled well site cannot be located, masonry dam sites in rock drainages will have to be substituted. Either course of action will require detailed work.

1A-162

Proposed Reservoir
110° 45' 36° 30' 16-1/2" S. x 5-1/4" W.

Water is badly needed in this area. A suitable site has been selected. To construct this reservoir would take 3,000 yds. of earth @ \$0.35, or \$1050.00. Rock core wall \$350.00. Desilting plot 2-mile fence @ \$300.00 -- \$600.00, and water spreaders in desilting plot \$400.00. Total, \$2,500.00.

1A-160

Proposed Drilled Well
111° 00' 36° 30' 1" S. x 7" W.

*with record well no. 1937
Recomm. to C.C.C.*

Permanent water is not adequate to meet the needs of this range. Geologists have approved this location and water can be expected at about 600 feet.

Estimated cost of drilling well, installing windmill, 50,000 gallon steel-rim storage tank, and troughs, \$4,500.

1A-153

Proposed Reservoir
111° 15' 36° 30' 1-3/4" S x 8-1/2" W.

Water is deficient in this area. No suitable location was found during the survey, but rock slopes might afford a masonry or cement dam site upon a detailed survey of the area. Cost should not exceed \$1,500.00.

85

WR 834

1A-163

Proposed Reservoir

110° 45' 36" 30' 15" S. x 2-1/2" W.

Water is needed in this area. No suitable site could be located, but further detailed work is likely to show one to be present. If such can be found, a reservoir should be constructed with desilting plot. Cost should not exceed about \$2,000.00.

1A-164

Proposed Reservoir

110° 45' 36" 15' 1-1/2" S x 2-1/4" W.

A location was picked at this place by an E. C. W. and S. C. S. representative last year. The soil is sandy and the drainage small at this location. Water is needed in the area, however, and if by detailed work in the area, a better location can be found, a reservoir is recommended. It is thought that the range riders in the area could probably select a site in the area.

Cost should not exceed \$2,000.00 including desilting plot.

1A-152

Proposed Reservoir

111° 30' 36" 30' 1-1/4" S. x 1-1/4" W.

This area is lacking on water. A suitable sight for the construction of a dam could not be found, but rock slopes in the area might afford a masonry or cement dam site upon further detailed study. If a suitable sight can be located within a mile of this sight, a reservoir should be constructed. Cost should not exceed \$1,500.00.

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WR

835

MISCELLANEOUS PROJECTS PROPOSED

SHEARING PLANTS

Shearing plants are proposed at Red Lake, Cow Springs, Kaibeto, and Antelope Reservoir, and at 1A-151 and 1A-161 if water is developed.

DIPPING VATS

Construction of dipping vats at 1A-151 and 1A-161 is recommended if water is found. Each dipping vat will cost approximately \$2,000.00.

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WR 836

JUSTIFICATION AND COST SHEET FOR RANGE IMPROVEMENT

Unit No. 1 District Navajo

Address

Rancher's Name

Location	Project No. of Development	Classification of Development	Purpose	Serviced Area (Acres)	Miles	F. A.	S. C. C.	Surface acres		Forage acres		Private land		State land		Public Domain		Forest		Indian		Other	
								(A.U. on ranch)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)	(A.U. in A.U.)
110151360151 18' x 13 1/2'	1 A - 150 D		Stock Distribution	15000		1950	780	Justification		R.A. Justification		Other Justification		Archer's		Estimated		Kind of Development		Kind of		Yards	
								A.U. Per	Cost	A.U. Per	Cost	Cost	Par	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost
110151360151	1 A - 150 D		Stock Distribution	15000		1950	780	250	1950	250	1962						5500.00	New Drilled well					
110151360151	1 A - 150 D			11000		1962	785	250		1962						5500.00	New Reservoir						
110151360151	1 A - 152			8000		820	168	250		820						1500							
110151360151	1 A - 153			6000		300	120	250		300						1500							
110151360151	1 A - 154			8000		800	320	250		800						1500							
110151360151	1 A - 155			7000		180	196	250		180						2000							
110151360151	1 A - 156			8000		670	268	250		670						2000							
110151360151	1 A - 157			7500		850	310	250		850						1500							
110151360151	1 A - 158			7500		1050	420	250		1050						1500							
110151360151	1 A - 159			7000		550	224	250		550						2000							
110151360151	1 A - 160 D			15000		1280	512	250		1280						1500	Has Drilled Well						
110151360151	1 A - 161			15000		2140	856	250		2140						5000	New Drilled Well						
110151360151	1 A - 162			1500		835	324	250		835						2500	New Reservoir						
110151360151	1 A - 163			5000		1110	444	250		1110						2000							
110151360151	1 A - 164			4000		670	256	250		670						2000							
TOTAL																							

Improvement (New development) (Repair)
 Classification (New) (Repair or change)
 (Roads) (Fences) (Cattle guards)
 (Trails) (Horse, tractor etc.)

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JUSTIFICATION AND COST SHEET FOR RANGE IMPROVEMENT

Rancher's Name		Address		Unit No. 1		District		Navajo						
(Brands)	(Kinds of L.S.) (Survey C.C. in A.U.) (A.U. on ranch)	(Surface acres)	(Forage acres)	(Private land)	(State land)	(Public Domain)	(Forest)	(Indian)	(Other)					
				S.A.	S.A.	S.A.	S.A.	S.A.	S.A.					
Location	Project No.	Classification of Development	Service Area (Sections)	Purpose	Survey C.C. in A.U.	Justification A.U. Per Cost M.	R.M. Justification Cost	Other Justification Cost	Actual A.U. Cost	Estimated A.U. Cost	Kind of Development Permitted by Cooperator	Kind of Material	Kind of Labor	Year
111°00'36"151 12°S x 14°W	1 A - 6	M	5000	Dredging	100	2.50	\$ 400.00			25.00	Repair desilting plot fence.			
110°45'36"151 2°S x 12°W	1 A - 14	M & D	8000	-	960	2.50	960.00			1275	Repair dam fence desilting plot.			
111°00'36"151 15 3/4°S x 8°W	1 A - 21	D	6000	-	720	2.50	720.00			189.50	Develop well			
111°00'36"151 16 3/4°S x 13 3/4°W	1 A - 23	M	16000	-	1735	2.50	1735.00			Unknown	Check wall to see if it has sanded up.			
111°15'36"301 3 3/4°S x 3 3/4°W	1 A - 25	M	16000	-	1250	2.50	1250.00			Unknown	Way need deepening.			
111°00'36"151 9°S x 10°W	1 A - 28	D	12000	-	900	2.50	900.00			900.00	Deepen wall 100 feet.			
111°00'36"151 15°S x 8°W	1 A - 34	M	6500	-	610	2.50	610.00			450.00	Repair spillway.			
111°30'36"301 1°S x 1°W	1 A - 40	D	3000	-	480	2.50	480.00			Unknown	(See Eng. Report)			
111°00'36"301 4 3/4°S x 2°W	1 A - 47	M & D	8000	-	400	2.50	400.00			1000.00	Raise dam. Fix spillway decrease slope on lower side of dam.			
110°45'36"301 15°S x 8°W	1 A - 69	M	5000	-	200	2.50	200.00				Maintenance work complete.			
110°45'36"151 3 1/4°S x 9°W	1 A - 76	M & D	3000	-	210	2.50	210.00			195.00	Turn water away from well.			
111°00'36"301 5°S x 9 3/4°W	1 A - 84	D	8000	-	320	2.50	320.00			35.00	Install pump.			
110°45'36"151 12°S x 10°W	1 A - 83	M	6000	-	435	2.50	435.00				Maintenance work complete.			
110°45'36"301 12°S x 10°W	1 A - 88	M	7500	-	150	2.50	150.00							
111°15'36"001 10°S x 11°W	1 A - 91	M & D	9000	-	615	2.50	615.00			625.00	Build storage and repair troughs.			
TOTAL														

*Improvement (water development) (new) (repair)

Classification (fences) (new) (repair or change)

(Rounds) (Trails) (Cattle guards)

(Horse, tractor etc.)

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JUSTIFICATION AND COST SHEET FOR RANGE IMPROVEMENT

Rancher's Name _____ Address _____ Unit No. 1 _____ District Navajo _____

(Brands)	(Kinds of L.S.)	(Survey C.C. in A.U.)	(A.U. on ranch)	(Surface acres)	(Forage acres)	(Private land S.A.)	(State land S.A.)	(Public Domain S.A.)	(Forest S.A.)	(Indian S.A.)	(Other S.A.)
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Location	Project No.	Classification of Development	Purpose	Served Area Acres (Sections)	Miles	F. A.	Survey C.C. in A. U.	Justification A.U. Per Cost Mi.	R.M. Justification Cost	Other Justification		Actual A. U. Cost	Estimated Actual Cost	Kind of Development Furnished by Cooperator			
										Cost	For			Kind-Materials	Kind-Labor	Value	
111°15'37"00" 16°S x 4°W	1 A - 92	M	Stock Distributor	10000		1100	440	2.50	\$ 1100.00			\$	\$ 815.00	Widen spillway. Repair desilting plot fence.			
111°15'37"00" 132°S x 93°W	1 A - 94	M		7000		420	168	2.50	420.00				35.00	Repair desilting plot fence.			
111°15'36"45" 132°S x 10°W	1 A - 107	D		5000		775	310	2.50	775.00				201.00	Develop spring.			
111°15'36"30" 8 3/4°S x 13°W	1 A - 116	M		6500		130	52	2.50	130.00				65.00	Repair pipeline and clean spring.			
111°30'37"00" 13 3/4°S x 14°W	1 A - 120	M		7000		240	96	2.50	240.00				Unknown	Repair leak in reservoir.			
TOTAL																	

WR 839

*Improvement (Water development) (New/Repair)
 Classification (Fences) (new/repair or change)
 (Roads)
 (Trails)
 (Cattle guards)
 †Horse, tractor etc.