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ENGINEERING SURVEY FOR JAPANESE RELOCATION SETTLEMENT
NEAR HOLYOKE, COLORADO AND GRANADA, COLORADO

The following telegram is quoted:

1 DIV ENGR OFC SANFRANCISCO MAY 14 1942

DIVISION ENGINEER
MISSOURI RIVER DIVISION
OMAHA NEBR

WAR RELOCATION AUTHORITY REQUESTS YOU DETAIL AN ENGINEER
COMMA AN APPRAISER AND A MAN QUALIFIED TO PASS UPON WATER
SUPPLY FOR DOMESTIC PURPOSES COMMA TO MEET MR FRED RESS
AT PRINCIPAL HOTEL COMMA HOLYOKE COMMA PHILLIPS COUNTY
COLORADO COMMA ON TUESDAY MORNING MAY 19 FOR SITE BOARD
INVESTIGATION OF PROPOSED RELOCATION AREA FOR JAPANESE
EVACUEES NEAR HOLYOKE STOP ON MAY 20 SAME BOARD WILL CONTINUE
TO GRANADA TO INVESTIGATE LAMAR AND XY RANCH PROPERTIES IN
PROWERS COUNTY COLORADO STOP RELOCATION AREA WILL PROVIDE
FOR FROM 5000 TO 10000 EVACUEES TOP REQUEST YOU WIRE MR
R B COZZENS COMMA WAR RELOCATION AUTHORITY COMMA WHITCOMB
HOTEL COMMA SANFRANCISCO NAMES OF PERSONS WILL MEET MR RESS
AS REQUESTED END IN ABS DIV ENGR

MATHESON 606PM

END EM
END MS

In accordance with the above request the following party was
formed:

Captain H. R. Brown, Missouri River Division, Electric Power
Supply
Mr. B. M. Babb, Omaha District, Water Supply and Sewage
Disposal
Mr. H. B. Grace, Missouri River Division, Real Estate
Section

I N D E X

HOLYOKE AREA

Section I	PROJECT DESCRIPTION AND LOCATION...	Page 1
II	PRESENT USE OF THE LAND.....	1
III	CLIMATOLOGICAL DATA.....	2
IV	LAND ACQUISITION.....	2
V	REGIONAL FACTORS.....	5
VI	DOMESTIC WATER SUPPLY.....	7
VII	SEWERAGE.....	7
VIII	IRRIGATION.....	8
IX	TOPOGRAPHY AND DRAINAGE.....	8
X	ELECTRIC POWER SUPPLY.....	9
XI	FUEL.....	11
XII	TELEPHONE SERVICE.....	12
XIII	CONCLUSIONS.....	12

HOLYOKE

HOLYOKE AREA

I. PROJECT DESCRIPTION AND LOCATION:

The Holyoke area is located on the headwaters of Frenchman Creek in the east central portion of Phillips County, Colorado. Phillips County is in the northeast portion of Colorado. (See Exhibit No. III & No. IV) The area is approximately 12 miles east of Holyoke and the eastern border is coincident with the Colorado-Nebraska state line. The area is approximately 6 miles east to west and from 2-1/2 to 3 miles north to south and covers an area of approximately 9332 acres. The entire proposed area may be classified as flat and gently rolling ground. The expansion of the area to the west or to the east into the State of Nebraska is feasible.

II. PRESENT USE OF THE LAND:

A major portion of the area is in cultivation. About 500 acres of land are now irrigated. Approximately fifty (50) percent of the land is being farmed by owner-operators and the other fifty (50) percent by tenants. Fifteen families, or approximately 60 persons, will be displaced if this area is purchased by the Federal Government.

The irrigable soils are typical High Plains soils and are similar to Rosebud and Tripp series. They are quite fertile. Small grain farming is the major use of land in the area at the present time. Some corn and row feeds are also grown under dry land conditions. Dry land yields for the above crops average 10 to 20 bushels for wheat, 40 bushels for corn and 1-1/2 tons per acre for row feeds. Sugar beets, alfalfa, barley, oats and corn are being produced under irrigation.

Yields approximately 18 tons for sugar beets, 2 to 4 tons for alfalfa, corn 75 bushels per acre, oats and barley 75 to 80 bushels and wheat about 40 bushels per acre. Under irrigation the area is readily adaptable to sugar beets and sugar refining plants are located at Sterling, Colorado and Ovid, Colorado, 50 and 35 miles distant, respectively.

Foundation Conditions

The soil within the camp site area is such that stable foundations may be expected for any type of structure contemplated for the project. Structures existing within the area indicate no settlement may be expected from foundations designed for stable soil conditions.

Foundations should be carried to a depth of at least three (3) feet below normal ground level.

Flood Conditions:

So far as is generally known the proposed area is not subject to flood conditions.

III. CLIMATOLOGICAL DATA:

The average length of growing season is 140 days, and annual precipitation is approximately 18 inches. Average January temperature is 26 degrees and average July temperature is 76 degrees. The area is subject to the general windiness of the Plains, and has an average wind velocity of approximately 10 miles per hour. By reason of the altitude (approximately 3,700 feet), summer days are generally warm and summer nights are cool. No climatic factors appear to affect possibility of any industrial development.

IV. LAND ACQUISITION:

The site includes the following described land:

Twp. 7 N., Rge. 42W.:

Sec. 17: Lot 2, W 1/2 of SE 1/4; Sec. 19: Lots 1, 2, 3, and 4, E 1/2 of W 1/2, E 1/2; Sec. 20: Lots 1, 2, 3, and 4, W 1/2 of E 1/2, W 1/2; Sec. 29: Lots 1, 2, 3, and 4, W 1/2 of E 1/2, W 1/2; Sec. 30: Lots 1, 2, 3, and 4, E 1/2 of W 1/2, E 1/2; Sec. 31: Lots 1, 2, 3, and 4, E 1/2 of W 1/2, E 1/2; Sec. 32: NW 1/4.

Twp. 7 N., Rge. 43W.:

Sec. 21: S 1/2; Sec. 22: S 1/2; Sec. 23: S 1/2; Sec. 24: S 1/2, NE 1/4; All Secs. 25; 26; 27; 28; Sec. 33: N 1/2; Sec. 34: N 1/2; All Secs. 35, and 36.

In the following, no development cost has been taken into consideration.

Land Cost.	\$242,940
Improvements	<u>65,000</u>
	\$307,940
Cost of growing crops.	<u>89,000</u>
	\$396,940
Contingencies	30,000
Administrative overhead.	<u>15,000</u>
	\$441,940

<u>Tract No.</u>	<u>Owner</u>	<u>Appraised Value</u>
1	Ira Taylor	\$ 11,500
2	Percy Travis	12,500
3	Dudden	20,000
3-A	Dudden	2,400
4	Wm. Bauer	10,000
5	Lloyd Covert	4,200

<u>Tract No.</u>	<u>Owner</u>	<u>Appraised Value</u>
6	Ollie B. Stiles	\$ 7,000
7	W. E. Heginbotham	22,000
7-A	W. E. Heginbotham	13,500
8	Alice B. Stiles	4,800
9	George W. Meyers	8,300
10	Ella Kneale	4,000
11	Henry Lutz	3,200
12	C. A. Stiles	30,000
13	Rex Poe, et al	20,000
14	Geo. F. Garland	25,000
15	M. K. Bennett	28,000
16	Fred Kuehne	6,400
17	Edson Parr	8,000
18	Daisy Wade	6,400
19	R. A. Stout	4,800
19-A	R. A. Stout	3,000
20	Heman Poe	1,000
21	Guy and Glenn Poe	13,000
22	E. A. Denbo	6,000
23	Fred Borland	12,800
24	State School Lands	15,000
25	Pleasant Valley School	5,100
26	State Line Cemetery	40

V. REGIONAL FACTORS:

General:

The facilities for housing workers during the construction period will be overtaxed and will require the use of trailers and temporary camps. The facilities are considered adequate for the operating personnel.

Population and Locality:

There are no towns of any appreciable size in the vicinity of Holyoke. Towns and their population and distances to the sites are:

Holyoke, Colorado	12 miles west	Population	1226
Julesburg, Colorado	30 miles north	Population	1467
Haxtun, Colorado	18 miles west	Population	1027
Sterling, Colorado	50 miles west	Population	7195
Wray, Colorado	40 miles south	Population	1785
Amhurst, Colorado	9 miles northeast	Population	119

There are no building codes or zoning laws that will be effective in this area.

Labor:

Most of the skilled workers of this community have moved to other war industries and there would undoubtedly be a labor supply problem. The present rate for unskilled labor is 50¢ to 55¢ per hour and the rate for skilled labor is 75¢ to \$1.00 per hour.

Construction Materials:

Sand and gravel are available from local sources.

Accessiblity and Transportation Facilities:

The town of Holyoke is located on east-west U. S. Highway #6 and on the north-south State Highway #51. Highway #6 is a bituminous surfaced highway while State Highway #51 is gravel surfaced. As indicated on Exhibit III, the proposed camp site is located approximately

1-1/2 miles south of Highway #6.

The town of Holyoke is served by branch line of the Chicago, Burlington and Quincy Railroad. Interconnections are as follows:

Holdrege, Nebraska, main line CB&Q R. R. Omaha, Nebr. to Denver, Colorado.
Sterling, Colorado, CB&Q, Alliance, Nebraska to Denver, Colorado.
Sterling, Colorado, Union Pacific R. R., Omaha, Nebraska to Denver, Colorado.
Cheyenne, Wyoming, CB&Q R. R., Billings, Montana to Denver, Colorado.

Reference is made to Exhibit III which shows the Holyoke-Culbertson Railroad. This line is non-existent, therefore, the nearest trackage facilities are located in the town of Holyoke.

The Burlington Trailways Bus System provides service to Holyoke. There are three scheduled trips daily. The nearest war plant is located at Sidney, Nebraska, approximately 90 miles northwest of the project.

Roads Within the Area:

The tract is easily accessible by means of existing county roads. There are approximately eight miles of graded road within the tract. The road on the south boundary has a lightly graveled surface. Sandy loam, characteristic of the area, makes a sound, desirable earth road, when well graded, and should be simple and economical to maintain, as evidenced by existing roads.

One small bridge crosses Frenchman Creek on the west boundary of Section 36. This bridge is of wood construction with wood abutments, and suited to farm, or light traffic only. Other roadway crossings are directly on the stream bed of the creek and which appears to be satisfactory for most conditions.

VI. DOMESTIC WATER SUPPLY:

Water of excellent quality is available over the entire tract at a depth of 200 to 225 feet. Wells of the type now existing within the tract, and producing water for both domestic use and for irrigation purposes furnish water in sufficient volume, 1000 to 1800 gal. per minute for a camp of considerable larger proportion than is contemplated here.

The city supply for Holyoke, Colorado comes from this same strata. Their experience indicates the adequacy of the supply, and the excellent quality of the water. The water is relatively soft having a total hardness of 20 to 30 grains per gal. (soap test). The city relies on a single well 200 ft. deep with 60 feet of water. The draw down at peak load of 1500 gal. per minute is approximately 10 feet.

The improvements required for camp supply would be as follows:

(Costs are approximate)

3 water wells complete	@ \$7000.	\$21,000.
Distribution System		58,600.
Elevated storage for 450,000 gal.		
3 - 150,000 gal. tanks	@ 15,000.	<u>45,000.</u>
TOTAL		\$124,600.

VII. SEWERAGE:

The topography of the site selected for the camp area is suited to the economical installation of a sewerage collection system for adequate sewerage requirements.

Complete treatment will be required for sewage, the effluent being discharged into Frenchman Creek directly south of the camp area.

Approximate cost for complete sewerage for the proposed camp is as follows:

Sewage Collection System.	\$65,000.
Disposal Facilities	<u>75,000.</u>
TOTAL.	\$140,000.

VIII. IRRIGATION

Irrigation within the tract is now carried on successfully by means of water pumped from wells and distributed through a conventional system of ditches.

Wells serving the areas now cultivated, are generally 200 feet in depth. The water rises to within 60 feet of the surface and under peak conditions of pumpage, the draw down is 10 to 12 feet for a delivery of approximately 1500 gal. per minute.

It has been estimated that complete dependence upon irrigation for crop requirements would lower the water table, if practiced generally. However, dependence upon irrigation in this area is supplemental to annual rainfall and irrigation of the tract as proposed, is not expected to affect ground water conditions to an appreciable extent, over a 10 year period, providing recovery of water is held to approximately 200 acre feet per section of land per year.

It is estimated that one well will be required for each 160 acres irrigated, 7,432 acres of the tract are proposed for irrigation. Approximately 50 wells will be required at an average cost of \$6000 each representing a total cost of \$300,000 or \$40 per acre.

IX. TOPOGRAPHY AND DRAINAGE:

Generally the tract is well drained, the slope being toward Frenchman Creek which bisects the area. The entire tract is very slightly rolling, much of it appearing nearly level and except for the depression marking Frenchman Creek all of the area is free of water

courses detrimental to practically all agricultural operations. Such watercourses as exist are gentle depressions with erosive action generally absent. Frenchman Creek, which is dry for a large part of any season, has a sandy bed and for a part of its length prairie grass grows along the creek bed blending the contour of the drainage course with the adjacent land and giving the appearance of a gentle depression rather than a marked water course.

Beginning at the south bondary of the tract, grazing land adjacent to the tract slopes rapidly upward toward the summit of a chain of hills, two or more miles to the south. The drinage from this grazing area is diverted largely toward the southeast boundary of the tract, and no apparent erosive action is caused by reason of the rapid run off from this adjacent hilly area.

On the other three sides, the tract is bounded by farming lands of similar physical appearance to the tract area. Drainage from these adjoining areas is toward Frenchman Creek.

X. ELECTRIC POWER SUPPLY:

The maximum demand is based on 700 K. W. @ 90% P. F. per 10,000 evacuees, therefore, the camp demand for 5000 evacuees and 500 administration personnel is estimated to be 385 K. W. (Power for irrigation pumping not included.)

The source of supply in this vicinity is the Holyoke Diesel Plant which contains 3 units:

	<u>Prime Mover</u>	<u>K.W. @ 3700*</u>
#1	280 H.P.	150
#2	450 H.P.	275
#3	700 H.P.	425
	TOTAL	850 K.W.

The plant peak to date occurred in July, 1941, and was 375

K. W. A firm power analysis indicates the following:

Plant Capacity	850 K. W.
Less Peak	<u>375 K. W.</u>
	475 K. W.
Less Largest Unit	<u>425 K. W.</u>
Excess Firm	50 K. W.

It is concluded that firm power in excess of 50 K. W. is not available in the vicinity of Holyoke. This plant at Holyoke is not connected with any other generating plant.

Julesburg, Colorado, approximately 30 miles north of Holyoke has a Diesel plant with installed generating capacity of 760 K. W. and a peak of about 345 K. W. Interconnection is not considered practical.

Sterling, Colorado, approximately 50 miles west of Holyoke, has a steam and diesel plant of 5500 K. V. A. generating capacity (peak load unknown), however, the construction of approximately 50 miles of line to firm the Holyoke supply is not practical.

While the No. 3 machine (700 H. P.) is a new machine (1942), it is still subject to stoppages due to mechanical failures as has been the experience with the No. 2 machine (450 H.P.). The total operating hours on No. 3 is 581.

The installation of an additional 425 K. W. generator and prime mover is estimated to cost \$50,000.00. It is well to consider this as a critical material problem rather than a cost problem.

Reference Exhibit VII which indicates plant capacity, substation voltage, capacity and approximate load and transmission facilities to the site. The phase conductors on the existing line are No. 4 A, CWC, and the neutral is No. 6 A, CWC. The present load on this line is

about 35 K. W. At the camp tap, the load is expected to be 420 K. W. and regulation at this point would be about 5%. Approximately 1.5 miles of new line are necessary at an estimated cost of \$2,000 per mile, however, representatives of the R. E. A. indicated that materials including conductors were on hand and could be used for this extension. Increasing the capacity of the substation at the Holyoke plant appears necessary. Camp distribution could be accomplished at the transmission voltage. Energy is estimated to cost approximately 2 cents per K. W. H.

XI. FUEL

The use of coal for space heating, cooking and hot water heating is recommended. Coal is available from the mine at Routt County, Colorado. It is of the bituminous type with a value of 12,840 BTU's per pound. Egg coal will deliver at about \$8.00 per ton, F.O.B. Holyoke, and standard nut coal will deliver for about \$7.10 per ton, F.O.B. Holyoke. The following is an analysis:

Approximate Analysis:

Moisture	7.9%
Volatile Matter	37.5%
Fixed Carbon	50.0%
Ash	<u>4.6%</u>
TOTAL	100.0%

Ultimate Analysis:

Hydrogen	5.8%
Carbon	69.6%
Nitrogen	1.5%
Oxygen	17.8%
Sulphur	.7%
Ash	<u>4.6%</u>
TOTAL	100.0%

XII. TELEPHONE SERVICE

The town of Holyoke is served by the Bell System and a 4-wire rural type line is located approximately 1-1/2 miles north of the proposed building area.

XIII. CONCLUSIONS:

1. A large portion of the land appears suitable for the purpose intended and the entire area (9,332 acres) can be acquired for about \$441,940.00.
2. It is considered that adequate water can be secured from wells for camp and irrigation purposes. A camp water supply system is estimated to cost \$124,600.00.
3. A complete treatment sewage plant and a gravity flow collection system is estimated to cost \$140,000.00. Trenching difficulties are not anticipated.
4. Transportation facilities are considered adequate for camp operation but the transportation of construction materials will present a problem, inasmuch as the nearest trackage is at Holyoke.
5. As shown in Section 10, Electric Power Supply, a firm power analysis has indicated that there is a definite shortage of power in this vicinity. The installation of additional generating equipment is estimated to cost \$50,000.00.

I N D E X

GRANADA AREA

Section I	PROJECT DESCRIPTION & LOCATION. .	Page 13
II	PRESENT USE OF LAND	13
III	CLIMATOLOGICAL DATA	14
IV	LAND ACQUISITION.	15
V	REGIONAL FACTORS.	17
VI	DOMESTIC WATER SUPPLY	19
VII	SEWERAGE.	20
VIII	IRRIGATION.	20
IX	TOPOGRAPHY AND DRAINAGE	21
X	ELECTRIC POWER SUPPLY	21
XI	FUEL	24
XII	TELEPHONE SERVICE	25
XIII	CONCLUSIONS	25

GRANADA

GRANADA, COLORADO AREA

I. PROJECT DESCRIPTION AND LOCATION:

The Granada area is located in the Arkansas River Valley in Prowers County, Colorado. Prowers County is located in the southeast corner of Colorado. (See Exhibits V and VI). The area is approximately 7 miles long east to west and from 2-1/2 to 3 miles long north to south. The entire area is relatively flat. Expansion of the area can be made in any direction; however, land suitable for irrigation is available in a general east-west direction.

II. PRESENT USE OF LAND:

There are about 10,150 acres of land included within the boundaries of the area. Of this acreage, approximately 5,500 acres are now under irrigation and an additional 1,000 acres could be improved and irrigated to produce good crop yields.

The principal soil types found in this area are the Manvel silt loam, Las Animas silty clay loam, and Las Animas clay loam. The Manvel silt loam is one of the most productive soils of this region. The Las Animas soils are mostly heavy textured, affected by high water table and alkali accumulations in some places. The Granada Drainage District has improved the condition of much of these heavy textured soils. For the type of crops that can be grown on this project an average of 4 acre-feet of water per acre is believed to be adequate.

Approximately 50% of the land is in most cases silt loam in texture, with good moisture-holding capacity, and good sub-surfacing drainage. Approximately 40% of the land is heavy textured for the most part, and have been improved in many instances by drainage and incorporation of

of organic material in the surface. Other lands are range lands or lands unsuited to irrigation.

Crops well adapted to this area include sugar beets, alfalfa, small grains, and truck crops such as cucumbers, onions, tomatoes, beans, peas, cabbage, potatoes, sweet potatoes, and melons. Average yields on the best soils are: sugar beets 12 to 14 tons per acre; alfalfa 3 to 4 tons per acre; and barley 50 to 60 bushels per acre. Average yields of truck crops cannot be given as very little commercial production of these crops has been attempted in this locality.

There has been some damage to sugar beets by infestations of nematodes and leaf spot but this damage has been limited under a rotation system of farming.

Foundation Conditions:

The soil conditions within the building area are sandy with some coarse material and a small amount of cementitious material in the form of clay.

No difficulty is anticipated for any type of foundation required. No rock excavation is anticipated.

III. CLIMATOLOGICAL DATA:

The growing season at this project location averages about 165 days. The average annual precipitation is 15 inches, of which 12 inches occur during the growing season. The average annual temperature is 54 degrees F., with an average daily maximum during June through August of 91 degrees F., and an average daily minimum during December through February of 15 degrees F. The average annual snowfall is about 14 inches.

IV. LAND ACQUISITION:

The major portion of the area is in cultivation, and is now or was last year under irrigation. Of the total 10,150 acres in the proposed project area, 8,188 acres are included in two ownerships: (1) the X-Y Ranch with 4,668 acres, and (2) the American Beet Sugar Company with 3,520 acres. The remaining 1,962 acres are made up of small ownerships.

The X-Y Ranch lands are owner-operated and no problem would be presented in acquiring immediate possession of these lands, however, the lands of the American Beet Sugar Company are all tenant operated, with about 20 white families and 3 Mexican families involved. Most of these tenants have been on this property for several years. Generally the leases are on a year to year basis, but some are for as long a period as three years. It is believed these operators are generally well satisfied with their present leasing arrangement and will be unwilling to have their leases terminated and would no doubt find it difficult to relocate themselves as advantageously as they are now situated. The American Beet Sugar Company has stated they are not willing either to lease or sell their lands located within the proposed project, but if necessary to cooperate with the present emergency would rather sell than lease. It is believed the remaining small tracts within the area can be acquired without difficulty.

In the following, no development cost has been taken into consideration:

Land cost.	\$860,200
Improvements	63,800
	<u>924,000</u>
*Cost of growing crops	50,000
	<u>974,000</u>
Contingencies.	50,000
**Administrative overhead.	<u>10,000</u>
TOTAL	\$1,034,000

*Cost of growing crops does not include \$25,000, which is the approximate value of the 1942 alfalfa crop, which will no doubt be harvested before possession is requested.

**Due to the small number of ownerships within this proposed project, the administrative overhead should be a minor item of expense.

<u>Tract No.</u>	<u>Owner</u>	<u>Appraised Value</u>
1	American Beet Sugar Co.	\$ 700,000
2	Elbert S. Rule	144,000
3	Union Central Life Ins. Co.	9,600
4	Jessie C. Wilson	12,000
5	Dezie G. Noble	12,000
6	George B. Merrill	5,000
7	Fred and Vera Kennedy	4,000
8	L. R. Dickason	1,600
9	George R. McCartney	800
10	Maude Morris	400
10-A	Maude Morris	1,200
11	Warren E. Blazier	2,400
12	Bessie D. Hayden	15,000
13	W. H. Hayden	7,000
14	Mabel Overstreet	9,000

\$924,000

Legal Description

The site includes the following described land:

Twp. 22S., Rge. 44 W.

SE 1/4 Sec. 35; S 1/2 Sec. 36;

Twp. 23S., Rge. 44 W.

Sections 1, 10, 11 and 14; E 1/2, SW 1/4, S 1/2 of NW 1/4,
NE 1/4 of NW 1/4 Sec. 2; S 1/2, S 1/2 of N 1/2 Sec. 3; SE 1/4 Sec. 4;
NE 1/4 Sec. 9; E 1/2 of E 1/2 Sec. 12; E 1/2, E 1/2 of W 1/2 Sec. 15;

Twp. 22 S., Rge. 43W.

W 1/2 of SW 1/4, SE 1/4 of SW 1/4, SW 1/4 of SE 1/4 Sec. 31;

Twp. 23 S., Rge. 43W.

Sections 6, 8, 9, and 15; S 1/2 of SW 1/4, SW 1/4 of SE 1/4 Sec.
4; S 1/2, S 1/2 of NW 1/4 Sec. 5; N 1/2 of S 1/2, and that part of the
S 1/2 of S 1/2 lying north of the A. T. & S. F. Railroad right of way,
in Sec. 7; SW 1/4 of NW 1/4, W 1/2 of SW 1/4, SE 1/4 of SW 1/4 Sec. 10;
W 1/2 of SW 1/4 Sec. 14; NE 1/4, N 1/2 of SE 1/4, SE 1/4 of NW 1/4,
NE 1/4 of NW 1/4, all north of railroad in NW 1/4 of NW 1/4 in Sec. 16;
that part of N 1/2 of NE 1/4 north of A. T. & S. F. Railroad right of
way in Sec. 17; NE 1/4, N 1/2 of SW 1/4, S 1/2 of NW 1/4, NE 1/4 of
NW 1/4, all of NW 1/4 of NW 1/4 east of X-Y Ditch in Sec. 22; SW 1/4,
W 1/2 of NW 1/4, NE 1/4 of NW 1/4 Sec. 23

All located in Prowers County, Colorado.

V. REGIONAL FACTORS:

General:

Facilities for housing construction workers in the town of Granada
are considered inadequate. The population of Granada is approximately
350, however, it is believed that facilities in Lamar, about 18 miles

west , in addition to trailer camp and temporary facilities will have a tendency to relieve the construction worker housing problem.

Population and Locality:

Lamar, Colorado	18 miles west	Population	4,233
Las Animas, Colorado	50 miles west	Population	2,517
Springfield, Colorado	50 miles south	Population	1,393
Holly, Colorado	10 miles east	Population	971
Sheridan Lake, Colorado	26 miles north	Population	587

It should be pointed out that the construction of a Royal Air Force Operational Training Unit at La Junta, Colorado, (approximately 76 miles west) will overtax the housing situation in this general area. Due to the aforementioned construction, it is believed that there will also be a shortage of unskilled and skilled labor in this general area. The present rate for unskilled labor is about 55¢ per hour and rate for skilled labor is about \$1.00 per hour.

There are no building codes or zoning laws that will be effective in this area.

Construction Materials:

An adequate amount of sand and gravel are available in this area.

Accessibility and Transportation Facilities:

As indicated on Exhibit VI the area is traversed by the Atchison-Topeka and Santa Fe Railroad, which connects Kansas City with Albuquerque, New Mexico and the West Coast. Trackage facilities at Granada are limited but are considered adequate at Lamar.

Also as indicated on Exhibit VI, the area is traversed by east-west U. S. Highway #50 which is a bituminous surfaced highway. North-south State Highway #51 thru Granada is a gravel surfaced highway to the north and a graded road to the south.

Roads Within the Area.

In addition to a hard surfaced road (U. S. 50 Highway) which traverses the tract from east to west, all parts of the area are accessible by means of existing roads. These roads are, in general, in good condition, are equipped with suitable culverts or small bridges, and little or no additional construction should be needed to continue their effective use, other than normal maintenance.

VI DOMESTIC WATER SUPPLY:

Water for domestic use is available from three sources:

1. From water bearing gravels in creeks draining the area, which rises toward the south. This water may be piped to the building site by gravity, but must be collected at a source 8 to 10 miles south of the tract. The City of Lamar, Colorado, has such a water supply.

2. From water bearing gravel at shallow depth near the camp site but which is extremely hard and carries some alkali.

3. From artesian sources in the Dakota Sandstone underlying the area at a depth of approximately 500 feet. Water from this type of well within the area is highly satisfactory for human consumption. This source is used for domestic purposes by the town of Granada, Colorado and by the Santa Fe Railroad Company.

The last named source is recommended for development for this project. Artesian water is available in sufficient amount for camp uses, without treatment other than chlorination.

The improvement required for camp supply would be as follows:

2 water wells complete @ \$16,000.	\$ 32,000
Distribution System	60,000
Elevated Storage 450,000 gal.	
3 - 150,000 gal. tanks @ \$15,000.	<u>45,000</u>
TOTAL	\$137,000

VII SEWERAGE:

Sewerage for the proposed camp site may be constructed at minimum cost. The area is well drained and minimum depth of trenches would be needed.

The camp or building site is underlaid with a gravelly substance having the characteristics of rotten stone. No difficulty from this material is expected, also it lies in a strata which is well below the elevation of most of the construction incident to sewerage installation.

Complete treatment will be required for sewage. .

Sewage construction required will be as follows:

(Costs are approximate)

Sewage Collection System.....	\$ 70,000
Disposal Facilities.....	<u>75,000</u>
TOTAL.....	\$145,000

VIII IRRIGATION:

That portion of the tract now held by the American Chrystal Sugar Company is served by the Lamar Ditch with adequate water rights.

The Supply system is complete and with minor improvements and normal maintenance, no further ditching will be required, except such changes as may later be deemed desirable.

The X-Y Ranch is supplied by their private ditch. The system generally is in working condition, except the diversion works from the Arkansas River which have been destroyed by recent floods and construction in the amount of approximately \$12,000 will be required

to replace the diversion structure and cleaning of about twelve hundred feet of canal.

IX TOPOGRAPHY AND DRAINAGE:

With the exception of the building area and small plots adjacent to the south boundary of the tract, the entire area lying within the valley of the Arkansas River is alluvial and generally level in appearance, but with sufficient gradient toward the river for adequate drainage.

Small plots of land within the tract near the south boundary, overlap portions of the slope rising from the alluvial river valley, are well drained, but useless to agriculture.

The area indicated for the camp site as shown on Exhibits V and VI is on a gentle sloping area but well above the valley.

Approximately 40 percent of the X-Y Ranch, adjacent to the Arkansas River, is very flat but due to its porosity, and by means of ditches, is well drained for normal river conditions. This area is affected by annual floods.

One creek flows through the area near the town of Granada, bisecting the tract from south to north. This creek is usually dry, running water only during periods of extreme precipitation.

X Electric Power Supply

It is assumed that Theatre of Operations type construction will be authorized, therefore, the maximum demand will be based on 700 K. W. @ 90% P. F. per 10,000 evacuees. The estimated demand for 5,000 evacuees plus 500 administrative personnel is 385 K. W.

The prime source of supply in this area is the 5000 K. W. steam plant at Lamar, located approximately 18 miles west of the camp site.

There is also an interconnected 120 K. W. diesel plant at Holly (about 11 miles east of the site) which is used for standby service only.

The Lamar Municipal Plant contains the following equipment:

STEAM:

Steam at 400 pounds psi, 700° F - TT

- 1 - Boiler three years old 30,000 pounds steam per hour
35,000 pounds four hour rating.
- 1 - Boiler thirteen years old 25,000 pounds steam per hour
30,000 pounds four hour rating.

PRIME MOVERS & GENERATORS:

- 1 - Steam Turbine, condensing, 3600 RPM, 400 lbs. psi, 700°
F - TT, 2000 K. W., Three years old, direct connected to
3125 KVA 2400 Volt, three phase, sixty cycle alternator
and 30 K. W. exciter.
- 1 - Steam Turbine, Condensing, 3600 RPM, 400 lbs psi, 700°
F - TT, 2000 K. W., Thirteen years old, direct connected
to 2500 KVA, 2400 Volt, 3 phase 60 cycle, alternator and
15 KW exciter.
- 2 - Steam Turbines, Condensing, 3600 RPM 175 lbs psi, 480°
F - TT, 500 KW 22 years old direct connected to 625 KVA
2300 Volt, 3 phase, 60 cycle alternator and 10 KW
exciters.

The normal plant peak is approximately 2560 KW as follows:

City of Lamar.	900 K. W.
R. E. A.	460 K. W.
Transmission System.	<u>1200 K. W.</u>
TOTAL	2560 K. W.

The maximum plant peak to date is about 3800 K. W., which was caused by the use of electric power for construction at Caddoa Dam (about 17 miles west of Lamar). The peak at the dam is now about 1500 K. W. (occurs about 4:00 P.M.) and is expected to drop to less than 300 K. W. by September 1, 1942.

It should be pointed out that the prime mover and generator capacity appear adequate but that the boiler capacity is the limiting factor in a firm power analysis and with either boiler down for repairs it is believed that the use of industrial power would have to be curtailed. Lamar is not connected with any generating plant other than Holly.

There are two distribution agencies in this vicinity, the City of Lamar Transmission System and the Southeast Colorado Power Association (R.E.A.) with headquarters at La Junta, Colorado.

Reference is made to Exhibit No. I which shows the location of the transmission lines and to Exhibit No. II which is a schematic diagram showing generating plants, substation capacities, system voltages, conductor size and approximate loads.

Service from the Lamar system would probably require a 22 K. V. to 7.6/13.2 K. V., 450 K. V. A. substation at point "D", north of Granada (see Exhibits No. I and No. II). The existing 2.3 K. V. line to Granada is considered inadequate. Approximately 4 miles of line (7.6/13.2K. V.) are necessary and distribution could be accomplished at this voltage. An approximate cost estimate follows:

Substation	\$5000.00
Transmission Line	<u>8800.00</u>
TOTAL	\$13,800.00

The use of #6 copper for the transmission line is considered adequate and 4 miles of 4-wire line would require the use of about 7000 pounds or 3.5 tons of copper. Regulation would be about 3% to the camp switching station.

Service from the R. E. A. would require about one mile of line estimated to cost \$2200.00. The site is approximately 18 R. E. A. line miles from Lamar. A camp load of 385 K. W. plus an estimated existing 120 K. W. load would make the total load of 505 K.W. at the camp take-off point. Regulation at this point would be about 9%. The use of regulators at the camp switching station is considered adviseable. The maximum demand to date on the 750 K. V. A.

R. E. A. substation is 460 K. W., therefore, if this system is used, it would be necessary to increase the size of this substation.

Service from the 22 K. V. Lamar system is considered more practicable.

The unit cost of energy is estimated to cost 2 cents per K. W. H.

XI FUEL:

Coal appears to be the most suitable fuel for cooking, hot water heating and space heating and is available from the Walsenburg area approximately 180 miles westward. This coal is of the bituminous type with a value of about 12,598 BTU's per pound. Egg coal will deliver for about \$7.25 per ton, f.o.b. Granada and standard nut coal will deliver for about \$6.45 per ton f.o.b. Granada.

An analysis of the coal follows:

Moisture	4.0%
Ash	8.1%
Volatile Matter	38.2%
Fixed Carbon	49.0%
Sulphur	0.7%
	<u>100.0%</u>

XII. TELEPHONE SERVICE:

The town of Granada is adequately served by the Bell System.

The Granada-Lamar line parallels U. S. Highway No. 50.

XIII CONCLUSIONS:

1. A large portion of the land appears suitable for the purpose intended and the entire area (10,150 acres) can be acquired for about \$1,034,000.

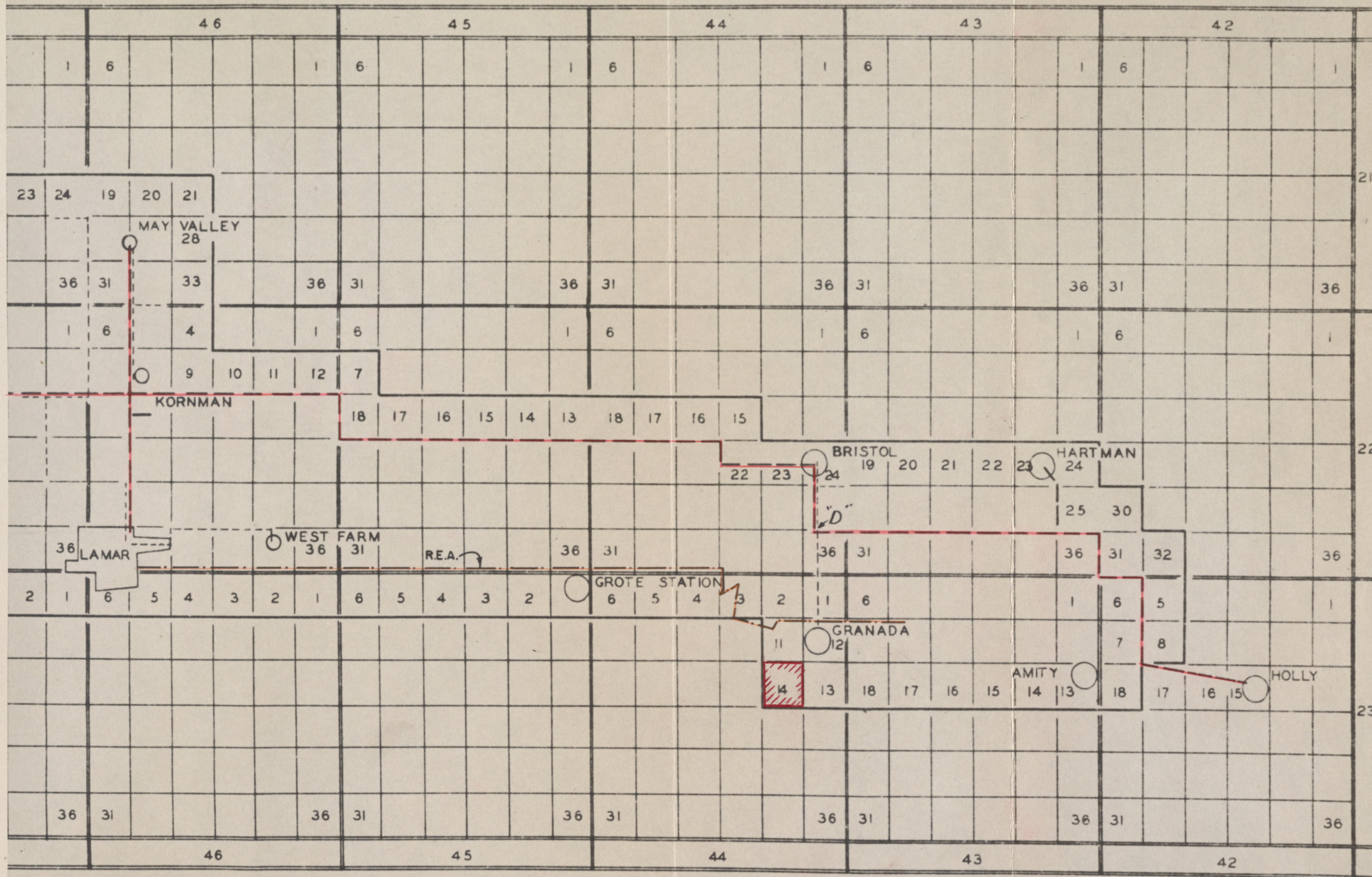
2. It is considered that adequate water can be secured from wells for camp and irrigation purposes. A camp water supply system is estimated to cost \$137,000.

3. A complete treatment sewage plant and a gravity flow collection system is estimated to cost \$145,000. Trenching difficulties are not anticipated.

4. Transportation facilities are considered adequate.

5. As pointed out in Section X, the boiler capacity is the limiting factor in a firm power analysis, and curtailment of the use of power may be reasonably expected when either boiler is out of service for repair or inspection. Transmission facilities in the vicinity of the site are considered adequate. A camp supply substation and line are estimated to cost \$13,800.00.

6. A portion of the bottom lands are subject to flooding.



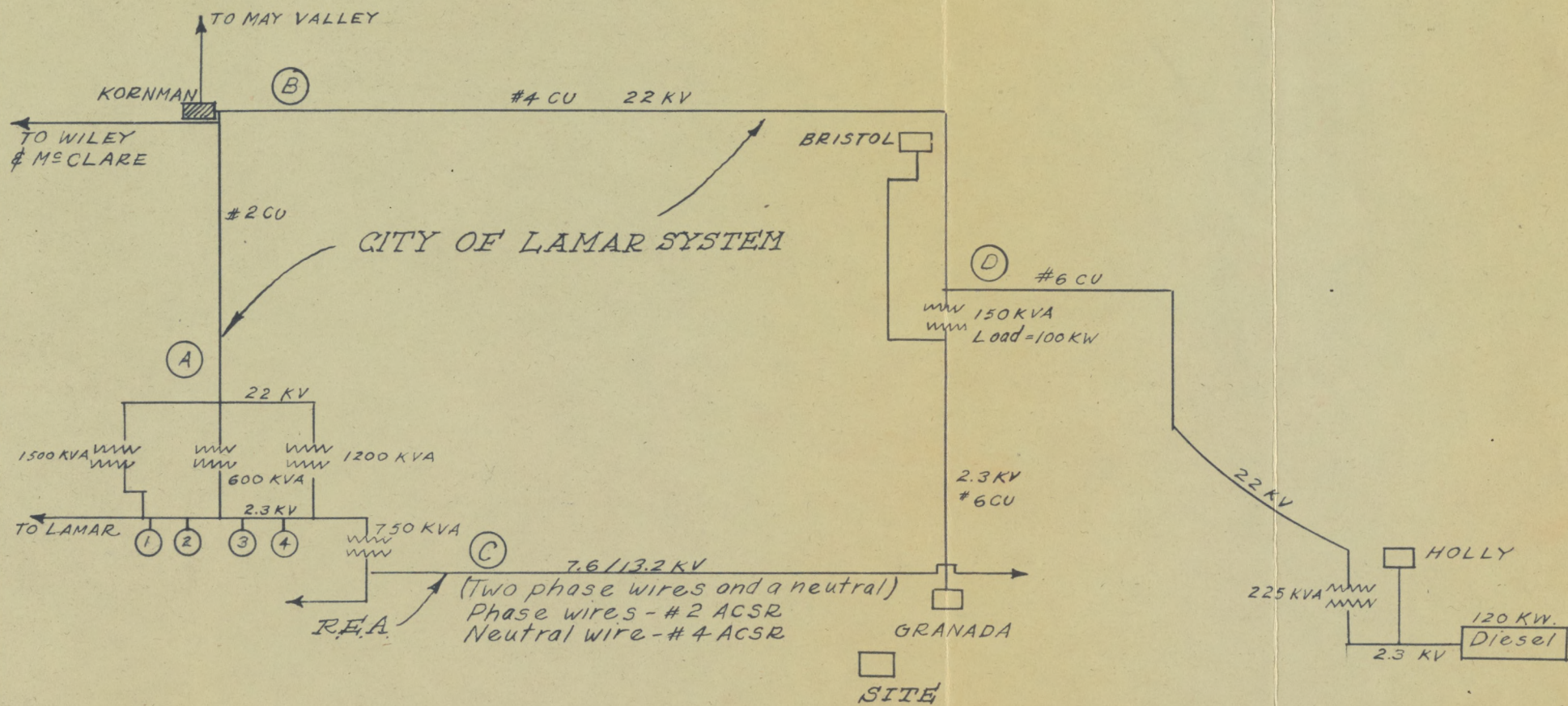
CITY OF LAMAR, LIGHT & POWER DEPARTMENT
 MAP OF ELECTRIC TRANSMISSION SYSTEM
 SHOWING PORTIONS OF BENT AND PROWERS
 COUNTIES, COLORADO SERVED.

NORTH

----- 2.3 K.V. FEEDER LINE (LAMAR SYSTEM)
 ——— 22 K.V. TRANSMISSION LINE (LAMAR SYSTEM)
 - - - - - R.E.A. LINE

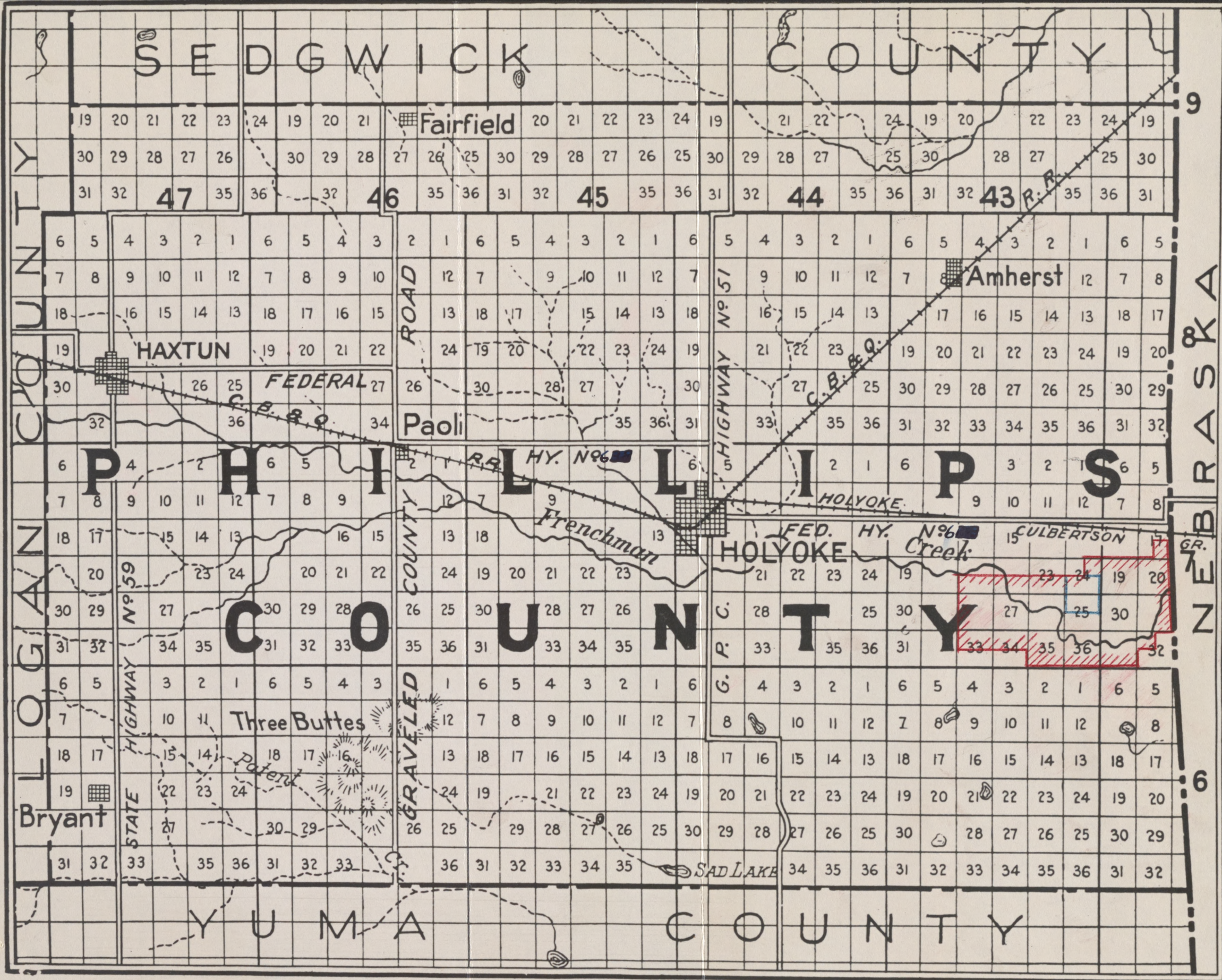
EXHIBIT "I"

L.K.C.

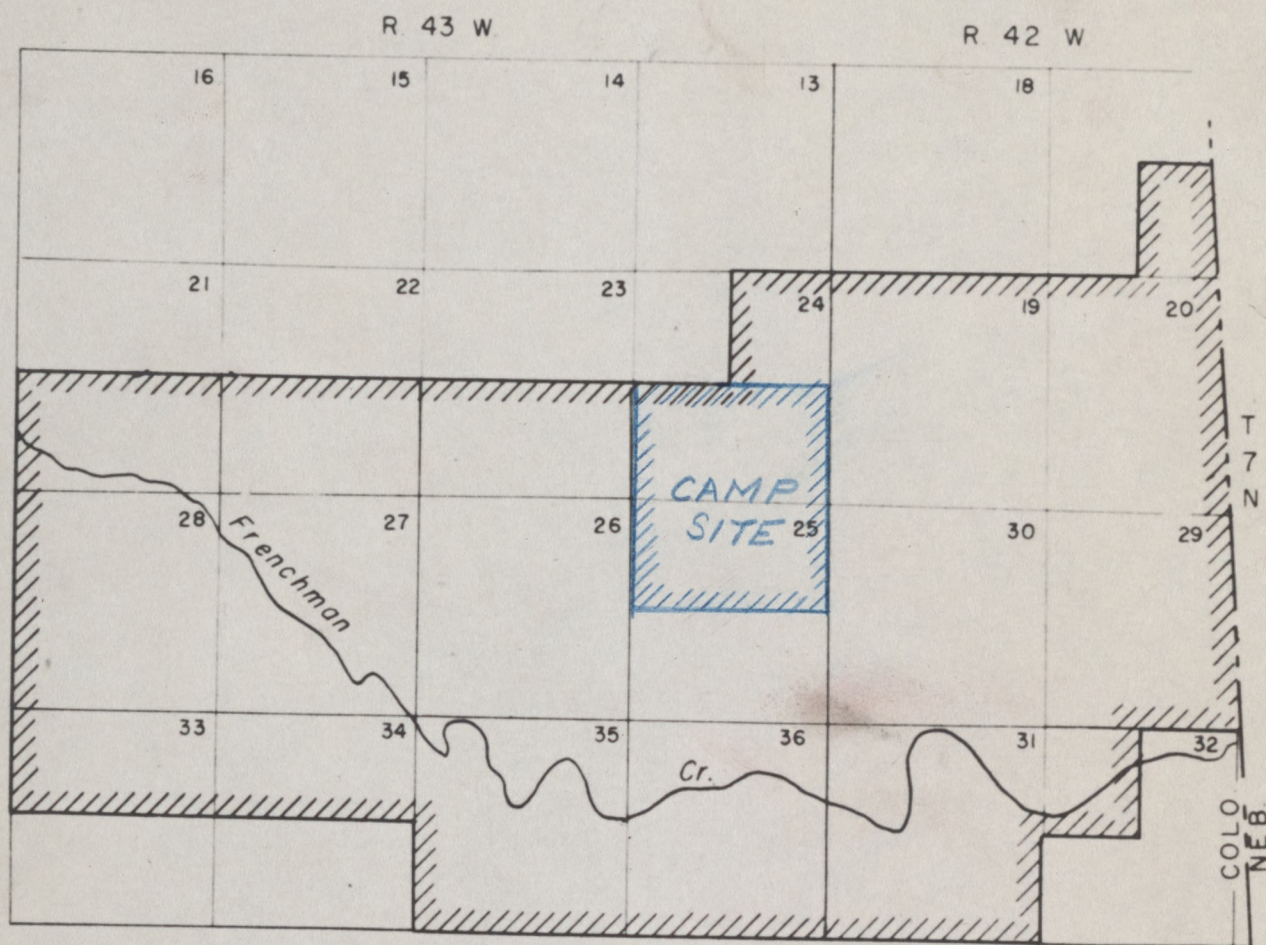


Load at Point	(A)	Approx.	1200 KW
"	(B)	"	200 KW
"	(C)	"	120 KW

EXHIBIT "II"



HOLYOKE AREA
PHILLIPS COUNTY, COLORADO



AREA BOUNDARY

PREPARED FOR
WAR RELOCATION AUTHORITY
BY
WATER UTILIZATION PLANNING SERVICE

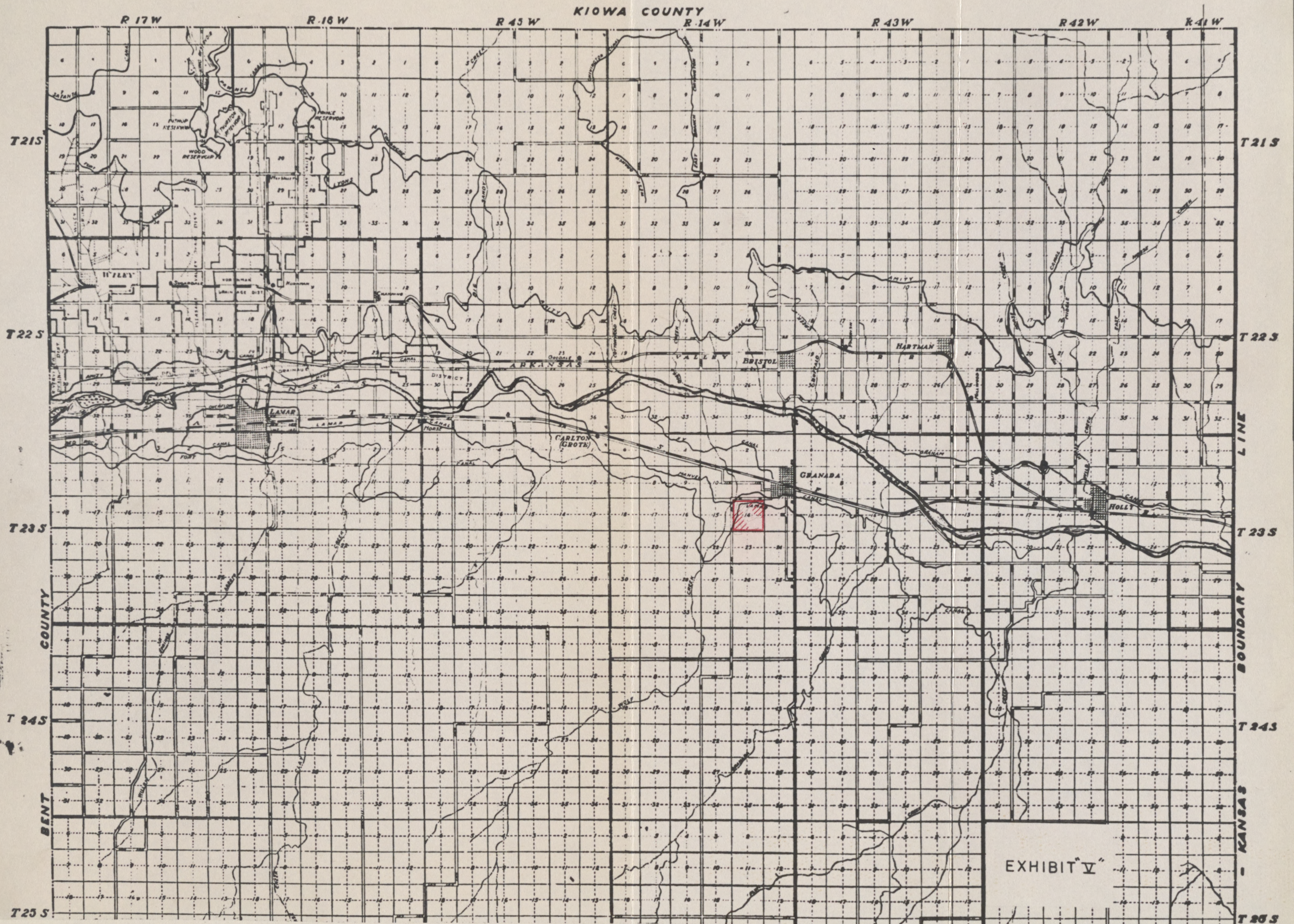
MAY - 1942

EXHIBIT "IV"

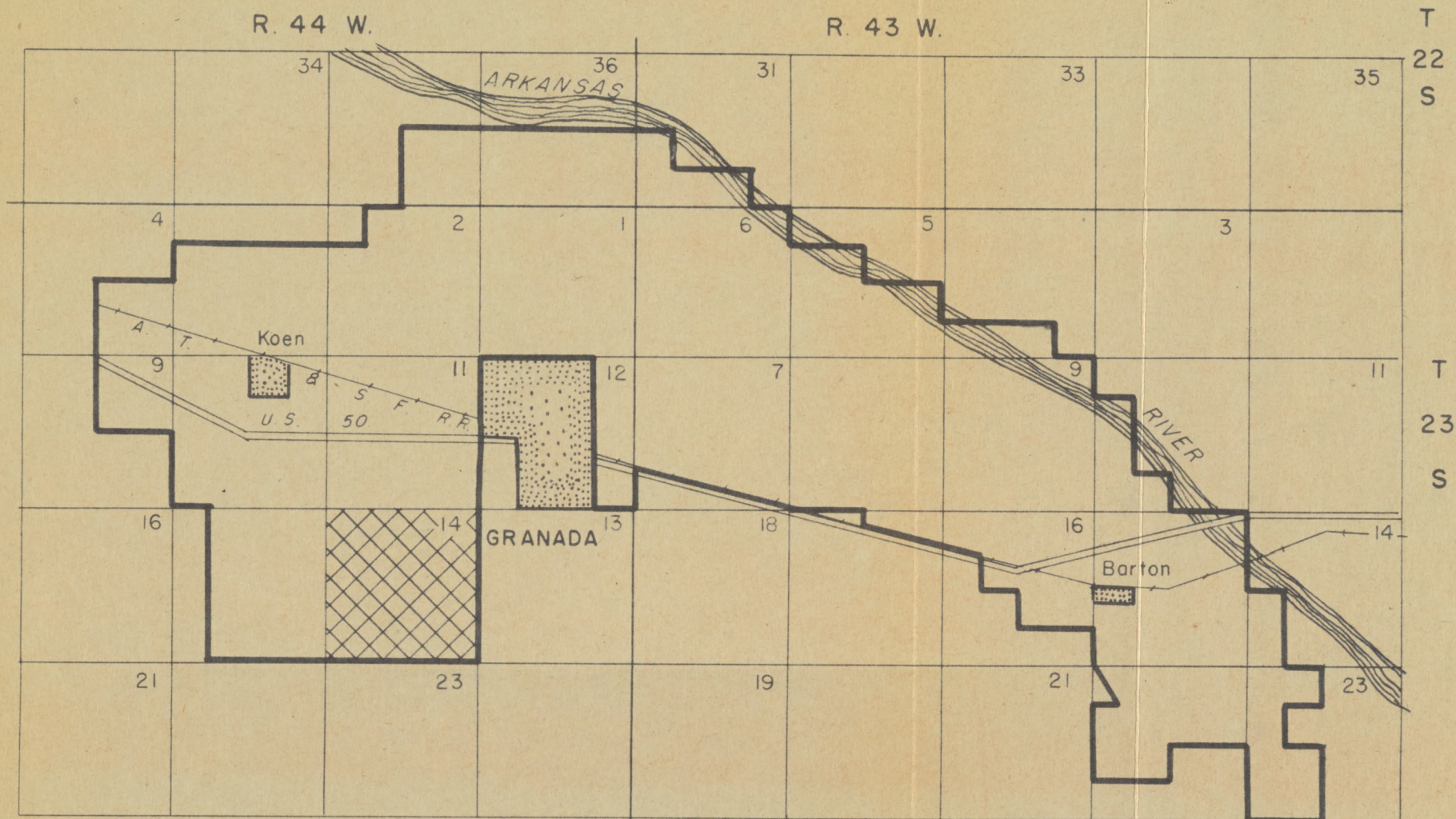
BUREAU OF AGRICULTURAL ECONOMICS

U. S. DEPT. OF AGRICULTURE

Map of Prowers County, Colorado



GRANADA AREA PROWERS COUNTY, COLORADO



— AREA BOUNDARY
 [Cross-hatch pattern] PROPOSED CAMP SITE

PREPARED FOR
 WAR RELOCATION AUTHORITY
 BY
 WATER UTILIZATION PLANNING SERVICE

MAY - 1942

EXHIBIT NO. VI

BUREAU OF AGRICULTURAL ECONOMICS

U.S. DEPT. OF AGRICULTURE

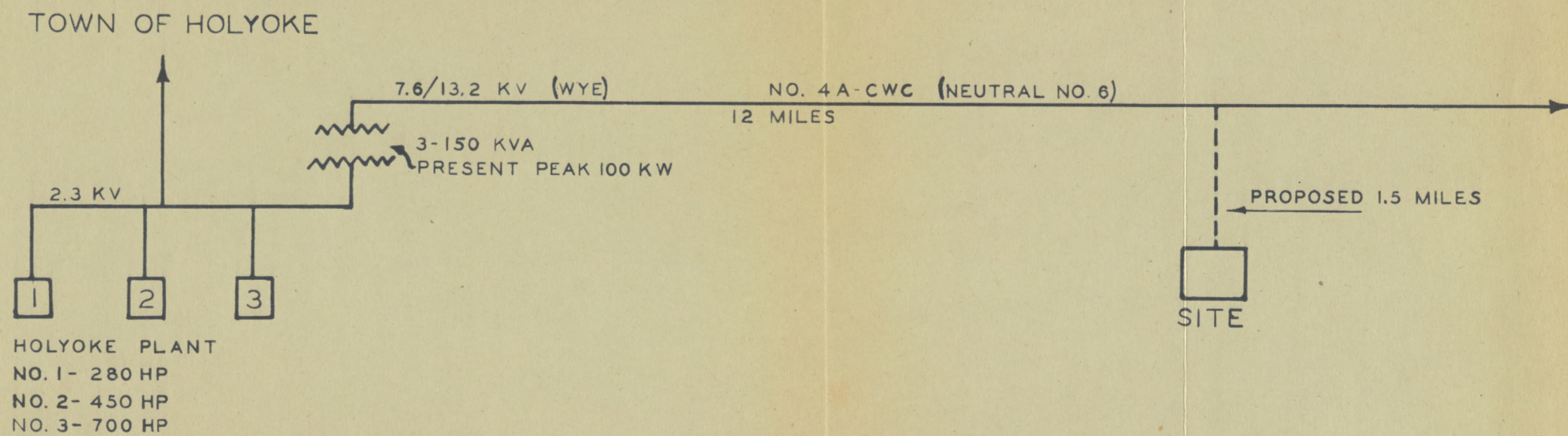


EXHIBIT NO. VII