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Report.

NAVAJO EXTENSION.

H. F. Robinson,
Superintendent of
Irrigation.

April 1909.

PERINTENDENT OF IRRIGATION.

DEPARTMENT OF THE INTERIOR,

UNITED STATES INDIAN SERVICE,

Albuquerque N. M., April 22, 1909.

Mr. W. H. Code, Chief Engineer,
522 Bumiller Building,
Los Angeles, Cal.

Dear Sir:

In accordance with Office Letter, Cooperation 21634-1909, to you, a copy of which you sent me with your letter of March 27, regarding Irrigation on the Navajo Extension, and directing me to go to Tolchaco on the 15th instant and confer with Mrs. E. G. Gates regarding a plan of hers to irrigate land in that vicinity for the purpose of establishing a colony for the returned Indian students, I made the trip, and herewith submit my report.

Mrs. Gates had three projects in mind, along the Little Colorado River, all of them west of Tolchaco, this latter point being nine miles down the river from Leupp.

The first and largest was a project to dam the Little Colorado at some point in the box canyon some four or five miles below Tolchaco, with the expectation of making a large reservoir on the flat above the canyon, which is the extreme western land of the tract proposed to water from the Leupp Reservoir project. This canyon is about 600 to 800 feet wide with side walls of red sandstone. The project, should it prove feasible, is so large that the Indian Office could not handle it on account of great first cost and no returns from the land to be irrigated.

It might prove at some later day, a project which might be investigated. But on account of its immensity I made no detailed examination. I enclose photos showing the canyon from the lower end, and a view down the river from the same point.

The second project was to divert water from the river at the crest of Grand Falls and carry water into the Denebito Wash, there constructing a reservoir for the storage of the flow of the river by building a dam across its mouth.

Upon examination, this wash proved to have two outlets to the river, and it would be impracticable to construct a reservoir o of any material capacity owing to the slope of the wash and the lengths and heights of the dams necessary.

The third project was at Black Falls, 24 miles below Tolchaco. Here was a body of land of perhaps two thousand acres, of which I estimate some 1200 would be irrigible from such a ditch as could be constructed. The ditch would be taken from the river at a point about 4½ miles above the falls, at the mouth of the canyon. Here the entire river has been thrown to the north side of the channel by a reef of lava, and the south side of the channel is filled with a bed composed of loose lava boulders, at a height of several feet above the present river level, and it is improbable that the river could change to the other side.

On the north side just where the full current strikes the bank is a mass of lava in which the headworks could readily be constructed. A dam would be unnecessary, and a little temporary work at each low water period would turn the entire river

into the ditch, provided the latter was taken out at a sufficiently low elevation. The first 1000 ot 1200 fee t of the ditch would be constructed in the lava bed, the cutting of which would average about twelve feet. The maximum flood at this point was about 9 feet, so that the headworks would be amply protected. There would be some fairly heavy cutting in the next two miles running from ten feet to the minimum, and I have estimated on an average of about 6 feet for this distance.

To serve the 1200 acres of land, basing the duty at 70 acres for each second foot, and allowing for losses in the ditch, its capacity should be 25 second feet at the upper end. To do this on a grade of 5.28 feet per mile would require a ditch about 5 feet on the bottom, flowing about 1.7 feet deep, and the velocity would be 2 feet per second. This size could be decreased toward the lower end. The total length of the ditch would be about 11 miles, though the last few miles would not be very large.

I made no surveys, and base my estimates on such simple methods as using a hand level and an odometer on the wagon, so these figures are only approximate, and may be taken only as such. The cost of the ditch as outlined, using maximum figures for excavation and 33¢ per yard as unit prices for moving earth, will be, aside from the engineering, approximatoly $ $30,000.00, or about $25. per acre.

The drawback to the project is the water supply. Generally by the middle or last of May the river goes dry, and remains so until the summer rains commence. This may be any time after the first of July, but they are uncertain as to time and quantity.

It is safe to assume that the river will be dry two to two and one half month covering part of May, all of June and more or less of July. Sometime it is still later before the water is in the river. At all other seasons of the year there is a sufficient supply of water.

It is because of this failure of water in the summer that I have had no more detailed surveys made.

There is absolutely no chance to store water for this tract with a reasonable expenditure of money.

However, this tract might be made of value in either of two ways.

The first would be to put in the ditch and only plant such crops as might be raised by the partial supply of water. Any winter crop of grain, such as wheat, rye and perhaps barley can be grown successfully at this altitude and in this climate, and will be ready for harvest by the time that the water supply fails in the summer. Probably other crops may be found which will mature successfully under the conditions. The Navajo raises the native corn on land which only has the winter rains and one or t two overflows from side drainage. With the ground thoroughly soaked during the winter from the ditch, I believe that the Indian could raise better crops of corn than he has been able to do with the conditions under which he has been working. Then too, ther are other crops which could be carried through the dry season by cultivation, using the dry farming (Campbell) system and conserving the moisture, but the Indian would need considerable instruction before they would adopt such methods.

The other proposition would be to put in a pumping plant at the head of the ditch and pump one or two runs of water during the dry months. Of course the practicability of this would depend entirely on whether there was sufficient water underground at this point to give a supply.

Black falls is formed by a reef of lava across the valley and the reef extends up as far as the ditch heading, and the underground water is forced to the surface, and there is water at this point often when the river above is dry. Prof. Gregory the U. S. Geological Survey Underground water expert who has been detailed to this reservation to investigate conditions of underground water might make an examination of the site and advise in the matter.

I understood from Mrs. Gates that should the pumping project be feasible she believes that the people who are interested with her in this colony proposition would be able and willing to construct this pumping plant under our direction and provide for its maintenance and operation.

If you think that under the circumstances of short season of water that the proposition has sufficient merit to warrant a detailed survey and estimate of area available and cost, I will put a party in the field as soon as I have one available.

I append photographs of the proposed heading for this ditch, and also a section of a map showing the vicinity where the project is situated.

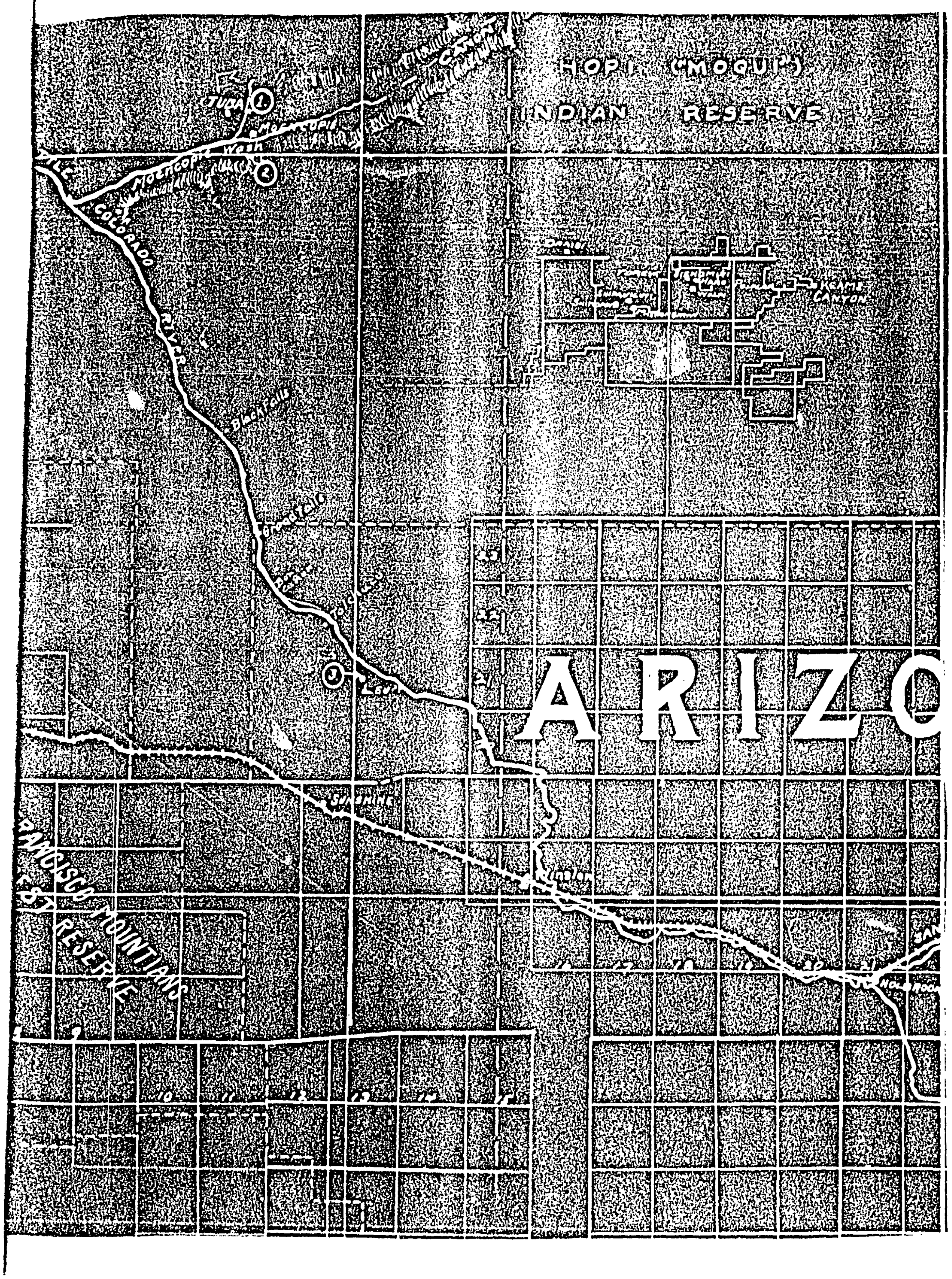
The distance from the nearest railroad station, Angell on the A. T. and S. F. Ry. is 35 miles; from Canyon Diable, 45 miles,

from Leupp, 33 miles; from Tolchaco 24 miles.

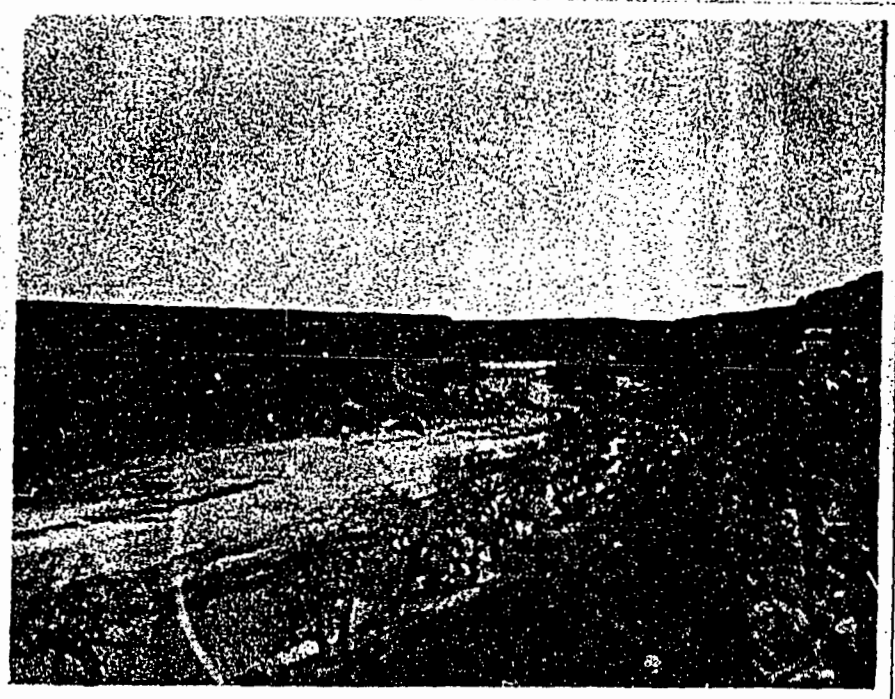
Very truly,

N. J. Robinson

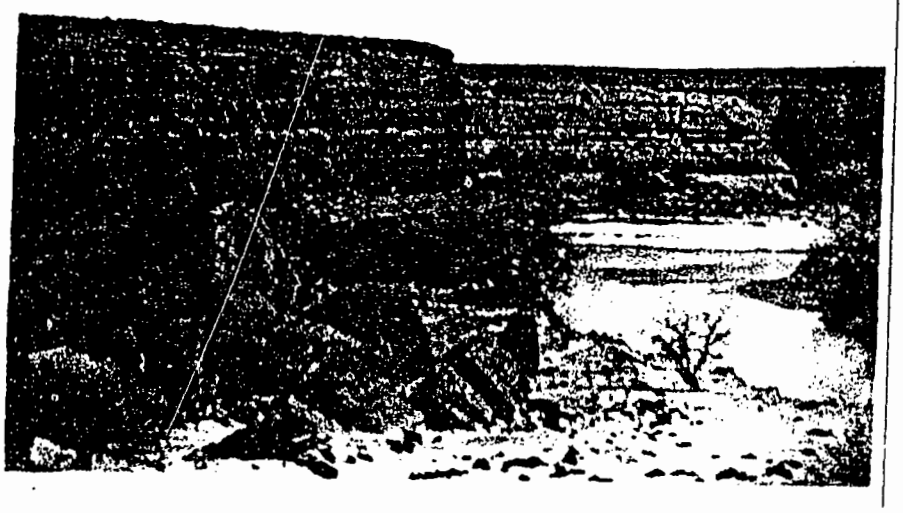
Superintendent of Irrigation.


HOPI (MOQUI) INDIAN RESERVE
TUBA
MOENCOPI
MOENCOPI Wash
COLORADO RIVER
KEAMS CANYON
ARIZO
SUNSHINE
HOLBROOK
FRANCISCO MOUNTAINS FOREST RESERVE

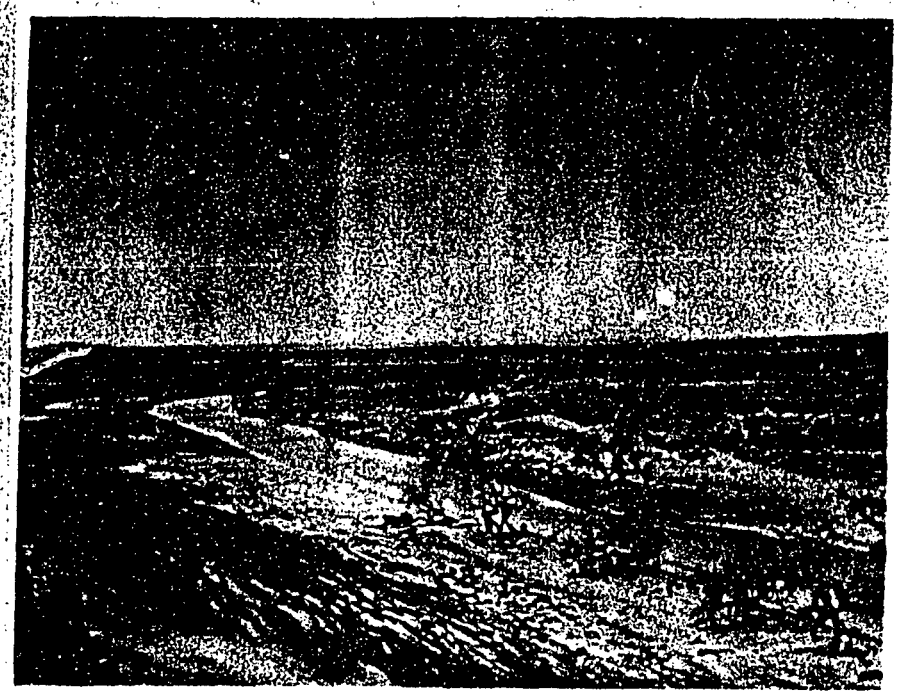
The Box Canyon of the Little Colorado about five miles below Tolchaco.



Looking up the Canyon.



Closer view, showing structure of side walls.

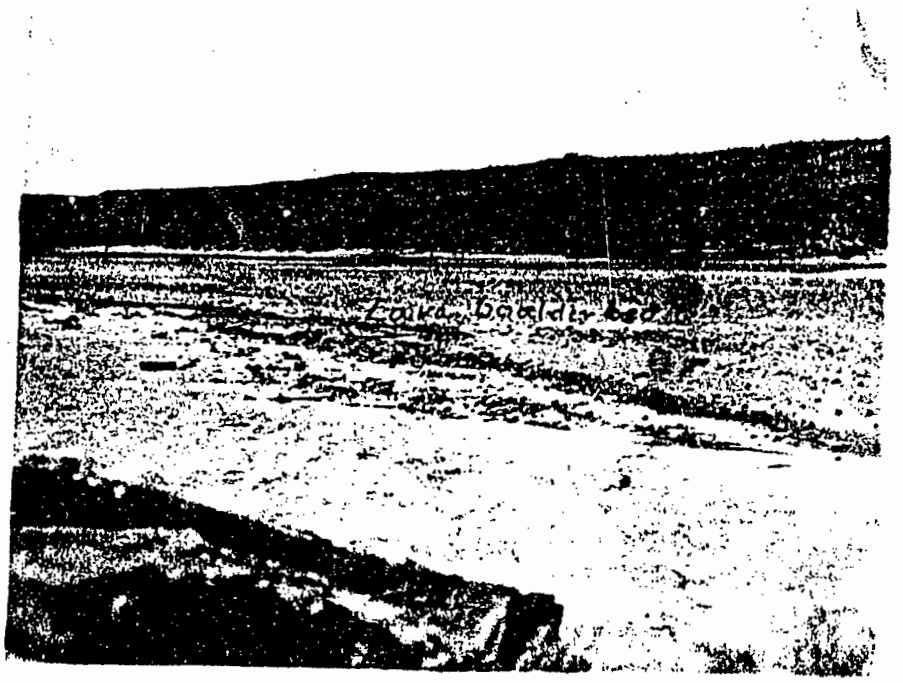


Looking down river from Box Canyon.

Proposed ditch heading at Black Falls.
Looking up river.

Proposed ditch at Black Falls.

Approximate heading. Looking West.



Looking across river from heading.

Proposed ditch at Black Falls.

Looking down stream from near head.

Location for Canal ½ mile from Head.

Grand Falls on the Little Colorado.

Front view of Falls.

Looking down Canyon from Falls.

Grand Falls, contd.

Near View of Falls.

The Gorge at foot of Falls.