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February 15, 1919

Report on the Navajo Indians of Arizona and New Mexico
by Malcolm McDowell.

February 15, 1919.

Sir:

I have the honor of submitting, herewith, a report of conditions in the Navajo Country of northeast Arizona and northwest New Mexico. My investigation began September 13th and ended October 10th, 1919, during which I traveled more than 800 miles through the Pueblo Bonito, Navajo, Moqui and Western Navajo Reservations. As the Navajo Country embraces some 22,000 square miles, the topography of which is so wild and rough that traveling is difficult, it would be a physical impossibility to cover the entire area within the four weeks I spent in that country, therefore it will be necessary for me to make another trip to round out my work.

The Navajo Country, lying in three states, includes the superintendencies of Pueblo Bonito in New Mexico, the Navajo and San Juan in Arizona and New Mexico, the Moqui, Western Navajo and Leupp in Arizona and about 600,000 acres in the southern part of Utah. It embraces

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parts of San Juan and McKinley counties in New Mexico, the Navajo and Apache counties in Arizona, part of Coconino county in Arizona and the southern part of San Juan county in Utah.

For the purpose of administration the Navajo country is divided into the superintendencies I have mentioned but all this area, with a population of over 32,000 Navajoes, may properly be handled for the purpose of a survey as a single unit. This great area includes vast stretches of practically worthless desert lands, millions of acres covered by mountain ranges and cut and slashed by canyons, dry washes and valleys; but a large proportion of the land, semi-arid though it be, is rough grasing land which is used by the Navajo Indians for raising their sheep, goats, horses and cattle. The Navajo Country is the largest undeveloped area of land under the supervision of the Indian Office and is peopled by the largest tribe of American Indians. Although I traveled hundreds of miles through this country, I saw but small parts of it and I doubt if the superintendent of any Navajo reservation, excluding, Leupp, has seen or ever will see all the land under his supervision.

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The Navajoes are shepherds; sheep is the economic basis of Navajo life. The sheep must be moved to find grass and water and to adjust the flocks to seasonal changes. Because of necessity the Navajo families live wide apart from each other. Their hogans, as they call their beehive shaped habitations of logs, branches, stones and dirt, are located with reference to convenient access to water and wood. Each family has two or more hogans which are used for summer and winter and as the demand for grass and water for their sheep compels them to move from place to place they occupy during the year their several hogans.

This family isolation, together with the nomadic habit of the Navajoes and the difficulty in traveling over the country caused by mountains, canyons, quick sands, and precipitous bluffs which edge high mesas, have made it well nigh impossible to take an accurate census of the entire Navajo people.

In 1915, under the supervision of Father Weber, Superior of the Franciscan Fathers at St. Michaels, Arizona, an accurate, scientifically planned census of the Navajo Reservation, whose seat of government is at Fort Defiance, Arizona, was made. This census was so comprehensive and

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complete that it offers a sound basis for estimating the entire population of the Navajo Country. The best authorities agree there are over 32,000 Navajo Indians in that part of the United States and that between 7,000 and 9,000 are children of school age.

The Navajoes are a prolific race; I found children in almost every hogan and families with four and five children are common. There is every evidence that the Navajoes, who are over ninety-five per cent full-bloods, are increasing in population to a degree which indicates that within a generation their country will not be able to sustain them unless the water supply for stock and domestic purposes is increased. Water is the prime essential for the economic and social development of the Navajo people.

The irrigation division of the Indian Office has done the seemingly impossible in the development of under ground water for stock and domestic purposes; the lines of wells which were sunk six to eight miles apart, equipped with pumps operated by windmills, and the numerous "seeps" which have been developed into real springs bear testimony to the achievements, accomplished under remarkably adverse conditions, of the staff of the

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irrigation division. The Indians have a saying 'where water is there is no grass, where grass is there is no water.' This epigram states the case completely for there are great areas of grass land in which there is no water for stock and there are good springs, so far remote from grass lands, that they are useless so far as the sheep are concerned.

The irrigation division with its wells has brought water to waterless grass areas and thus has greatly increased the range and this increased grazing area makes it possible for more Indians to live and sustain themselves in the Navajo Country. I doubt if any money appropriated for Indians by Congress has reached the high efficiency of the few thousand dollars appropriated for developing the water supply in the Navajo Country.

There are something like fourteen million acres of land of all kinds, that have an economic value in this country. Of this acreage 51,000 acres are classed as agricultural (an eastern farmer would call almost all of such land worthless) and the Indians farm less than 25,000 acres but use all of the 13,000,000 acres of grazing land for their flocks which aggregate nearly 1,300,000 sheep and goats; their herd of scrub ponies

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numbering 60,000 and their cattle which total about 38,000 head. An agricultural survey of this country has never been made; the estimate of 51,000 acres of agricultural land is based on the known area which might be irrigated. Undoubtedly there are large tracts of soil which need only water to make them productive but such lands lie so far from the present available water sources that the cost to irrigate them is prohibitive.

I found three problems pressing for solution, land, school and water. The land problem involves over one hundred townships in the public domain east and south of the Navajo, Moqui and Leupp Reservations. These townships are occupied and, in common with white stock men, used by some 6,000 non-reservation Navajo Indians. The solution of the land problem calls for Congressional legislation and negotiation between the Department of the Interior and the railroad companies. The water and school problems affect the whole Indian population. The water supply can be increased through larger appropriations and a school census and new school policy are necessary to arrive at a satisfactory solution of the school problem.

The Santa Fe Railroad skirts the southern edge of this country and for fifty miles on each side of its

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right of way the public domain is a checker board, for the odd number sections belong to the Santa Fe and Prices railroad companies and the even number sections are the public domain. Almost all of the non-reservation or public domain Navajoes live north of the Santa Fe right of way. The railroad lands in the Navajo Country have been sold or leased. Indians have leased some of the townships. The railroads not only have the legal right to sell their lands but such sales would be in line with the best business practices for the railroads have been paying taxes on these lands for years. The Santa Fe Railroad for a number of years refused to sell its lands because it hoped that some way would be opened which would allow the Indians to acquire the railroad sections but, apparently, the Santa Fe railroad has come to the conclusion the Government cannot or will not develop a practical method by which the railroad lands can be secured for the Indians and such lands now are offered for sale. If the railroad sells the railroad sections to white cattle men the Navajo Indians now occupying and using the lands practically will be evicted and the land problem will cease to trouble the government for it will be transformed into an ordinary problem of caring for several

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[illegible] men, women and children.

[illegible] public domain to the east and south of the reservation was occupied, as I have said, by some 6,000 non-reservation Navajo Indians. Several thousand Indian allotments of 160 acres each have been selected but the allotments have not been approved nor have any trust patents been issued to the Indians. A few of the white men have homesteaded. The white homesteads are of 640 acres each, four times the size of an Indian allotment. Every usable square foot of all the public domain area under consideration is grazed by sheep, goats, horses and cattle; there is not an idle acre in the country except desert and rock clad lands which are of no use and cannot be used for any purpose.

The 6,000 non-reservation Navajoes on the public domain were born on the land, as were their ancestors; in every respect except actual ownership it is their land but not an Indian owns a foot of it. Although they do not live on reservations and, therefore, are non-reservation Indians they belong to the Navajo tribe and retain their tribal relations. Although they are non-reservation Indians, receiving nothing from the Government in the shape of money or land, they are wards of the Government for the Government

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the limited supervision over them. The Pueblo Bonito jurisdiction is entirely on the public domain; the agency [illegible] Crownpoint, New Mexico, where a reservation boarding school is located. This jurisdiction is called a reservation but actually it is an agency.

These Indians are self-supporting - they get no money or rations from the Government - they neither ask nor want anything from the Government. Like all Navajo Indians they are herdsmen each family owning sheep, goats, horses and some cattle. The Pueblo Bonito Indians are typical Navajos and conditions on the Pueblo Bonito jurisdiction are typical of a very large part of the whole Navajo country. This jurisdiction covers an area, approximately, of sixty by fifty miles and sixty of the one hundred townships under consideration are in the Pueblo Bonito area. Thirty-three townships (that is the railroad lands in thirty-three townships) are leased to white men and seven to Indians who pay from $230.00 to $280.00 rental for a township a year. There are but thirty-four white homesteaders in this area. According to the best information obtainable about ninety sections of railroad lands have been sold.

In all the Pueblo Bonito jurisdiction there is not

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In all the Pueblo Bonito jurisdiction there is not

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one living stream of water. There are nine artesian wells, the largest of which is on a white man's land and is fenced off so that the Indians cannot use the water. There are about twenty stock wells equipped with windmills, six shallow lakes (mere drainage ponds) which, with the exception of one, are dry most of the year and a number of so called "springs" which are really "seeps" from which the water oozes out from the sand and that spring is considered an important source of water supply if a gallon of water can be collected from it inside of five minutes.

White stock men figure that 640 acres, a square mile, will support from ten to twenty steers or from twenty to sixty sheep, depending upon the season. For two years there has been an abnormal drought and a number of white lessees have moved their cattle from the ranges in this country. All the range is over-grased and white men and Indians agree that it will take several years of good grass seasons and careful grazing to renew the range.

It is quite certain if it had not been for the drought and the affect of war on labor and man power much, if not all, of this public domain would now be under the complete control of white men and the Indians would have

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been evicted simply because they would not have been able to compete with the white stock men. By leasing and buying railroad sections, homesteading and leasing state school sections, a white man can control a grazing unit which would give him the absolute monopoly of from one to three townships. If this railroad land is sold it will be sold to white men and there will be a reversal of economic conditions for a few white stock men and their white employees will take the place of 6,000 producing and purchasing Indians; and instead of 6,000 Indian customers the stores at Gallup, Holbrook, Thoreau, Winslow and other railroad centers, will have but a mere handful of cow boys and stock bosses; instead of 6,000 men, women and children buying food, clothing, supplies and even some of the smaller luxuries, there will be several thousand Navajo men, women and children to be cared for by the state or Government or both.

The effect of this reversal of economic conditions upon the towns along the railroad would be serious to local merchants and the increase of live stock shipments over the railroad would not amount to much. This is the opinion I found among a number of business men who formerly opposed doing anything which might tend to secure the public domain

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for the use of the non-reservation Navajo Indians.

The citizens of Arizona and New Mexico are out spoken in their opposition to any increase of the present great area of non-taxpaying lands in those states by the extension of Indian reservations or the making of new ones. When it is considered about 36,500 square miles of New Mexico and Arizona are Indian lands which do not pay taxes; that the total area of both states is around 336,000 square miles; that enormous forest areas are set apart in National Forest reserves; that thousands of acres are in national monuments and tens of thousands of acres are still public domain, it is small wonder the taxpaying citizens of the two states are opposed to giving more land to non-taxpaying Indians.

This public sentiment must be taken into account in any attempt to secure the public domain for the permanent use of the Indians. It was this sentiment which stopped the efforts of the Government to exchange some of the railroad lands for lands in other parts of the country and to turn these railroad lands over to the Indians by covering them with a presidential executive order. As a basic proposition, on which to build up plans to secure lands to the public domain Navajoes, the payment of taxes by the

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Indians must be considered. I am strongly of the opinion from my talks with the non-reservation Navajoes that most of them will willingly pay taxes if they are given that confidence in their future which comes with the assurance of permanent land occupancy.

As I have shown public domain sections and railroad sections alternate forming a checker board. This arrangement, made in the early days of railroad land grants was a wise and far sighted precaution of the Government designed to prevent the railroads from withholding large blocks of good agricultural lands from settlement for future profit. In those days little thought was given to the arid and semi-arid lands in Arizona and New Mexico, useful only for rough grazing and usable only in large units. In Arizona and New Mexico men do not talk of grazing lands in terms of sections or acres; about the smallest unit of rough grazing land they consider is a township of 23,000 acres. In the east, where forty acres of good land are enough for a profitable farm, it was well that sections should be regarded as large units, but 640 acres, a square mile, of Arizona and New Mexico public domain are not enough to feed more than sixteen steer or seventy-five to eighty sheep. It is not agricultural land for there is no water for irrigation. It only can be used for rough grazing and

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much of it cannot be used for even that. The checker boarding of this land is an embarrassment to the development of the country, and unfair arrangement and no longer can be justified. It is unsound economically and no one can offer a valid reason for the continuance of the system.

This is the way representatives and business men of that country are talking today. They are seriously considering the urging of legislation which will enable the Secretary of the Interior to negotiate with the railroad and other parties in interest for rearranging the public domain on each side of the Santa Fe Railroad in Arizona and New Mexico, so that all the government lands will be blocked in solid townships or parts of townships and all the railroad sections likewise. The idea is not new; it has been brought to Washington several times but the white people of Arizona and New Mexico could not get together on the proposition. It lacked influential local backing. Public sentiment favoring what is known as 'blocking' the land is increasing and the time seems ripe for bringing this matter to the attention of the Department of the Interior and Congress in the interest, not only of the Indians, but the white people.

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It might be asked 'in what why would blocking the public domain and railroad lands benefit the non-reservation Indians?' It must be borne in mind that the white people who are beginning to favor this proposition are not considering the Indians at all; they have in mind all of the railroad land-grant belt contiguous to the Santa Fe right of way in both states, Arizona and New Mexico. The Navajo Indians occupy only about one hundred townships in this belt, a relatively small area. If the proposed re-arrangement of the public and railroad sections went no further than merely blocking the land the Indians would be but little better off than they now are. It is probable there would be less friction with white stock men but their future would be as uncertain as it now is.

To benefit the Indians through this proffered plan it would be necessary to secure the public domain for their permanent use and this only can be done through appropriate legislation and departmental action. The consolidation of each class of land under consideration unquestionably would have the effect of making the railroad lands more attractive to purchasers and lessees but, at the same time, it would put the public domain

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sections in better arrangement to carry out any practical plan for securing such land for the use of the Indians. Of course there are difficulties in the way of any purpose to make the Indians actual owners of the land, which is now public domain, but those who are interested in the proposed rearrangement of sections for the benefit of the Indians are strongly of the opinion that Congress and the Department of the Interior would be able to work out some practical scheme looking to Indian ownership of the public domain land in the one hundred townships involved in this proposition, an ownership which would carry with it the full responsibilities and obligations of a land owning citizen.

Superintendent S. F. Stauber, of the Pueblo Bonito school and agency, has under his charge several thousand non-reservation Indians and sixty of the one hundred townships are in his jurisdiction. For years he has labored earnestly and continually to secure the public domain or railroad lands for the permanent use of his charges. When efforts to exchange the Santa Fe Railroad sections in his jurisdiction for lands elsewhere were stopped by the provision in the 1918 Indian Act which prohibited the extension of any Indian reservation in

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New Mexico and Arizona except by Congressional action, Mr. Stecker put forward the proposition to block the railroad and public domain lands preliminary to securing an adequate acreage for the permanent use of the Indians.

Some of the white stock men and business men in that section saw the advantage to them of such an arrangement and I found a number of indications of a growing public sentiment in favor of the proposition. Father Weber of St. Michaels, Arizona, and Superintendent Peter Paquette of the Navajo Reservation are in favor of the proposed rearrangement of the public domain checker board. In Albuquerque I talked with a number of leading men who are interested in stock raising and the development of the country and in every case found them favorable to the proposed plan which I have outlined above.

According to the latest figures available and which are contained in the report of the Commissioner of Indian Affairs for the fiscal year ended June 30, 1916, the total population of the Navajo Indian country, exclusive of 2,385 Hopi in the Moqui Reservation and 388 Hopi and 190 Paiutes in the Western Navajo Reservation, is 30,773 of which 16,000 are minors. There is nothing

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in the reports to indicate if the Navajo Indians in [illegible] the southern part of San Juan county, Utah are included in the figures of the Western Navajo Reservation. The proportion of minors to the total population appears to be abnormally large but every where I went I saw many children around the hogans. Undoubtedly the [illegible] Navajoes are a prolific race and rapidly increasing in population. [illegible] difficulty exists. These conditions make day school [illegible]. The Commissioner's report shows that in the six superintendencies of the Navajo Country there are 9,615 children eligible for school and that only 2,089 attend, leaving 7,524 children who are not attending school. The total school capacity of the reservation boarding, mission boarding, reservation day and mission day schools is only 2,072. The Navajo school children in the Moqui Reservation have no school facilities at all, for the reservation boarding school at Keams Canon was discontinued a few years ago because the buildings were unsafe and the five day schools in that superintendency are only for the Hopi, at least only the Hopi Indians attend. [illegible]

This, then, is the school situation in the Navajo Country; 7,524 children of school age and eligible for school cannot go to school because there are no schools [illegible] boarding school at Keams Canon was in operation with very

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for them to attend. This condition has been presented to Congress and the Indian Office for many many years and every year it is growing worse. [illegible] I have shown that because of economic conditions the Navajo Indians cannot live in villages or towns; that their homes are scattered and wide apart from each other and the topographical character of the country makes traveling a difficult matter. These conditions make day schools practically impossible. An experiment was made with two day schools and it was a failure. The Navajoes want their children educated and the only way that seems to be at all practical for educating the children is to build and maintain a number of reservation boarding schools. [illegible] There should be no hesitancy whatever in Congress appropriating money for one boarding school, at least, in the Black Mesa district of the Hoqui Reservation. The several hundred school children in this district have not even a chance to go to school. They cannot attend the Hopi day schools which are miles from them and besides the old racial antagonisms simply make it impossible for the Navajo and Hopi children to attend the same school. This was attempted when the reservation boarding school at Keams Canon was in operation with very

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unsatisfactory results.

Congress appropriates $100,000 a year for "fulfilling treaties with Navajo Indians for schools in Arizona." For the fiscal year ended June 30, 1918, the Indian Office expended $60,632.52 from this appropriation of which $7,585.88 went for construction of buildings; $1,630.13 went for repairs of buildings and $50,980.56 was expended on the water system of the Navajo school, a dormitory at Tohachi boarding school and some building at the Pueblo Bonito school.

With an education denied 7,584 children because there is not a school desk in the entire Navajo Country for one of them, this treaty appropriation of $100,000 for Navajo schools is simply pitiful. These children are entitled to an education; they are of a race which in time will become an important part of our citizenship. The time is coming when the Navajo Indians will be voters and seven-ninths of their children today are barred from school.

I cannot place too much emphasis upon the immediate necessity of the Government taking hold of this problem with the earnest intention of arriving at a quick solution. I feel positive that if a commission of senators and

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representatives of the United States Congress were to visit this reservation its members would return to Washington to urge legislation, backed by sufficient appropriation, to immediately build non-reservation boarding schools to give these 8,624 school-less Navajo children an education the lack of which is a shame and disgrace to the American people who are the guardians of these Indians and therefore responsible for this unjustifiable and inexcusable breach of trust.

More water is the prime necessity in the economic development of the Navajo and Hopi Indians; more water for domestic and stock purposes. While the Navajo Country is not absolute desert it probably is one of the driest parts of the United States. The scanty rain fall is distributed very irregularly throughout the year. The climatic and soil conditions of this immense area make it well nigh impossible for the average white man to realize a livelihood in it but the Indians, for generations, not only have lived here but have increased in population. Some, it is true, barely exist but most of them seem to be in fair circumstances and there are a few who might be called 'well off.' Although the rain fall is very scanty it is enough to start grass and other vegetation and even bring them to maturity in most parts of this country, providing

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fair to good grazing for a few months.

It is the water supply and not the feed primarily which goes to make this a grazing country. Where water and grass, together, are available the land is grazed; where there is grass and no water (and there are large areas in this condition) the grass is useless; where there is water and no grass (and there are districts of many square miles in area in this country where there is no grass near water) the water can only be used for domestic purposes and for the needs of travelers. Large portions of this country have no natural water whatever except occasional seeps or water holes, which furnish water for a short time after the melting snows in the spring or storms at other times and then become dust dry. It is the quantity and distribution of water that set the limit for the size of the flocks and herds in the Navajo Country.

Before leaving Washington on this survey I talked over the Navajo matters with Commissioner Sells and Assistant Commissioner Meritt. Both laid special emphasis on the question of the water supply for that country. It was suggested I get in touch with the Irrigation Division of the Indian Office and I called on Mr. W.H.Reed, Chief Engineer of that division. Mr. Reed not only gave me a

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great deal of information but made a number of suggestions which proved to be most valuable and helpful. On my way west I stopped at Albuquerque and called on Mr. H. F. Robinson, Superintendent of Irrigation of District Number 5, which comprises the states of Colorado and New Mexico, northern Arizona and a small part of Utah.

He told me for the past seven or eight years the Indian Irrigation Service has been trying to increase the water supply of the Navajo and Hopi Indians both for stock and domestic purposes. He said 'the water supply for a grazing country involves not a few large supplies, but many small ones; that it is not necessary to increase the supply at points where water exists but to try to develop it at other points where there is grazing and no water. In considering the development of water at places, it must be borne in mind that too great a quantity at any one place, when there is a scarcity at others, will naturally cause that part of the range to be over stocked; and as at no place is the grass very luxurious there is great danger of entirely destroying all of the feed near the water by over grazing it.

'Stock raising, especially the raising of sheep on these reservations, has proved the salvation of the Indians. They are natural herdsmen and, for a number of

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years, their flocks have increased to about the maximum figure that natural water would supply, although the limit of grazing has not nearly been reached. The natural increase of the flocks would reach a maximum quantity, then there would be a season of drought and the mortality would be very great, reducing the flocks to the number that could exist on the diminished water supply.

"The work that we had been doing under the name of under ground water development consists of deep well drilling (on wells over 300 feet deep) which has been for the purpose of exploring for or developing artesian flows; shallow well drilling (for wells less than 300 feet) in the Navajo and Hopi country; well maintenance and the development of springs and water holes. For a couple of years we were exploring for water at depths of more than one thousand feet under the direction of the Geological Survey and it was demonstrated that artesian water could not be found in the Hopi country, but it was found in the eastern part of the Navajo Reservation north of Gallup.

"The past year, with its extreme drought, has demonstrated to both the Indians and the Service the great value of this under ground water development. I have been familiar with the Navajo Country since 1904 and this has

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been the driest season during these years. All of the water holes have dried up, a few supposedly permanent lakes have no water and many of the springs and seeps have failed. There is one lake in the Chin Lee Valley which has never been known to go dry to my knowledge, but it has been absolutely dry this year. Were it not for the wells we have put down in the vicinity of that lake much live stock would have been lost already. In a report from Foreman Womack he makes a statement that 'had it not been for the wells already put down a large number of the Navajo and Hopis would have been out of the stock business eight months ago.'

By a happy and fortunate coincidence I met, at Gallup, Mr. Alexander H. Womack, who has direct charge of the work of the Indian Service Irrigation Division in the Navajo, Moqui, Western Navajo and San Juan Reservations. He was just starting on a tour of inspection and took me with him. I do not suppose any man, excepting perhaps Professor H.E.Gregory, knows more about the Navajo Country than Mr. Womack does, for his duties require him to cover the entire district and the character of his work brings him in intimate contact with the Indians who told me he was one of their best friends.

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With him I traveled over 700 miles and wherever I went found unmistakable evidences of the fact, as stated by Mr. Robinson, that the stock wells, drilled and installed by the Irrigation Division, not only had saved the Indians from great stock losses during these last two years of drought but, in many cases, they had saved them from actual destitution.

The Indians told me they could not have pulled through the second summer of the drought had it not been for the Irrigation Service wells and every missionary, Indian trader, government employee and white stock man with whom I talked declared that these stock wells not only had saved the situation for the Indians by supplying the precious water in areas where the springs had dried up but had opened up new pastures in districts where before the range could not be used because of lack of water.

The Indian Service Irrigation Division has put down about 125 shallow wells for stock purposes. The standard equipment for each well consists of a windmill on a steel tower with a galvanized iron tank and watering troughs. These wells are strung along valleys and are from six to eight miles apart. Every new well put down

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adds from twelve to sixteen miles to the travel distance of the Service men who go from well to well to oil the machinery and make such repairs and adjustments as are necessary for operation and maintenance. It thus will be seen that every new well installed necessarily adds to the expense of maintenance and this fact has apparently been over looked by the Congressional Committees in making the appropriations for water development in the Navajo Country because practically the same appropriation is made each year.

When I saw the well driving machinery which was used by the Irrigation Division in the Navajo Country I really was amazed at the amount of work the Service had accomplished, because the rigs were old and of a type not designed for driving wells in that kind of country. The policy of the Irrigation Service in sinking many shallow wells, equipped with windmill driven pumps only for the purpose of watering stock, has proven to be the best policy. At the same time there seems to be sound reason for attempting to develop the artesian water in certain parts of that country for irrigation purposes and I asked Mr. Robinson to prepare a short statement for me on this subject. Later he handed me the following:

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As you are familiar with the needs of the Indians and the proposed exploration for artesian water for the purpose of irrigation it is not necessary to go into any details of this part of the subject.

'The point you wished me to cover is, in my opinion, the possibility of securing artesian water and then, following that, an estimate of the cost of putting down one test well.

'It is possible that at any place south of the Hopi villages artesian water may be found. The geological formation is such that water that falls throughout the Black Mountain country may be carried under impervious strata to the south, and by piercing a hole through this material may rise sufficiently high to make a flowing well. This is the opinion of Prof. Herbert E. Gregory after a careful reconnaissance of the entire country. In his report entitled 'The Navajo Country,' published as Water Supply Paper 380, on page 182 he gives the geologic formation of this section in which he thinks that artesian water is likely to be struck, and that the well sunk at Keams Canon, while it gave negative results and demonstrates the unreliability of the Dakota sandstone as a water carrier of prominence in this area, he does not think that it means water may not be found in other parts of this area; for

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he says on page 175 'because of the variable nature of the Dakota the Keene Gypsum well does not furnish conclusive evidence that similar wells at First Mesa, Second Mesa, Oraibi, and intervening points will be unsuccessful.'

'Of course, the sinking of such a well would be entirely experimental, and if such a well is put down it should not be less than 2000 feet in depth, unless artesian water is secured at a lesser depth. To do this we would have to purchase a drilling rig with a capacity of at least 2000 to 2500 feet. We could put in a portable rig which would be available for work at other points, or we could build a wooden tower and put in an engine and boiler with a bull wheel and walking beam, but such an outfit could not be moved to another point without being entirely rebuilt.

'The price of all machinery has increased so greatly that I am unable to give you any accurate figures without first securing them from the makers of these rigs, but from data secured lately I believe a portable rig such as I mention would cost, complete with all tools, cable, etc., not less than $5,500 and perhaps $7,000. Such a rig would have about a 25 H.P. boiler locomotive type, and engine about the same rated H.P. with approximately 10 x 10 cylinders and equipped with tools for drilling a hole of

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10, 10, 8, 6 and 5 inches in diameter, for it would be necessary to begin with a 12 inch hole at the surface and put down the size hole as far as the formation would allow, then of course to the next smaller size, and it is probable that at the depth of 300 feet we would get down to 5 inch casing.

"All well casing has increased in price at least 100 per cent, and it may be difficult to get it at any price. It is estimated that a well 2000 feet deep would cost not less than $15,000.

"With a new rig and everything working in the best manner we should be able to do rapid work at a minimum cost, considering the market. We have an old well rig putting down deep wells, and it cost us, owing to difficult drilling and the fact that the rig would not work anywhere nearly as efficient as a new one, $12,000, to put down well No. 113 which is 1050 feet deep. This well is located about forty miles north of Gallup.

"In the estimated cost of the rig it is probable that the wooden tower rig with the equipment could be put in for $1000. to $1500. less than the portable rig."

There are several small irrigation projects in the country notably the Marsh Pass and the Ganado projects both of which are practically complete and together they

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will enable the Indians to farm something like 5,000 acres of land. In addition to these projects is the Hopo Wash project in the Hopi Country.

All of the agricultural lands of the Hopi Indians consist of the sandy bottom lands along the three main washes that run between their mesa. The best single area they have is what is known as the Hopo or Second Mesa Wash. This wash, heretofore, has had no defined channel for a number of miles and in this flat, watered by the occasional floods, are extensive corn fields.

Several years ago the valley commenced to cut up with narrow deep channels commencing at its junction with the First Mesa Wash, these channels are gradually cutting back through the fields, and some of their best fields have already been destroyed, and if something is not done soon the rest of this area will be rendered valueless. A study has been made of the situation and a method of controlling the flood waters coming down and preventing further erosion has been worked out. The original suggestions for this work came from Foreman Womack and while some of the details have been modified considerably any credit for the successful working out of the plan is due to him.

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The plan in brief is to spread out the flood waters coming down this valley and prevent their flowing in any defined channel, and to try and build up by silting the channels that have already been formed. This will be done by first a rock and brush dam in the channel at a point where it is very shallow, throwing the water out onto the floor of the valley where it will first be guided away from the stream channel by means of earthen dikes, and its distribution and control by means of what might be termed a porous dam.

This system works on a theory that the water, when it comes down the stream, will carry with it not only boulders and sand but floating debris. As the latter strikes the porous dam it clogs to a certain degree the wire netting of which this dam is constructed, this of course retarding the water to a certain extent. The water naturally backs up and within a few minutes there is quite a pond behind the dam. As the water continues to carry debris down the stream the blocking becomes more complete and the nonflowing material, as it is being carried down the stream, naturally comes to a stop when it strikes the comparatively still water and sinks to the bottom of the upper end of the pond. This operation shows that the floating debris is checked by the dam itself.

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while the heavier material has filled practically all of the basin before it comes in contact with the dam, or rather the floating material behind the dam.

These dams will be placed at intervals depending upon the slope of the land, and will be so built that the top of one dam is at the elevation of the bottom of the one above it. The accumulation of the material between these points will form level steps upon which the crops can be grown, and the water of the stream will be spread over such a wide area that it will not run with any depth across this land, hence will not wash or injure growing crops. In addition to these light dams, gates will be placed in the dikes that are constructed to assist in the distribution of the water and the irrigation of lands lying between the dikes and the stream itself.

The original plan was to reclaim something over a thousand acres of land at an estimated cost of $7,700. but the last report submitted (which has been approved) will cover about one-third of the area, it being thought that it might be wise to see this part complete and tested that any errors in construction might be remedied before further work is done. To complete the part covered in this last report Superintendent of Construction Post

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estimates $8,125, but Mr. Robinson has asked that $5,000, or so much as may be necessary, be authorized owing to constant changing costs of material and increased cost of labor. [illegible]

I have gone into the details of the water problem to emphasize the fact that Congress, simply by enlarging appropriations, to an adequate amount, for the water supply of the Navajo Indians can bring about a large increase, almost immediately, of the grazing areas in the Navajo Country, thus opening up more territory to meet the insistent demands of a growing population and also, in all probability, developing new agricultural areas for the Hopi Indians. There are no tribal, economic, administrative or legislative complications to settle; no new policies to formulate and try out. The men and machinery are on the ground, the work is going on; all that is needed is more money for construction and maintenance of shallow stock wells in the Navajo and Hopi countries and for drilling one deep well south of the Hopi villages to ascertain if artesian water can be developed in that section. One flowing well in the country south of the Hopi villages would do more to hasten the civilization of the Hopi Indians than years of effort under present

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conditions for the flowing water, irrigating acres of land which needs only water to make it very productive, would bring the Hopi Indians down from their high rock mesas to the new farm lands made by the artesian well and this would be such a radical change in their living conditions that it would be a long step forward on the road to progress.

Recommendations.

As this is a report of progress and not a final report I have only the following general recommendations to suggest;

That the Board stand ready to aid the white citizens of northern New Mexico and Arizona to secure appropriate legislation and departmental action to bring about a rearrangement of the public domain and railroad sections contiguous to the SantaFe railroad right of way in both states, so that each class of land shall be blocked in townships or half townships where such rearrangement is possible, keeping in mind the securing of the public domain east and south of the Navajo, Moqui and Leupp reservations for the permanent use of the non-reservation Navajo Indians.

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That a persistent and insistent campaign be conducted to provide enough school facilities to furnish every Navajo boy and girl an education.

That the under ground water development in the Navajo and Hopi countries by the Irrigation Division of the Indian Service be given special attention by the Indian Office and Congress to the end that enlarged appropriations shall be made for the construction and maintenance of shallow stock wells, the drilling of artesian wells and the development of agricultural lands in accordance with the plans and purposes of the Irrigation Division.

Respectfully,

(signed) Malcolm McDowell,
Member, Board of Indian
Commissioners.

To
Hon. George Vaux, Jr., Chairman,
Board of Indian Commissioners,

Approved:
George Vaux, Jr., Chairman,
March 6, 1919.

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