

W. C. Gilbert

DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
Division of Indian Health

REPORT ON

ENVIRONMENTAL SANITATION SURVEY

AND

PUBLIC HEALTH SERVICE SANITATION PROGRAM

FORT YUMA INDIAN RESERVATION

Winterhaven, California

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Prepared by
Phoenix Area Office
Box 674
Phoenix, Arizona

FOREWORD

The following report has been prepared to set forth the findings of a sanitary survey conducted by the U. S. Public Health Service on the Fort Yuma Indian Reservation, and is intended to show sanitary conditions as found on that reservation during the winter of 1956. The field health program of the Public Health Service, Division of Indian Health, is new here, and the findings of this survey can be used as a baseline to which improvements can be contrasted as the program develops.

House-by-house material for this report was secured by the Public Health Service sanitarian on the reservation, Mr. Edmond Jackson. This data plus supplementary material secured from the Fort Yuma Sub-Agency, U.S. Census Bureau, and other sources, was assembled by the Phoenix Area Office sanitary engineering section. The help of the following officials is acknowledged with thanks: Mr. Norwood Cox, Sub-Agent for Fort Yuma; Dr. Richard Fodor, Medical Officer in Charge, PHS Indian Hospital on the reservation; and Mr. Erich A. Schultz, Program Analyst at the Phoenix Area Office.

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THE TRIBE AND ITS ORGANIZATION

The Fort Yuma Indian Reservation, in the southeast corner of California, is now home to a group of Indians who once lived in scattered settlements up and down the banks of the Colorado River. They made their living by small scale farming, the gathering of wild vegetable foods, hunting, and fishing. Because of the wealth of natural resources, they were indifferent agriculturalists. Women gathered wild products, men hunted and fished, and both tended the farms. The usual crops of corn, beans, and squash were grown and, in historic times, watermelons and cantaloupes and wheat were added to the list. Among the wild food plants, great dependence was placed upon mesquite and screwbean.

There was considerable interest in warfare, especially among the Cocopah, the Mohave and the Yuma, but it was not for gain in raids as among the Apache. Warfare was a matter more of style and execution than a mode of economic or territorial conquest. Opposing leaders took no-retreat vows, brandished their clubs and shook their nose pendants at each other, and in battle were backed by well ordered squadrons of club wielders and bow and arrow fighters. War honors were important and good fighters were men of high prestige.

Religious interest revolved around death ceremonies, and religious beliefs were phrased in terms of the acquisition of power through dreams. Both elements are still important, as is the belief in the curing power of medicine men. Shamans, orators, singers, chiefs, war leaders, and others, all derived their power from dreams. These are involuntary and, in native theory, replace learning, or at least, are prerequisite to learning. The recital of myths and myth-songs and the delivery of formal orations were the marks of great ability and high personal quality and, in great measure, provided the only avenue for personal prestige after American troops put a stop to warfare.

The family was the producing and consuming unit and there was little division of labor beyond part time shamans and war leaders, so that each family was responsible for its own subsistence (1).

The reservation was established by Executive Order of President Chester A. Arthur on 6 July 1883. On 15 August 1894 an Act of Congress authorized the dividing of the reservation into 5-acre trust allotments to each Indian, and on 3 March 1911 this allotment share per Indian was increased to 10 acres. There are at present 822 of these 10-acre allotments, the income from which devolves upon the original allottee or his descendents.

Tribal affairs are governed by a Tribal Council, the present chairman of which is Mr. Henry Chaipos. It consists of 7 members, elected from the reservation at large. Meetings are held every

month at the tribal offices on Agency Hill. This group officially styles itself the "Quechan Tribal Council," Quechan being an alternate, interchangeable name for Yuman.

The Council prepared a census roll of the members of the Quechan Tribe as of 30 June 1955. Through the cooperation of Mr. Norwood Cox, Sub-Agent for the Fort Yuma Reservation (the Agency is at Parker, Arizona, 118 miles by highway up the Colorado River), this census roll was examined and, with births and deaths since 30 June 1955 taken into account, yielded the following data:

TABLE I. Age Distribution of Yuma Indians, as of 31 December 1956

Age	Yuma Indians, by Sex				Ratio Males to 100 Females
	Total		Male	Female	
	No.	%			
TOTAL	1,209	100.0	581	628	92.5
Under 5	130	10.7	63	67	94.0
5 - 9	188	15.5	89	99	89.9
10 - 14	158	13.1	68	90	75.6
15 - 19	117	9.7	60	57	105.3
20 - 24	109	9.0	54	55	98.2
25 - 29	70	5.8	31	39	79.5
30 - 34	91	7.5	43	48	89.6
35 - 39	62	5.1	26	36	72.2
40 - 44	54	4.5	25	29	86.2
45 - 49	48	4.0	22	26	84.6
50 - 54	56	4.6	22	34	64.7
55 - 59	29	2.4	19	10	190.0
60 - 64	31	2.6	19	12	158.3
65 - 69	25	2.1	14	11	127.3
70 and over	41	3.4	26	15	173.3

An analysis of these data shows that the Tribe is relatively young in its composition. The mean average age on 31 December 1956 was: Male 26 years 7 months, Female 24 years 1 month, or 24 years 10 months for an over-all average. The median age over-all was 20 years 7 months (Males 20 years, 11 months, and Females 20 years 2 months). The U.S. Bureau of the Census cites the following median ages for the entire population of the United States (2):

TABLE II. Median Age at Census Dates Since 1900 and for 1 July 1955.

Year	Median Age(years)
1900	22.9
1910	24.1
1920	25.3
1930	26.5
1940	29.0
1950	30.2
1955	30.1

The drop from 1950 to 1955 reflects the continued high birth rate in the U.S. From this table it may be seen that the Yuma Tribe has now the age-group make-up of the U.S. prior to 1900.

REFERENCES:

(1) Indians of the Southwest, First Annual Report of the Bureau of Ethnic Research, Department of Anthropology, University of Arizona, 1953.

(2) Current Population Reports, "Population Estimates," series P-25, No. 121, 27 September 1955, Bureau of the Census.

THE RESERVATION AND ITS RESOURCES

Yuma, Arizona, lies on the south bank of the Colorado River, which at this point flows from east to west. The Fort Yuma Reservation is situated directly across the river from the City of Yuma (See map on following page). The reservation is roughly triangular in shape with one leg following the river, another perpendicular to it, and the hypotenuse on the northwest bordering the All-American Canal. Its dimensions are four and a half miles north and south and four and a half east to west. The total area is 7,914 acres, of which 7,743 acres are level and irrigable.

The elevation of the land near the river is 125 feet above sea level. The terrain, while practically level, does have a slight uniform slope upward toward the hills to the north, and the elevation of the reservation just before the All-American Canal is 140 feet. There is only one prominence, "Agency Hill", which rises to 267 feet. This is virtually on the river bank, contains the Sub-Agency office and the Public Health Service Indian Hospital, and commands a view of the entire reservation. This hill is "school reserve" land and thus on the map is not shown as reservation land proper.

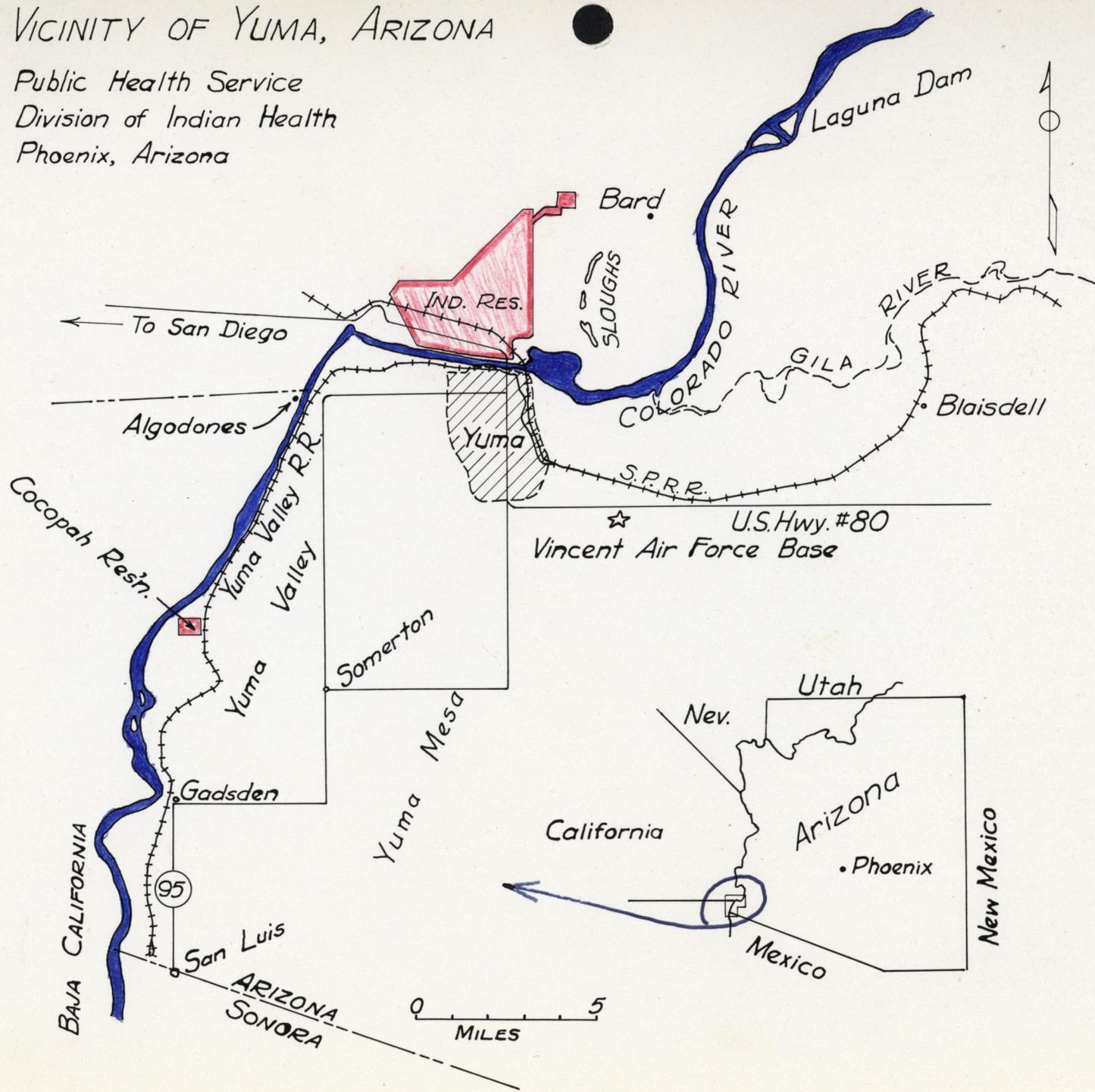
To the west of Agency Hill is the townsite of Winterhaven, California (See Photo 1). This area, 0.25 miles by 0.3 miles, is an island in the reservation, a white community surrounded by Indian allotments. It is an important trading center for the Indian



Photo 1. Main Street of Winterhaven, California

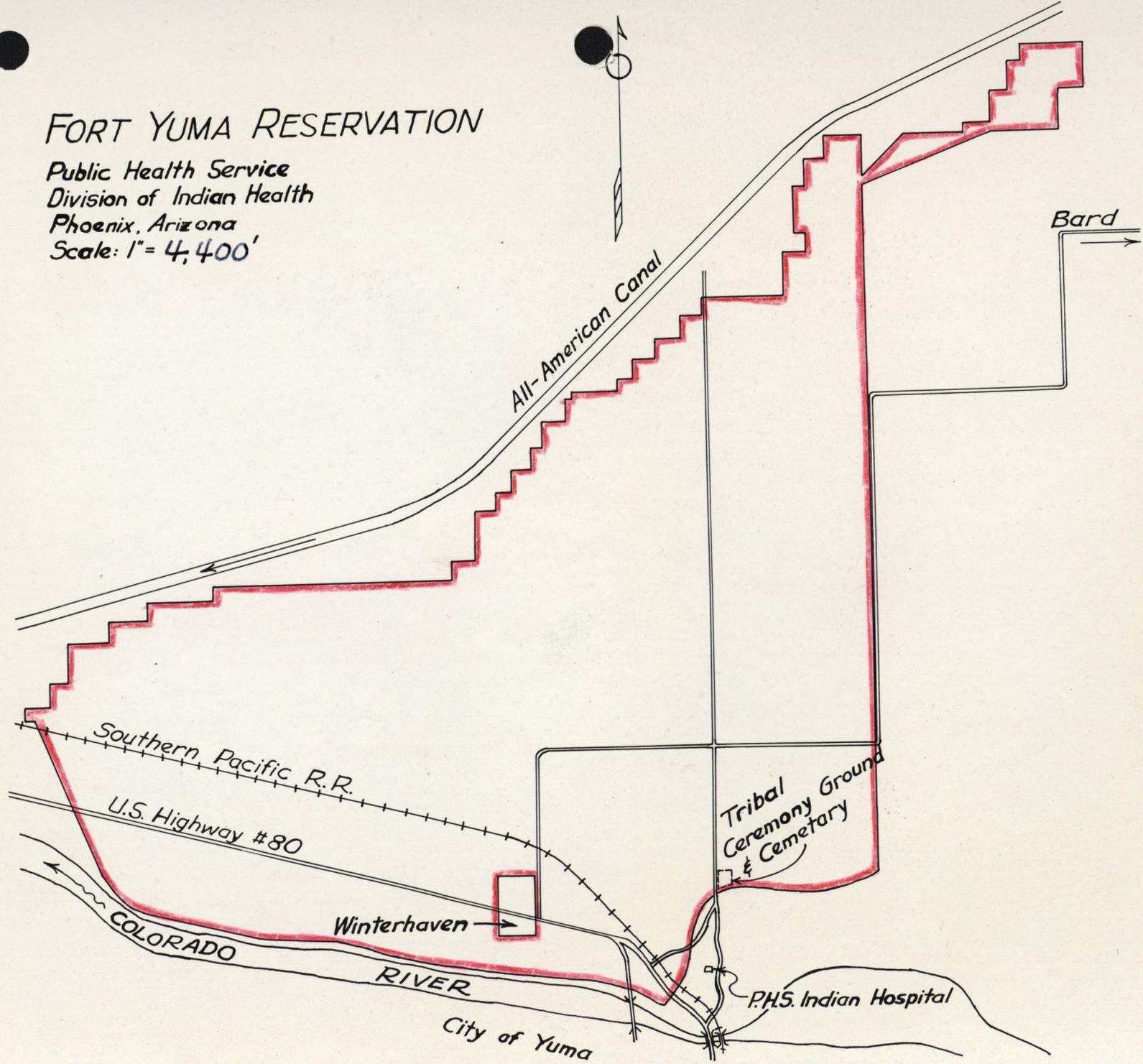
VICINITY OF YUMA, ARIZONA

Public Health Service
Division of Indian Health
Phoenix, Arizona



FORT YUMA RESERVATION

Public Health Service
Division of Indian Health
Phoenix, Arizona
Scale: 1" = 4,400'



families and lies completely outside the jurisdiction of the Bureau of Indian Affairs, tribal police powers, or PHS Division of Indian Health responsibility. Its sanitation, however, is intimately associated with that of the reservation, and is fostered by the Imperial (California) County Health Department.

The climate of the Yuma area is among the hottest on record in the United States. The mean annual temperature for Yuma (and very closely for the Fort Yuma Reservation) is 71.9 degrees, and this is of significance when housing is being considered (1). The average rainfall approximates 3.5 inches per year, and must be supplemented by irrigation for the growing of crops. Irrigation water was formerly brought to the fields from the Laguna Dam on the Colorado, but is now taken from the All-American Canal, which links the Colorado River with the Imperial Valley of south central California.

TABLE III. Monthly Temperatures, 1877 - 1942*

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Ext. Max.	84	92	100	107	120	119	119	119	114	108	96	83
Ext. Min.	22	25	31	38	39	50	61	58	50	38	29	22
Mean	54	58	64	70	76	85	89	90	84	73	62	55

*U.S. Weather Bureau records.

The average length of the frost-free growing season, during the years 1877 to 1942, was 352 days. The winds at the airport on the open mesa just south of Yuma average 5.2 miles an hour, with an average maximum of 28.2 mph and an extreme maximum of 44.0 mph. Distribution of rainfall throughout the year is shown in Table IV. At the Yuma Citrus Station of the University of Arizona evaporation records are maintained and indicate a yearly evaporation rate of 121.4 inches, with a monthly maximum rate of 17.4 inches, during July. Relative humidity determinations at the same station show a maximum of 71% at 6:00 a.m. in August, a minimum of 18% at noon in June and 17% at 6:00 p.m. in June. The yearly averages at the Station, and applying in general also to the reservation area, are: 61% at 6:00 a.m., 26% at noon, and 27% at 6:00 p.m. These figures, which are higher than one would expect in view of the extreme heat, show the influence of extensive irrigation.

TABLE IV. Rainfall at Yuma, 1870-1942 (1)

January	0.45"
February	0.41"
March	0.34"
April	0.10"
May	0.04"
June	0.02"
July	0.09"
August	0.50"
September	0.35"
October	0.22"
November	0.29"
December	0.53"
Annual Total	3.47"

The reservation lies entirely in the floodplain of the Colorado River. The terrain, once broken by old river channels, sloughs, sand dunes, and outwashes from the hills to the north, is now leveled by years of farming. Its soils have been washed in by the Colorado and Gila Rivers and consist of sands and clays mixed in a very non-uniform fashion. They have a high lime, potash, phosphorus, and soluble salts content (2). The principal crops grown are cotton and cantaloupe, and according to the records of Mr. Stribling McCollough, Soil Conservationist, a bale of cotton per acre is the usual production (contrasted to two bales in the more fertile fields of the Salt River Valley around Phoenix). Other crops grown include alfalfa, grain sorghum, flax, castor beans, barley, wheat, Sudan grass, lettuce, and watermelon.

A survey was made of the income of the Indian families by Mr. Jackson with the help of Mr. Cox and Mrs. Pinkney of the Imperial County Welfare Department, early in January 1957. All of the income for a family was noted, consisting of the wages of the head of the household supplemented in some instances by work of the spouse and/or children, and including income from welfare, allotment leases, and other sources. Not all of the families lived on the reservation, but all were listed on the tribal census roll. Some of these family units live in Yuma and surrounding communities.

The average income for the 253 wage earners surveyed (making up all but 15 of the families possible from the roll) was \$2,745. per year. This reflects the earnings of a few well-to-do Indians and is not too indicative of the bulk of incomes. A better figure is the median income, the income such that one half the families exceed it and the other half are lower. The median income was \$1,966. per year. The interquartile range (middle half of the incomes reported)

was \$1,570. to \$3,250. per year. It is our opinion that this compares more than favorably with other Indian groups in the Phoenix Area, and is indicative of the benefit the Yuma Indians derive from their nearness to a major white community.

Employment for most of the male wage earners comes from agricultural work (often on the fields which they have leased out to white farmers), employment on the Southern Pacific Railroad, manual labor in and around Yuma. Several are creating excellent reputations as contractors, linotype operators, crew foremen, and farm operators.

Approximately 5100 acres of land are leased out to white farmers. Land in good condition will lease for \$30 or \$35 an acre, while land poorly prepared for irrigation may bring \$6 to \$10. Because the original allotments have in many cases been divided up between two or more heirs, the annual income from leased land varies from around \$1,000. down to only a few cents. The total lease income for members of the tribe so far this year is over \$17,000. and all of the leases have not yet been renewed.

There are no Indian communities on the reservation. Each family or "extended" family lives on its own allotment. In general, the dwellings (if there be more than one) on an allotment are clustered very close together so as not to take out of crop production any more land than is necessary. There is an extensive network of roads and every house is accessible by car.

There are no Bureau of Indian Affairs-operated schools. The San Pasqual School District, operating under the Imperial County School Department, has two nearby schools, one on Agency Hill and the other on the east edge of the reservation. Both are attended by Indian and white children alike. The total enrollment of 471 (December 1956) is made up of 211 Indian children and 260 white children.

TABLE V. School Enrollment, San Pasqual School District as of December 1956

	Agency Hill	Lincoln	Total
Indian Children	36	175	211
White Children	52	208	260

The County Health Department, with its headquarters at El Centro, California, is responsible for school sanitation at both institutions. Indian children of high school age go across the river to Yuma each day to attend school.

There are no restaurants, cafes, slaughterhouses, tribal rodeos, fairs, or other activities involving sanitation, within the jurisdiction of the Indian Health Program. Proximity to Yuma has made tribal fetes unnecessary, and there are no tribal enterprises.

REFERENCES:

- (1) Records of the U.S. Weather Bureau, Yuma, Arizona, Station.
- (2) Records of Sub-Agency Soil Conservationist, Fort Yuma.

HOUSING

In contrast to the Navajo and to some extent the Utes, the Yumans are not a nomadic people, but are to a considerable extent sedentary, leaving home during the growing seasons to earn a living in the Imperial Valley or in the fields from Yuma to Phoenix but returning home during off seasons. In most cases the family of the wage earner will remain at home, and because of the allotment system houses have been maintained consistently at one location for each family for years. This is of signal importance in environmental sanitation work, as any improvements made can be expected to be fruitful and relatively permanent.

There are 150 houses on the reservation. Of the 1209 Yumans on the tribal roll as set forth above (page 2), 646 live on the reservation (317 males and 329 females). They have an age distribution as shown in Table VI.

TABLE VI. Age Distribution of Reservation Indians
as of 31 December 1956

Age	Number	Percent of Total
Infant	7	0.9
Pre-School	62	9.7
School	210	32.5
Adult	367	56.9
Total	646	100.0

There are 132 single-family units, 17 two-family dwellings, and only one house with three families. Table VII indicates the occupancy rate of the homes on the reservation, excluding several houses for which data are not available.

Electricity is available throughout the reservation. It is presently wired into 87 of the dwellings, or 58% of the total number of homes, and the building of new homes as detailed in the following pages will make this percentage even higher.

TABLE VII. Occupancy Rates for Reservation Homes

No. Rooms Per Dwelling	Dwelling Units		Persons Included		Total No. Rooms in Dwelling Units	Av. No. Rooms Per Person	Av. No. Persons Per Room	
	No.	Distri- bution %	No.	Distri- bution %			Mean	Median
Total	148	100.0	619	100.0	494	.80	1.3	1.2
1	12	8.1	26	4.2	12	.46	2.2	1.7
2	33	22.3	89	14.4	66	.74	1.3	1.4
3	35	23.6	151	24.4	105	.70	1.4	1.5
4	33	22.3	148	23.9	132	.89	1.1	1.2
5	32	21.6	189	30.5	160	.85	1.2	1.2
6	2	1.4	8	1.3	12	1.50	.7	.6
7	1	.7	8	1.3	7	.88	1.1	1.1



Photo 2. Typical Frame and Adobe Home (Unsatisfactory Dwelling)
Photo courtesy of S.M. McCollough

The traditional dwelling of the Yuman has been a house made of a willow framework filled in with adobe, with a board roof covered over with brush and mud. These serve well against the intense heat in the summer but decompose quickly, are difficult to keep clean and well screened, and are not highly regarded by the Indians themselves. They are more than willing to leave them and move into something better.

Other Indian families live in plain sun-dried mud brick houses, houses built of cinder block, and frame houses.



Photo 3. Another Example of Unsatisfactory Dwelling, Frame and Adobe

A program of singular interest on the reservation began in 1955, when the U.S. Congress authorized the expenditure of funds from the monies due the organization denoted "The Indians of California," to be used for the development of better housing. A share of this money was allocated to the Yuma Reservation, and with the funds 70 units of war surplus housing were brought to the reservation from the vicinity of San Diego, California, and set up. The houses were turned over to the individual Indian family without charge, but the Indian had to have the structure dissembled, moved by trailer-truck to his allotment, and re-erected. A sum of \$300 per house was provided by the Indians of California for the moving of the unit and improvements to the building once it was set up. This money could be used for wiring of electricity, installation of water and sewage disposal. Our sanitarian, Mr. Edmond Jackson, has been of considerable



Photo 4. War Surplus Housing Unit Ready for Assembly on Site
Additional Photographs in Appendix



Photo 5. War Surplus Housing Unit Almost Completed

help to his people, acting as expeditor and helping to locate the proper site for water and sewage facilities. Forty-five of these homes were set up and occupied by early January 1957, and twenty-five more have been delivered to the site or contracted for. Each house comes complete with a plumbing system, kitchen and bathroom sinks, bathtub, hot water heater, glazed windows and screening.

TABLE VIII. Types of Houses Occupied on Reservation

Type	Satisfactory	Unsatisfactory
Frame and Adobe	--	65
Frame	65	5
Adobe	--	7
Masonry	5	--
Miscellaneous	--	3
Total	70	80

Screening of the house is complete in 116 instances (77% of the total), partial in 32 (22%) and non-existent in only 2 (1%).

WATER SUPPLY

Fort Yuma is particularly favorably situated for the development of ground water sources for drinking water. The All-American Canal passes along the uphill side of the reservation, and as this



Photo 6. Typical Driven Well. Note Absence of Concrete Base.

is only partially lined with concrete, a portion of this water soaks into the soil and recharges the ground water between the canal and the Colorado River. Throughout the reservation area the water table (top level of the ground water) is within ten or fifteen feet of the surface of the ground. The level varies somewhat through the year but is always within reach of a pitcher pump or other hand-operated pump. In fact, the water level is so high that it presents a problem in seepage pit construction, and these must be built shallow and wide rather than narrow and deep.

The only community water system on the reservation is the extension of the City of Yuma supply across the river to Agency Hill. Here it is used by Bureau of Indian Affairs facilities, the Public Health Service Hospital, a school, two church missions, and twelve resident families. In addition, eight Indian families truck the water from a hydrant on the Hill to their homes for lack of a closer developed source. This water is taken from the Colorado River, is thoroughly treated and chlorinated, and presents no sanitary hazard as it is piped to the delivery point.

Forty-three of the homes provided with electricity have been equipped by their owners with electric pumps and pneumatic storage



Photo 7. Driven Well Equipped with Electric Pump and Pneumatic Tank

tanks (usually 42-gallon capacity) and inside plumbing. An additional twelve houses have electric pumps supplied from shallow wells on the premises, but no inside plumbing system (See photo 7).

Seventy-four dwellings are provided with shallow wells and hand pumps. A common fault of these wells, as of similar wells equipped with electric pumps, is that there is not proper protection at the ground surface against contamination following the casing down to the ground water and reentering the well (See photo 6), and this could be remedied by the building of concrete aprons about the pump base. However, in practice this hazard is not great (compared with other public health hazards on the reservation), and while it cannot be condoned and should be remedied, the danger is overshadowed by others, such as poor excreta disposal.

Of the houses with inside plumbing, 29 sources have not been tested bacteriologically to date, and 14 have been tested. Our sanitarian has taken all of these samples and had them tested at the Thomas Laboratories, a private testing concern in Yuma. All but one of the samples were free from coliform bacteria, and the latter sample was from a leaky pump which has since been repaired.

Among the wells with hand or electric pumps but NO inside plumbing, 79 were satisfactory, with the exception noted above, and 7 were patently unsatisfactory.

The usual mode of storage in the home is a covered galvanized iron can. Of all the cans so used only about 5 were uncovered, which to us indicates a high degree of "sanitation awareness" (and for which we take no credit, as it happened before the inception of the present Program).

One house, with only one inhabitant, uses river water direct. The remaining 12 households not accounted for above use water from neighboring wells.

SEWAGE DISPOSAL

The maintenance and use of proper sewage disposal facilities again indicate a high degree of enculturation among the Yuman Indians. The results of the survey during the winter of 1956 indicate:

Satisfactory water carriage systems:	20
Satisfactory privies:	74
Unsatisfactory privies:	56
Houses without excreta disposal means:	<u>0</u>
Total	150

In some instances the owners of war surplus houses from San Diego have been unable to afford water carriage sewage systems. These people have been advised by our sanitarian to build pit privies until such time as they can afford a septic tank and seepage pit.

Soil from the digging of several seepage pits has been examined in the past and has never revealed the presence of lenses or strata of gravel. So far only fine sand and silt have been



Photo 8. Septic Tank and Seepage Pit Under Construction. Mr. Jackson, P. H. S. Sanitarian, is looking down the Seepage Pit. Concrete Slabs Cover Septic Tank.

encountered. A maximum separation between water well and sewage system has been encouraged by Mr. Jackson, taking into account the direction of flow of ground water. This is occasionally made difficult by the small area of the allotment utilized for housing, because as mentioned before (page 7), only a minimal plot is taken for the house and a large segment left for crop growing. Periodically the farm land is plowed deep with a tractor-drawn spike to bring up new earth, and should this land be used for sewage disposal, this plowing would disrupt the tile field or seepage pit.

PREMISE SANITATION

Under this heading will be considered both refuse disposal and sanitation inside the home. Consideration will also be given to vector control, as this is intimately associated with refuse and garbage disposal.

Of the 150 homes surveyed, 82 (or 55%) provided steel drums or other acceptable method of refuse storage, and 65 (43%) had no such means. Seventy-seven of the homes were rated as satisfactory in the manner in which they collected refuse and garbage and removed it from the premises, while 72 allowed trash to pile up to an unacceptable degree. Eighty-two of the homes utilized a community refuse disposal area (See photo 9), while it appeared that 66 households dumped their refuse indiscriminately or at least unacceptably.

A sanitary landfill refuse disposal site is located about 500' north of the highway out a half mile west of Winterhaven.



Photo 9. Refuse Disposal Area West of Winterhaven

The refuse is dumped off over the edge of a dry slough and from time to time earth-moving equipment covers the trash with a layer of dirt. The sanitarian encourages the use of the dump site and points out to the lessee of the dump site when the area needs maintenance (as it does in photo 9).

Flies present a serious health hazard on the Fort Yuma Reservation. According to Mr. R. L. Dills, Supervising Sanitarian of the Imperial County Health Department, the summers are too intensely

hot for the breeding of significant numbers of flies, and there are two upsurges of fly populations: one about April and another in the fall of the year.

During the survey 29 householders complained of flies in their home or about the premises, 12 complained of roaches, and 3 had dwellings infested with mice. This is, of course, a subjective type of finding and does little more than point out the existence of these insects and vermin. They are far more wide-spread than the answers to the survey would indicate. Replacing the adobe earth-floored home with the war-surplus prefabricated house will do much to alleviate the fly and vermin problem.

The presence of sloughs and irrigation canals and ditches makes for luxuriant mosquito breeding. So far these insects have not been incriminated in disease transmission at Fort Yuma, but they represent a nuisance. An extensive mosquito control program would be needed before these pests could be reduced to bearable proportions.

Cooking is done on the following types of stoves:

Wood Stove:	71
Wood & kerosene:	17
Wood & butane gas:	6
Electric stove:	22
Kerosene:	11
Butane gas:	20
Not surveyed:	3

Food is stored in covered tin cans, primarily as a defense against dehydration but indirectly to avoid contamination. This procedure is carried out in 130 homes, with only 20 homes unsatisfactory. There is refrigeration (electric machine or ice box) in 109 homes. While dish washing techniques were not investigated exhaustively, it was the opinion of our sanitarian that it was satisfactory in about 65 homes, unsatisfactory in 25, and indeterminate in 60.

PUBLIC HEALTH SERVICE PROGRAM

At the time of the writing of this report there are on duty at the Fort Yuma Public Health Service Hospital a Medical Officer in Charge, an Assistant Medical Officer, a nursing, clerical, and maintenance staff, and a sanitarian. The latter is the only full-time field health employee, working under the guidance and direction of the Medical Officer in Charge.

Mr. Edmond Jackson, the sanitarian, began working for the Public Health Service, Division of Indian Health, at Fort Yuma in the summer of 1955. Since that time he has carried out a diversified program, with particular emphasis on the proper establishment of each of the new war surplus houses. Beyond the location and construction of each well and sewage disposal system, he has encouraged and helped arrange for the bringing in of electricity, the installing of screening, the elimination of fly breeding places, and other environmental sanitation activities. In the summer of 1956 he carried out an extensive fly spraying program, using Malathion, with considerable success.

It is plainly more sensible to erect a facility right than to erect it improperly, tear it down, and build it correctly. Thus Mr. Jackson's work is currently significant and should eliminate many mistakes which might otherwise have been made in the construction of the war surplus housing sanitary appurtenances.

CONCLUSIONS AND RECOMMENDATIONS

The Fort Yuma Reservation is passing through a memorable period in its history. The sanitary environment of the people is improving year by year. With the construction of the prefabricated houses and the improvements being made in many of the remaining homes, the reservation should eventually compare favorably with surrounding white communities. This progress can be accelerated significantly by the continuing work of the Public Health Service.

Records from the Fort Yuma Public Health Service Hospital for the last few years do not reveal any pronounced incidence of enteric disease or communicable diseases which could be attributed to a faulty environment. Why this is so is not certain because intestinal sickness is known to be present among the Yuman Indians.

Sanitation work on this Reservation is a little more sophisticated than on many other reservations in the Area. There are a higher proportion of water-carriage sewage systems, higher ratio of individual water wells, and somewhat more complex vector control needs. The sanitation program should involve the following activities.

Recommendations. To bring the environment of each Indian family on the reservation to a par with that of the white families in the vicinity, we would recommend the following:

1.) Housing. Encourage and foster the building of suitable homes. This has been done by the Bureau of Indian Affairs, and a great deal of credit is due to Mr. Cox and his staff for their work in arranging for the building of the San Diego houses. The Public Health Service is concerned that each house be adequately and properly provided with clean, safe drinking water, and proper sewage disposal. This should be done while the houses themselves are being erected and while the interest of the family is high in building a comfortable, sanitary dwelling for itself. The sanitarian should continue to help his people by filling out their applications, arranging for the buying of building materials and the construction of wells and septic tanks, locating these facilities properly, teaching the simple principles of personal hygiene, safe water supply, dish washing, etc.

2.) Water. The eight families currently trucking water from Agency Hill (for distances up to 2 miles) should each be provided with a water supply. The twelve households now securing water from neighbors' wells should likewise have supplies of their own, for convenience and also to foster the more lavish use of water for laundering and for personal hygiene. These systems are estimated to cost \$30.00 each for a total expenditure of \$600.00.

Every well not presently provided with a concrete floor or apron around the casing at the ground surface should be so protected. This will prevent the entrance of surface contamination into the well and insure the pumping of nothing but pure ground water from the well. The concrete should extend ten feet down the casing, in a cone shape with the wide end at the ground surface. It is estimated each such structure would cost \$25.00. As it is not known that any of the wells are so protected at the present time, 139 wells need improvement, for a total cost of \$3,475.00.

3.) Excreta Disposal. The 56 unsatisfactory privies found during the survey should be replaced with new frame sanitary pit privies. Each such privy will cost about \$70.00, for a total cost of \$3,920.00.

4.) Refuse and Garbage Disposal. Every house on the reservation is conveniently accessible by road (except in rainy weather). It is more economical for one truck to operate through the area collecting trash than for each home owner to dispose of his own. Certain revenues accrue to the Tribal Council and either through the use of some of this money or through the levying of a service charge, a collection service should be set up on the reservation. This need operates only one or two days a week, as experience develops, and our estimate is that a contract could be negotiated for this service for \$5,000.00 per year.

5.) Fly Control. Teach each Indian family to rid its premises of flies by removing trash and garbage and by the use of insecticides. The latter is being demonstrated during each fly breeding season by Mr. Jackson on a reservation-wide basis. Ultimately the work should be assumed by a non-Governmental agency or by the householders themselves.

6.) Mosquito Control. A careful study should be made of the mosquito problem and control measures needed. These would perhaps consist of better control of irrigation water, filling or draining of sloughs and other standing water, and the judicious use of insecticides.

Wilfred C. Gilbert
Assistant Area Sanitary Engineer

APPENDIX A

Presented herewith are additional photographs of war surplus houses being erected on the Fort Yuma Indian Reservation. They were considered extraneous to the main body of this report, but are included here because of the high significance we attach to the development of these high-quality houses, and to their importance in furthering good environmental sanitation on the reservation.



Photo 10. Prefabricated Housing Unit Unloaded from Truck and Ready for Assembly



Photo 11. Partially Assembled Prefabricated Housing Unit



Photo 12. One More Plywood Panel in Place



Photo 13. One More Panel in Place



Photo 14. Completed Dwelling Unit. Note Absence of Extensive Footings (Not Needed Because of Mild Climate)



Photo 15. Completed War Surplus House