

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY  
WASHINGTON 25, D. C.

WATER-RESOURCES INVESTIGATIONS OF  
MOUNT MCKINLEY NATIONAL PARK, ALASKA

By  
Chester Zenone

Prepared in cooperation with the National Park Service  
Administrative Report for U.S. Government use only

Water Resources Division  
Alaska District  
1970

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MONC/USGS

April 27, 1971

Memorandum

To: Director, National Park Service  
Attention: Chief, Division of Water Resources

From: Chief, Water Resources Section, Office of Land Acquisition  
and Water Resources, WSC

Subject: USGS Administrative Report: "Water Resources Investigations  
of Mount McKinley National Park, Alaska," by Chester Zenone

Enclosed for your files and information are two copies of subject report and incoming correspondence. Our collective comments regarding this report were forwarded to the Geological Survey in Anchorage on March 18, 1971, but only one revised final report, with appropriate changes and corrections was sent by the Survey. We are taking a more expedient means of forwarding the information to you by the following comments and changes, rather than return all copies to the Survey for revision:

1. Title Page - Date of issue is December 1970
2. Page 7 - Add to end of second paragraph: "Some organic pollution of the stream seems inevitable because of the obvious concentrated use of the small valley by moose. Continued chlorination of the water as a minimal treatment should remove this danger."
3. Page 18, 1st paragraph - Insert as 3rd sentence: "The well was pumped at 5-10 gpm for a short time to obtain a water sample. Such a yield could be expected on a continuing basis because recharge from Wonder Lake through the water-bearing gravels probably occurs."
4. Substitute the enclosed sheets, Page 19, 20, and 21, in lieu of the report's pages 19 and 20.

(Sgd)

Gerard S. Witucki

Enclosures - 2

cc:  
Director, Pacific Northwest Region w/enc. & inc.  
General Superintendent, Alaska Group w/enc. & inc.

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## CONTENTS

|                                                     | Page |
|-----------------------------------------------------|------|
| Abstract . . . . .                                  | 4    |
| Scope and purpose. . . . .                          | 5    |
| Hydrogeologic setting. . . . .                      | 5    |
| Individual sites investigated. . . . .              | 7    |
| McKinley Park Hotel - Alaska Railroad area. . . . . | 7    |
| Park Headquarters area. . . . .                     | 9    |
| Savage campground . . . . .                         | 12   |
| Sanctuary campground. . . . .                       | 12   |
| Teklanika campground. . . . .                       | 13   |
| Igloo campground. . . . .                           | 15   |
| Toklat campground and road camp . . . . .           | 15   |
| Wonder Lake area. . . . .                           | 15   |
| Quality of water . . . . .                          | 19   |
| References cited . . . . .                          | 19   |



## ILLUSTRATIONS

Page

Figures 1-6. Maps showing:

|                                                                                                                     |    |
|---------------------------------------------------------------------------------------------------------------------|----|
| 1. Mount McKinley National Park . . . . .                                                                           | 6  |
| 2. Location of water-supply development<br>sites at McKinley Hotel and Park<br>Service Headquarters areas . . . . . | 8  |
| 3. Location of bedrock wells in<br>McKinley Hotel area. . . . .                                                     | 10 |
| 4. Location of test-well and water-<br>resources development sites at<br>Teklanika campground . . . . .             | 14 |
| 5. Location of water-resources develop-<br>ment sites at Toklat River<br>campground area. . . . .                   | 16 |
| 6. Location of test wells in the Wonder<br>Lake area. . . . .                                                       | 17 |

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## TABLES

---

|                                                                            |    |
|----------------------------------------------------------------------------|----|
| 1. Data on wells in the McKinley Hotel -<br>Alaska Railroad area . . . . . | 11 |
| 2. Selected chemical data on water at<br>McKinley National Park . . . . .  | 20 |



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ABSTRACT

Water-resources investigations at several sites in Mount McKinley National Park, Alaska, were made by the U.S. Geological Survey. A new 8-inch well at Teklanika campground was tested in June 1969. The well should yield 50 to 75 gpm (gallons per minute), which is adequate for anticipated water requirements at the site. Two shallow 2-inch wells were jetted along a small stream in the Wonder Lake area. The results of test pumping these wells suggest that 15-20 gpm of ground water are available.

Adequate supplies of good quality ground water are presently available from fluvial deposits at Toklat, Sanctuary, and Savage campgrounds. Additional supplies may be developed at these sites. Ground water of satisfactory quality and quantity can also be obtained from similar deposits at Igloo campground. Development of deep ground water in the Park Headquarters and the McKinley Park Hotel - Alaska Railroad areas from bedrock has been unsuccessful. Surface-water and shallow ground-water sources will probably continue to provide adequate water supplies to facilities there.



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## SCOPE AND PURPOSE

The Geological Survey was requested to investigate the availability of water supplies at specific sites in Mount McKinley National Park (fig. 1), to appraise the overall water resources of the Park, and to make recommendations for development of those resources. However, a comprehensive areal water-resources report was not feasible within the expenditure of time, personnel, and finances allotted to the present study. A study program leading to such a report might involve the installation of stream-gaging stations and continuous recorders of ground-water levels in aquifers, the measurement of precipitation at several sites, a study of the interrelationship between surface water and ground water, and an evaluation of water quality. Much of the data for this type of study would require a long time base in order to be meaningful and might necessitate a continuing study for a period of perhaps 5 to 10 years.

The present investigation consisted of reconnaissance visits to individual sites; the site data cannot be extended for very great distances and widely separated data points cannot be correlated. Each site presents an isolated water-resource problem. Discussion of sites is in order of occurrence of the campgrounds westward from the McKinley Park Hotel along the road to Wonder Lake.

## HYDROGEOLOGIC SETTING

Some general conclusions on the regional hydrogeologic relations of the Mount McKinley National Park area can be drawn from the descriptions of the geology by Capps (1933) and by Reed (1961). Within the Park, all the rocks ranging in age from Precambrian to Tertiary have been intensely metamorphosed. Metamorphism commonly decreases the water-bearing capabilities of rocks. The water-yielding ability of the rocks is still further reduced locally by the presence of permafrost. Therefore, the consolidated rocks in the Park are, in general, unfavorable for developing ground water in large quantity.



Figure 1 --- Map of Mount McKinley National Park

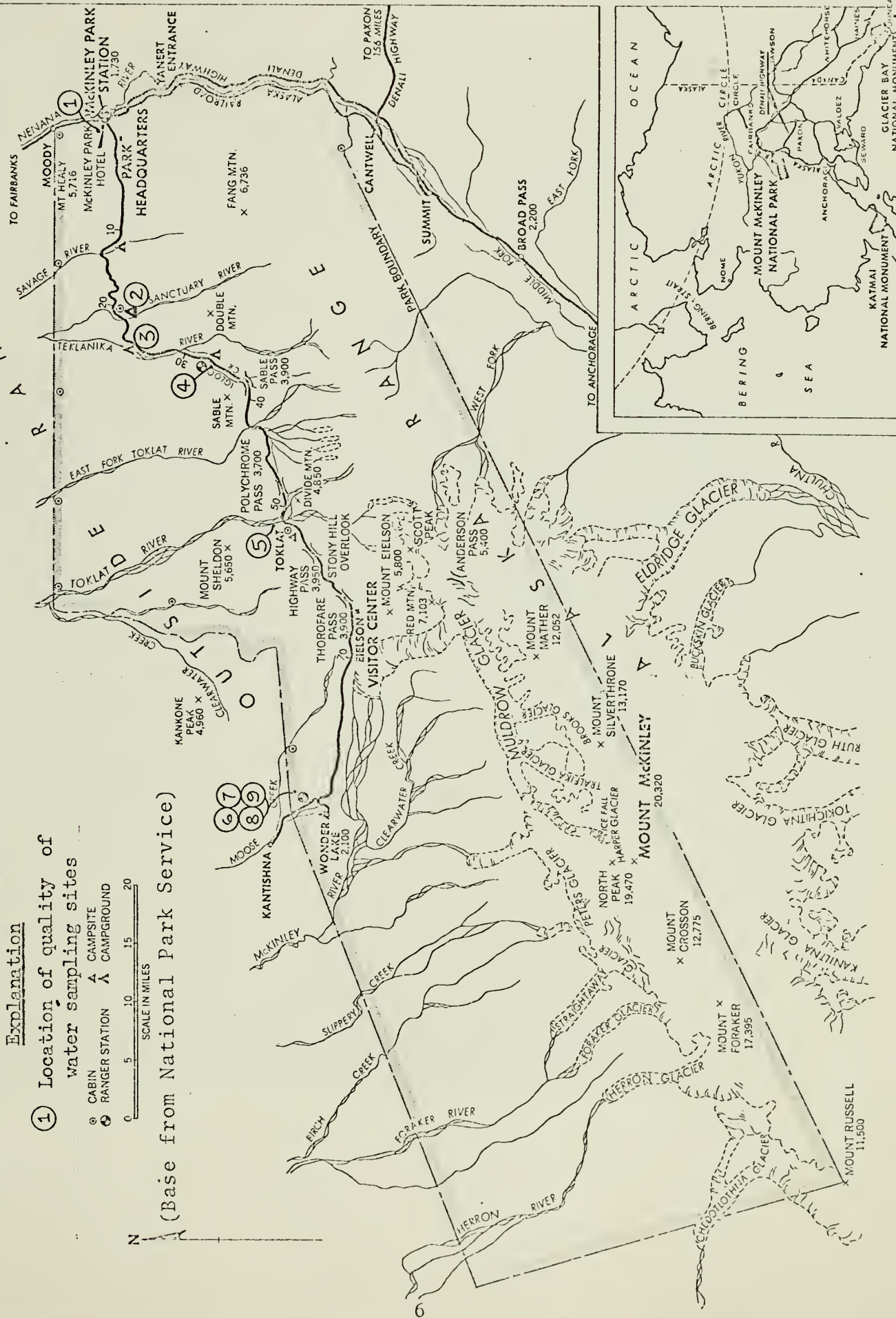
Explanation

- ① Location of quality of water sampling sites

- CABIN  
● RANGER STATION  
△ CAMPSITE  
▲ CAMPGROUND

0 5 10 15 20  
SCALE IN MILES

(Base from National Park Service)





In most of the areas where water supplies are needed the surficial materials are glaciofluvial and fluvial silts, sands, and gravels. These deposits are recharged by the streams and from precipitation and offer favorable sites for ground-water development. The glacial-silt content of many of the streams in the Park prevents their direct use as drinking water.

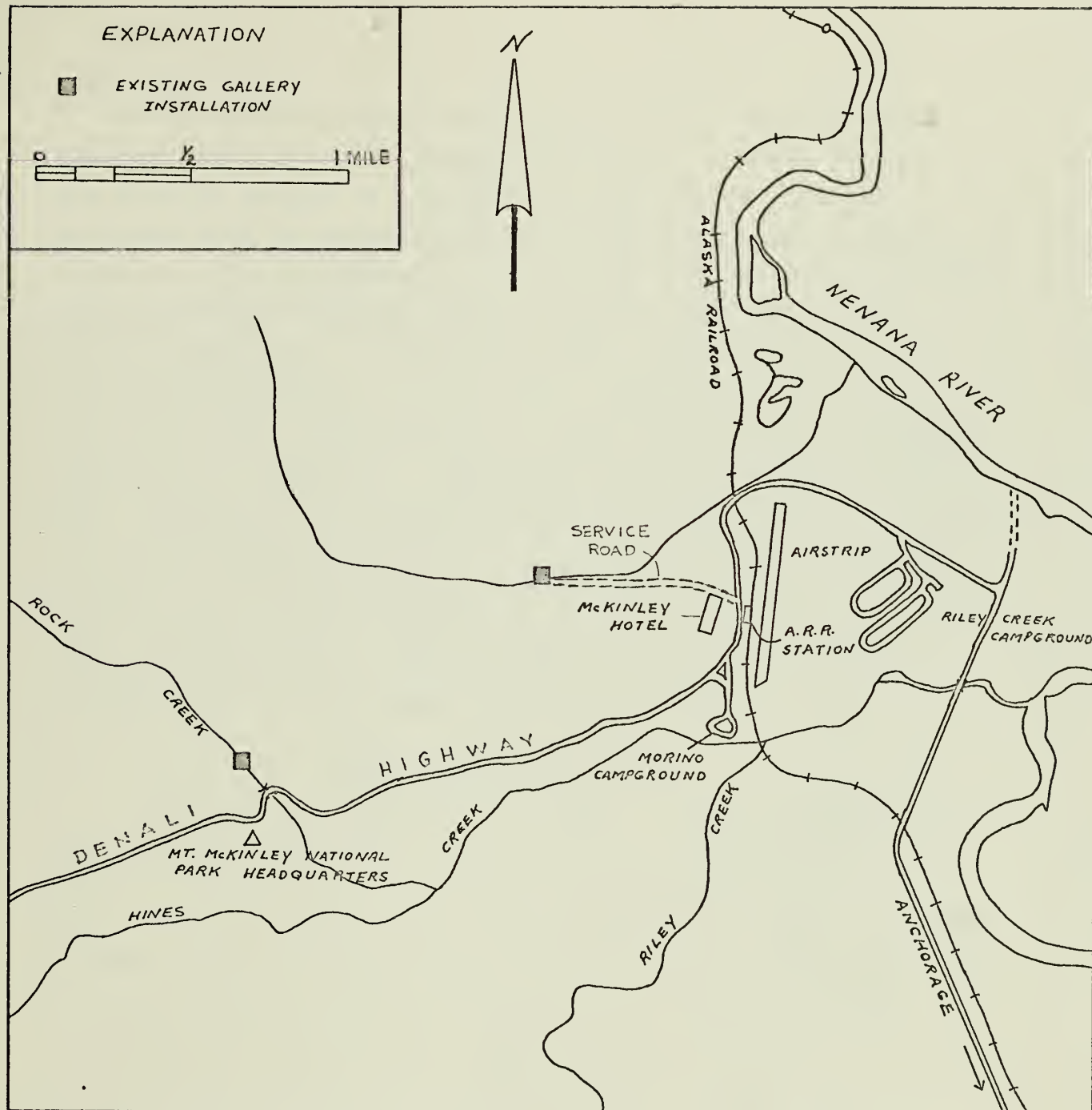
#### INDIVIDUAL SITES INVESTIGATED

##### McKinley Park Hotel - Alaska Railroad Area

The present water supply for this area is a gallery installation about 3,000 feet west of the hotel in a small unnamed stream (fig. 2). According to a report by Tryck, Nyman and Associates (1962), there has never been a lack of water in this stream. Measurements of streamflow to determine normal or average flow have not been made. However, when observed in June, and again in September 1969 (following a full year during which precipitation in interior Alaska was only slightly more than half of normal), practically all surface flow was infiltrating into the gravel fill above the gallery intake pipe. In a search of the valley some 50 to 100 yards upgradient from the intake, several small springs and seeps contributing flow to the stream were found. Annual winter aufeis or icings indicate that these springs normally flow year-round.

The stream used for water supply seems adequate for present demand. However, should an additional source be required due to increased future demands, water could be obtained from a gallery beneath either Riley or Hines Creeks. Some organic pollution of the stream seems inevitable because of the obvious concentrated use of the small valley by moose. Continued chlorination of the water as a minimal treatment should remove this danger.





Base from U.S. Geological Survey;  
Healy C-4 quadrangle; 1:63,360

Figure 2.--Location of water-supply developments at McKinley Hotel and Park Service Headquarters areas.



Surficial material consisting of 30 to approximately 140 feet of clay, silt, sand, and gravel of glaciofluvial and fluvial origin in the McKinley Park Hotel - Alaska Railroad area is unfavorable for ground-water development because it is unsaturated in many places where test drilling has been done. Beneath these surficial deposits is the Birch Creek Schist, which yields only small quantities of water from fractures. Five wells, ranging in depth from 158 to 404 feet, were drilled in this area between 1962 and 1965 (fig. 3, table 1). Only one well yielded more than 3 gpm. Analysis of the aquifer-test data from well MP-4 (table 1) by the Geological Survey indicated that it would yield 12 gpm on a sustained basis. The water is rather hard (338 mg/l (milligrams per liter)  $\text{CaCO}_3$ ) but is otherwise of acceptable quality. This is the well now being used to supply water for the hotel during the winter.

#### Park Headquarters Area

Although no problems concerning the water supply for the Park Headquarters area were reported, an investigation was made of the gallery installation in Rock Creek (fig. 2), which supplies this area. The gallery, on a bench above the present level of Rock Creek, is fed by ground-water flow and by small springs issuing from gravel at the edge of an abandoned stream channel. During June, the water level in the gallery collector house was observed to be low. Ground-water discharge, or spring flows supplying the gallery, was undoubtedly lower than normal at this time because of the long period of deficient regional precipitation.



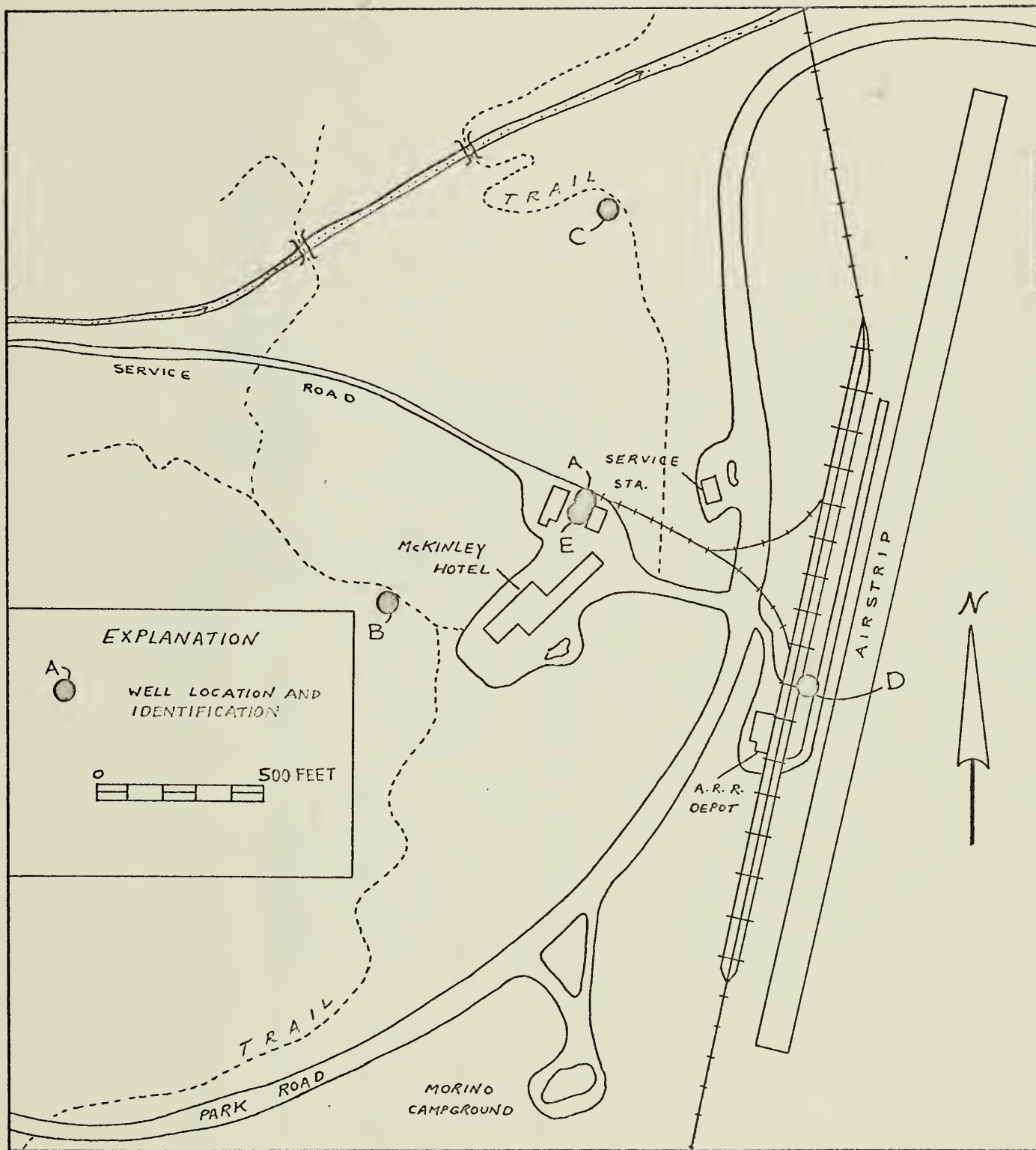


Figure 3.--Location of bedrock wells in McKinley Hotel area.



Table 1. Data on wells in the McKinley Hotel-Alaska Railroad area.

| Well no.                                               | Map no.<br>(fig. 3) | Location                                                                  | Water level                                                                               | Log of well                                                    | Total depth<br>(feet)          | Yield<br>(gallons per<br>minute)                                               | Chemical quality, in milligrams per liter |          |                             |
|--------------------------------------------------------|---------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------|-------------------------------------------|----------|-----------------------------|
|                                                        |                     |                                                                           |                                                                                           |                                                                |                                |                                                                                | Iron                                      | Hardness | Total dissolv-<br>ed solids |
| USGS 50,001 (unused)                                   | A                   | Near ARR siding at powerplant                                             | Fluctuated from 93 to 109 ft below lsd., 1965-1969. Measured 102 ft below lsd. Aug. 1969. | Fractured schist                                               | 290<br>Cased to<br>total depth | 0.7<br>Reported                                                                | --                                        | --       | --                          |
| USGS 50,002 (unused)                                   | B                   | Approx. 300 ft west of south-<br>west corner of hotel, on<br>nature trail | Fluctuated from 93 to 97 ft below lsd., 1965-1969. Measured 96 ft below lsd. Aug. 1969.   | Fractured schist                                               | 234<br>Cased to<br>total depth | --                                                                             | --                                        | --       | --                          |
| VP-4, test 2 (activated<br>summer 1969<br>Used by NPS) | C                   | On nature trail 1,000 ft<br>north of service station                      | Measured 127 ft below lsd<br>Aug. 1963. Measured 137 ft<br>below lsd June 1969.           | 0-36 ft clay, silt,<br>gravel<br>36-404 ft fractured<br>schist | 404<br>Reported                | 12<br>Based on USGS<br>analysis of<br>pumping data                             | 0.02                                      | 333      | 329                         |
| US-2 (unused?)                                         | D                   | 300 ft northeast of ARR<br>Depot, 30 ft east of tracks                    | Measured 80 ft below lsd,<br>Nov. 1962.                                                   | 0-30 ft gravel,<br>30-153 ft schist                            | 153<br>Measured                | 0.5<br>Measured Nov.<br>1962<br>Drawdown 50 ft<br>after several<br>hrs pumping | --                                        | 912      | 893                         |
| VP-1 (unused)                                          | E                   | Hotel powerplant                                                          | Measured 105 ft below lsd,<br>Jan. 1963                                                   | 0-134 ft unconsolidated<br>134-246 ft fractured<br>schist      | 246                            | 3.0<br>Reported                                                                | --                                        | --       | 576                         |

1/ Land surface datum



During dry periods such as this, the yield of the gallery could be increased by lowering the bottom of the existing intake pit or extending a collector beneath the alluvium of the stream channel upgradient from the present installation.

#### Savage Campground

In the area of Savage campground (on Savage River, fig. 1), alluvial-fan material overlies the Savage River flood plain. The flood-plain deposits consist of coarse gravel and sand and are thought to be 50 to 100 feet thick (Hulsing, 1965). These deposits are recharged chiefly by the Savage River but partially from rainfall and snowmelt on the hills north of the campground. Even during the dry period in June 1969, the water level in the gallery's sump was at land surface. If additional water is needed in the future, wells near the river would probably provide an adequate supply. Wells should be drilled upgradient from possible contaminating flow from the campground sanitary facilities.

#### Sanctuary Campground

Sanctuary campground (on Sanctuary River, fig. 1) is on a low flood plain. Test drilling (Morris, 1968) showed that the area is underlain chiefly by stream-deposited sand and gravel to a depth of about 25 feet. In a test well near the present river channel, the material penetrated was sand and gravel; water level was 3 feet below land surface. The well was pumped at 10-15 gpm for 2 hours. A shallow well or gallery constructed in the Sanctuary River alluvium, south of the camping area proper to avoid contamination, would probably satisfy water requirements.



## Teklanika Campground

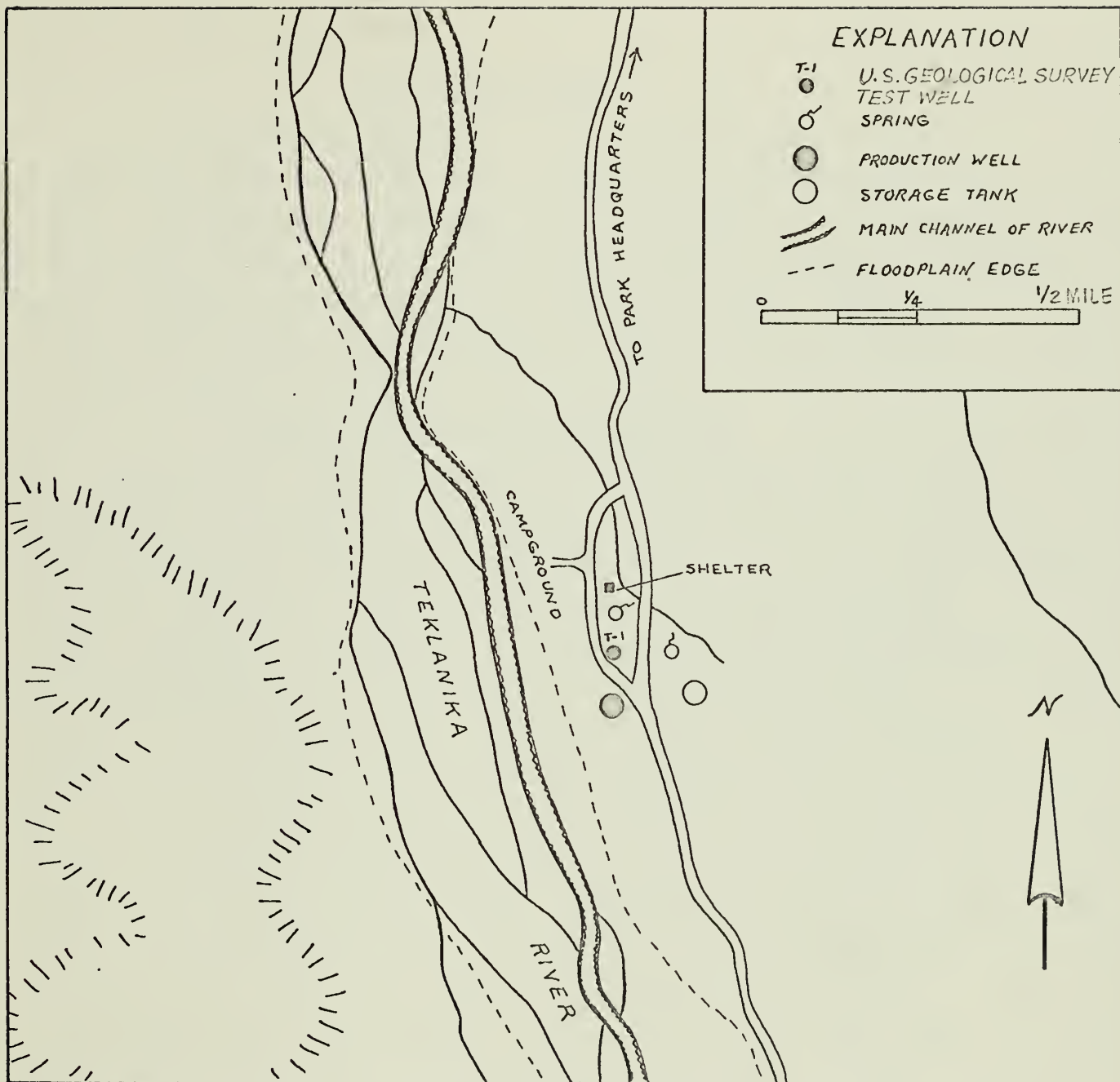
In the Teklanika campground area (fig. 4), the subsurface materials are also flood-plain and alluvial deposits. Test wells drilled in August 1967 showed that the spring area near the old shelter cabin is underlain by water-bearing sand and gravel to a depth of about 45 feet.

Although observations were made in June 1969 during a dry period, flow in the main spring behind the cabin was estimated at 3 to 4 cfs (cubic feet per second) or 1,350 to 1,800 gpm. Furthermore, in March 1969, water was observed flowing from the spring, although air temperature was  $-12^{\circ}\text{C}$ ; this suggests year-round availability of ground water.

In summer 1968, an 8-inch diameter production well (fig. 4) was constructed for the National Park Service by a private contractor by driving perforated casing to a depth of about 21 feet. The prepumping water level was 5.5 feet below land surface. During a pump test in June 1969, a drawdown of 5 feet occurred. The discharge seemed to be limited by the size of the intake pipe, because discharge was 75 gpm regardless of the throttle setting of the pump motor. During pumping the water level declined immediately to the top of the perforations in the casing and remained at this level for 1 hour; after pumping ceased, the recovery of the water level to its prepumping position was almost immediate.

This well should serve the water needs at Teklanika campground for some time. Future increased demands could be met by additional wells in the same general area. Springs are evident along the road south of the campground where ground-water conditions are probably similar to those at the present well site.





Base from U.S. Geological Survey;  
Healy C-6 quadrangle; 1:63,360

Figure 4.--Location of test-well and water-resources development sites at Teklanika campground.



### Igloo Campground

In the Igloo campground area (on Igloo Creek, fig. 1), subsurface materials are coarse and contain sandy gravel and many large boulders. Recharge to these deposits is primarily from Igloo Creek. A well or gallery along the stream near the tent camping area should provide adequate water. The best site would be west of the highway bridge, to avoid contamination from the camping sites and toilets.

### Toklat Campground and Road Camp

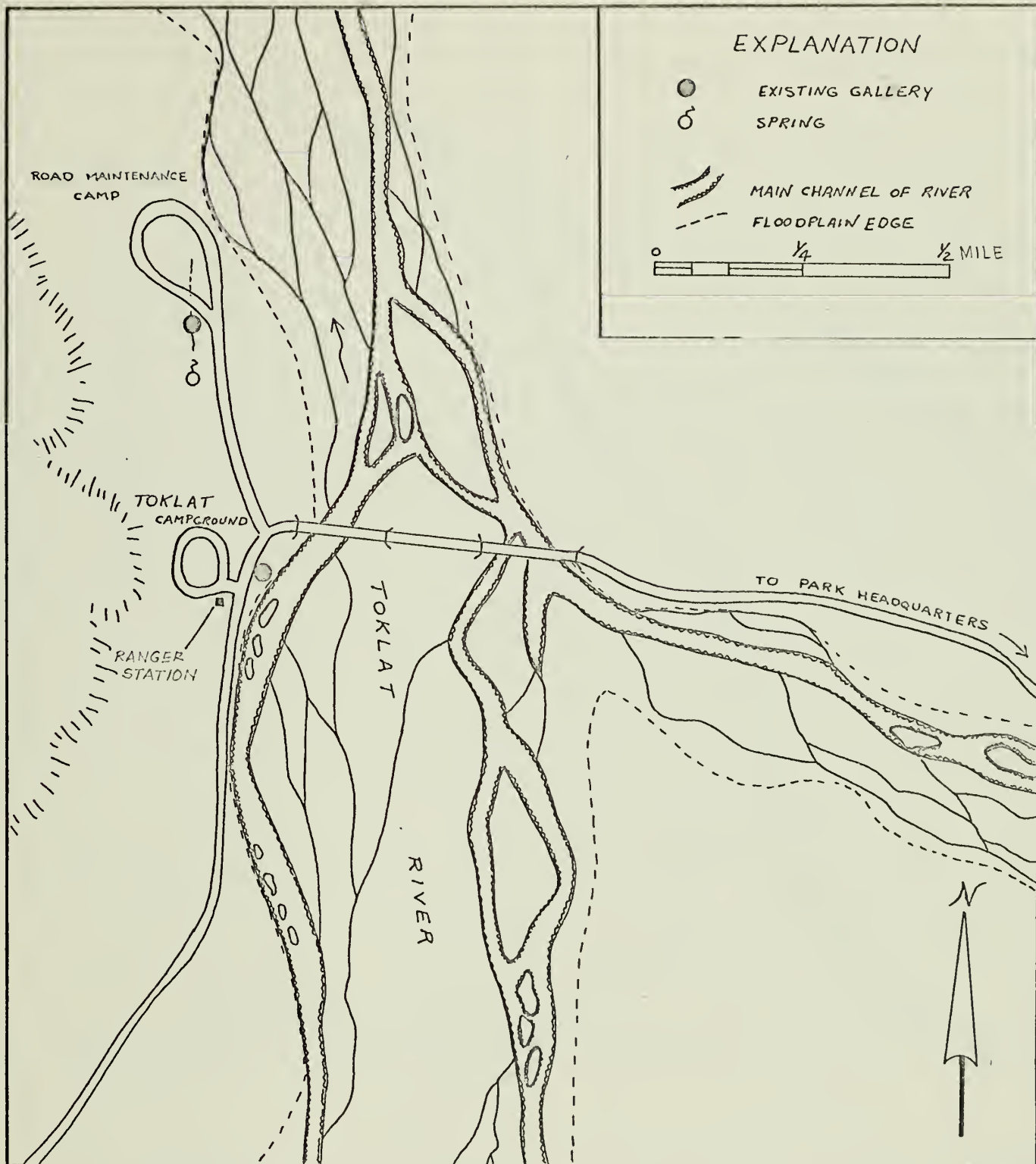
The Toklat campground area (on Toklat River, fig. 5) is underlain by interbedded sand, gravel, and boulders of alluvial fans and recent flood-plain deposits along the Toklat River. The gallery system now supplying water to the campground from these deposits is adequate, but might be subject to flooding and possible destruction because of its present location near the existing channel. A shallow well near the location of the present gallery, but on higher ground, would provide a more reliable water source for the campground.

The current water supply for the Toklat road-maintenance camp is a gallery constructed in a spring area near camp. (fig. 5). The quantity of water available is adequate but a water-quality problem exists. The source of contamination appears to be the great number of squirrel dens in the embankment above the spring. The gallery is now about 200 feet below the source of the spring. A solution to the problem of animal contamination would be to construct a new gallery at the spring outlet.

### Wonder Lake Area

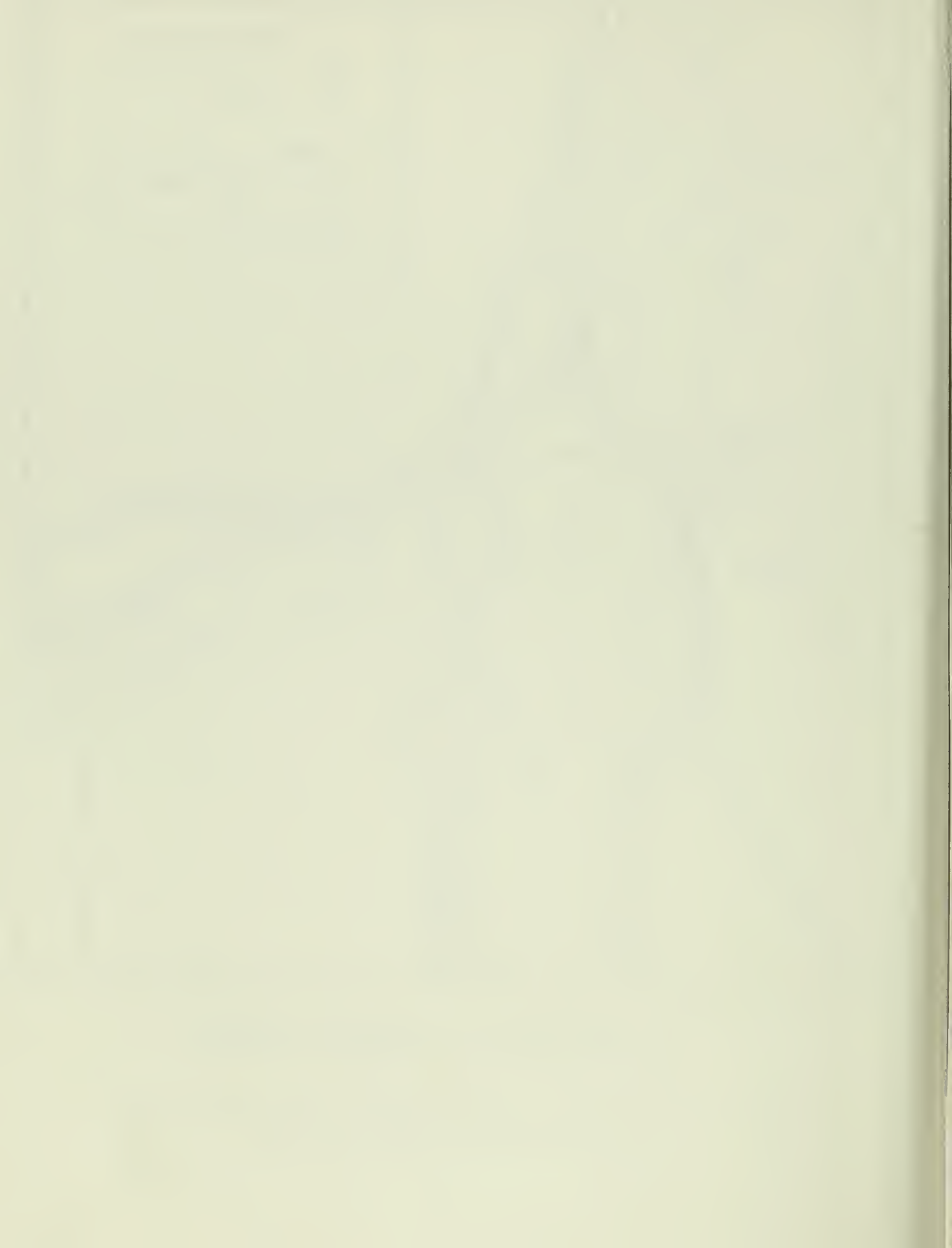
In the Wonder Lake area (fig. 6), Birch Creek Schist is covered by only a thin veneer of glacial-moraine deposits. Permafrost is present throughout the area except beneath and immediately adjacent to Wonder Lake.

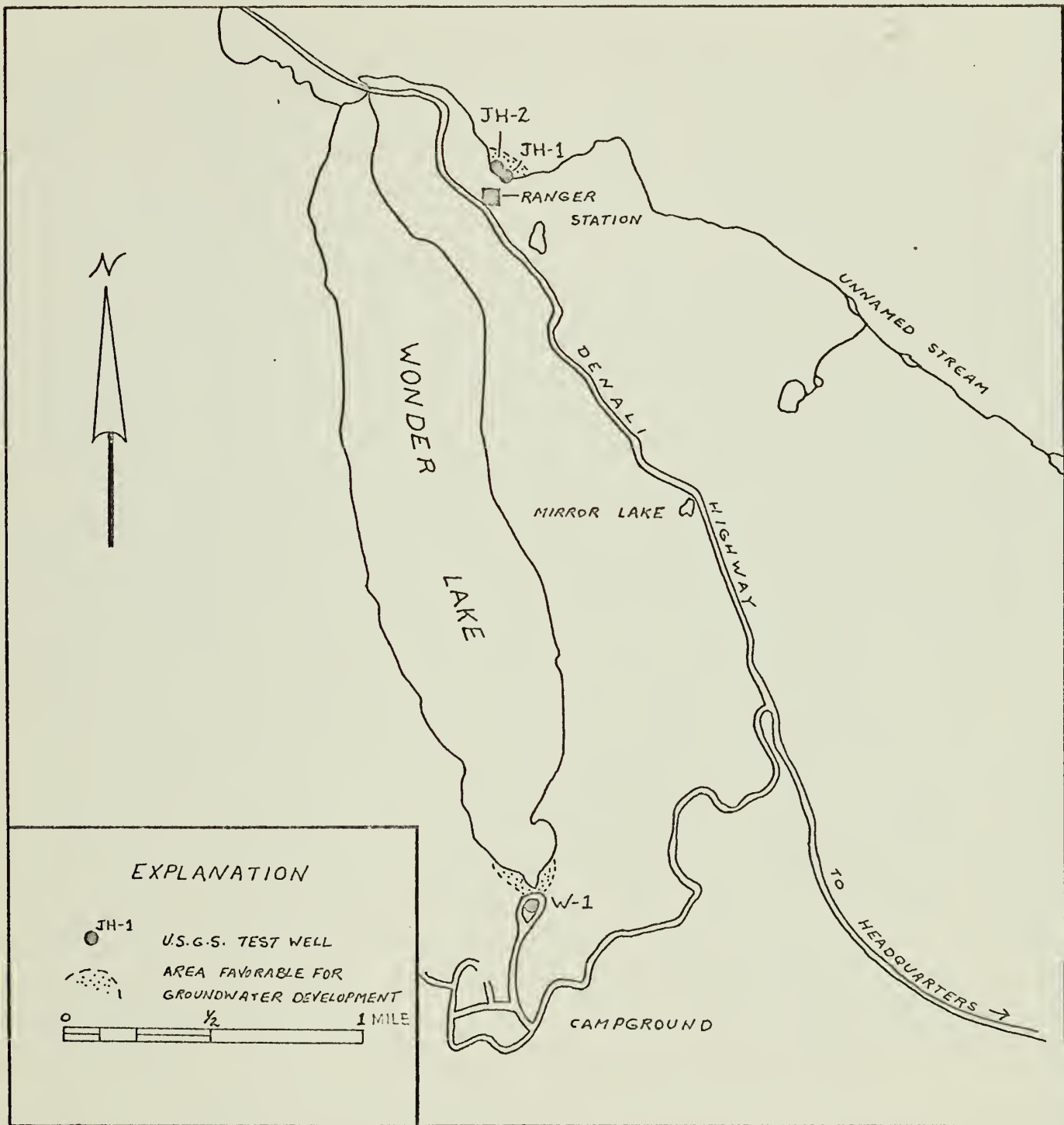




Base from U.S. Geological Survey  
Mount McKinley C-1 quadrangle; 1:63,360

Figure 5.--Location of water-resources development sites  
at Toklat River campground area.





Base from U.S. Geological Survey;  
Mount McKinley B-2 quadrangle; 1:63,360

Figure 6.--Location of test wells in the Wonder Lake area.



A test well (W-1, fig. 6) was drilled near the boat ramp at the east end of Wonder Lake. This well penetrated gravel throughout its full depth of 28 feet and yielded water of acceptable quality (Morris, 1968). The water level was 7 feet below land surface. A gallery or shallow well near the edge of Wonder Lake would probably supply adequate drinking water to the camping area.

A need exists for an alternative water supply at the ranger station at the north end of Wonder Lake. The present source, a small excavated sump in the channel of a small unnamed stream that empties to Wonder Lake, is undesirable due to the organic debris that collects at the pumping site.

The possibility for developing ground water from the gravel of the stream was first recognized when flow was observed beneath the ice and at open reaches in the stream in March 1968. Water temperature was 1°C, although air temperature was -12°C. This indicated year-round ground-water flow. To confirm this possibility, two exploratory holes were jetted about 100 yards east of the ranger station.

The holes, JH-1 and JH-2, were drilled to depths of 15 and 18 feet, respectively. Mixed sand and gravel were present in both holes. Test pumping through the open end of the 1-1/2-inch diameter drill pipe yielded 15-20 gpm; pumping time was 30 minutes in each case. The ground water from these two exploratory holes contains 1.1 mg/l manganese in solution, which imparts an undesirable taste; the water also contains excessive amounts of iron. Treatment to remove these constituents would be necessary prior to use as drinking water. An adequate water supply for the ranger station could be obtained through use of a well or gallery system in the gravel deposits underlying the creek adjacent to the station.

The well was pumped at 5-10 gpm for a short time to obtain a water sample. Such a yield could be expected on a continuing basis because recharge from Wonder Lake through the water-bearing gravels probably occurs.



## QUALITY OF WATER

Miscellaneous chemical analyses of the water at Mount McKinley National Park are given in table 2. Specific water-quality problems caused by organic material at the McKinley Hotel gallery site, at the Toklat road camp, and at Wonder Lake ranger station have been discussed.

The ground waters from unconsolidated sediments and the surface waters sampled in summer 1969 (table 2, part A) are calcium bicarbonate type of moderate hardness. Except for excessive (greater than 0.3 mg/l) iron content in two of the samples, all constituents are within acceptable limits for drinking water set by the U.S. Public Health Service (1962).

Analyses of water from 3 wells completed in bedrock in the McKinley Hotel area show the water to be very hard (338 to 912 mg/l of  $\text{CaCO}_3$ ). Dissolved-mineral content in the four samples either approaches or exceeds the recommended upper limit of 500 mg/l for drinking water (U.S. Public Health Service, 1962). These deep ground waters should not be considered for public supply so long as alternative sources of better quality are available.



#### REFERENCES CITED

- Capps, S. R., 1933, Geology of the eastern portion of Mount McKinley National Park: U.S. Geol. Survey Bull. 836-D, p. 219-300.
- Hulsing, Harry, 1965, Water supplies at campgrounds in Mount McKinley National Park, Alaska: U.S. Geol. Survey Administrative Letter, 6 p.
- Morris, D. A., 1968, Results of water-resources investigations during fiscal year 1968 in Mount McKinley National Park, Alaska: U.S. Geol. Survey Administrative Report, 16 p.
- Reed, John C., Jr., 1961, Geology of the Mount McKinley quadrangle, Alaska: U.S. Geol. Survey Bull. 1108-A, Mineral Resources of Alaska, 36 p.
- Tryck, Nyman and Associates, 1962, Rehabilitation of hotel water system Mount McKinley National Park, Alaska: Preliminary engineering study, 40 p.
- U.S. Public Health Service, 1962, Drinking water standards: U.S. Public Health Service Pub. no. 956, 61 p.



Table 2.--Miscellaneous chemical analyses of the water at Mount McKinley National Park.

| Area                                                                                                                                          | Source                                | Temperature<br>(°C) | Silica<br>(SiO <sub>2</sub> )<br>(mg/l) | Iron<br>(Fe)<br>(total)<br>(mg/l) | Calcium<br>(Ca)<br>(mg/l) | Magnesium<br>(Mg)<br>(mg/l) | Sodium<br>(Na)<br>(mg/l) | Potassium<br>(K)<br>(mg/l) | Bicarbonate<br>(HCO <sub>3</sub> )<br>(mg/l) | Sulfate<br>(SO <sub>4</sub> )<br>(mg/l) | Chloride<br>(Cl)<br>(mg/l) | Fluoride<br>(F)<br>(mg/l) | Nitrate<br>(NO <sub>3</sub> )<br>(mg/l) | Dissolved<br>solids<br>(residue<br>on evaporation<br>at 180°C) | Hardness<br>as CaCO <sub>3</sub> |               | Specific<br>conductance<br>(micro-<br>mhos at<br>25°C) | pH  | Color |
|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------|-----------------------------------------|-----------------------------------|---------------------------|-----------------------------|--------------------------|----------------------------|----------------------------------------------|-----------------------------------------|----------------------------|---------------------------|-----------------------------------------|----------------------------------------------------------------|----------------------------------|---------------|--------------------------------------------------------|-----|-------|
|                                                                                                                                               |                                       |                     |                                         |                                   |                           |                             |                          |                            |                                              |                                         |                            |                           |                                         |                                                                | Carbonate                        | Non-carbonate |                                                        |     |       |
| Part A--Surface waters and ground water from unconsolidated sediments. (Collected June and September 1969 by Chester Zenone and D. A. Morris) |                                       |                     |                                         |                                   |                           |                             |                          |                            |                                              |                                         |                            |                           |                                         |                                                                |                                  |               |                                                        |     |       |
| Hotel gallery                                                                                                                                 | Unconsolidated stream                 | 3                   | 5.8                                     | 0.00                              | 47                        | 44                          | 2.1                      | 1.2                        | 293                                          | 59                                      | 0.4                        | 0.2                       | 1.2                                     | 311                                                            | 299                              | 53            | 518                                                    | 8.3 | 0     |
| Sanctuary R at campground                                                                                                                     | 2nd small stream upstream from bridge | --                  | 5.9                                     | .03                               | 50                        | 12                          | 4.8                      | 0.9                        | 170                                          | 42                                      | 1.1                        | .1                        | 0.7                                     | 204                                                            | 174                              | 31            | 337                                                    | 8.3 | 2.5   |
| Toklanika campground                                                                                                                          | Production well (6 in.)               | --                  | 1.4                                     | .28                               | 51                        | 15                          | 7.4                      | 1.2                        | 179                                          | 49                                      | 6.4                        | .1                        | .7                                      | 220                                                            | 168                              | 41            | 380                                                    | 8.1 | 0     |
| Iglloo Cr campground                                                                                                                          | Stream 25 ft above bridge             | 10                  | 5.1                                     | (?)                               | 25                        | 7.6                         | 15                       | 1.2                        | 142                                          | 11                                      | .7                         | .1                        | .6                                      | 136                                                            | 94                               | 0             | 233                                                    | 8.2 | 0     |
| Tollat R campground                                                                                                                           | Spring at road camp                   | 2.5                 | 7.0                                     | .01                               | 59                        | 31                          | 2.8                      | 1.2                        | 223                                          | 92                                      | .4                         | .2                        | 1.2                                     | 307                                                            | 275                              | 88            | 500                                                    | 8.1 | 0     |
| Wonder Lake ranger station                                                                                                                    | Stream "Wonder Dr"                    | 11                  | 8.3                                     | .03                               | 50                        | 4.0                         | 1.4                      | 1.2                        | 176                                          | 7.2                                     | .4                         | .0                        | 0.0                                     | 160                                                            | 142                              | 0             | 273                                                    | 8.0 | 0     |
| Wonder Lake ranger station                                                                                                                    | Shallow auger hole nr stream          | 7                   | 9.0                                     | --                                | 48                        | 3.8                         | 1.5                      | 1.6                        | 168                                          | 6.2                                     | .7                         | .0                        | 1.6                                     | 155                                                            | 137                              | 0             | 262                                                    | 7.5 | 10    |
| Wonder Lake ranger station                                                                                                                    | Test hole (11-1) in stream            | --                  | 11                                      | 2.50 <sup>1/</sup>                | 45                        | 4.0                         | 1.4                      | 1.0                        | 164                                          | 2.9                                     | .0                         | .0                        | 0.1                                     | 150                                                            | 130                              | 0             | 251                                                    | 7.4 | 10    |
| Wonder Lake ranger station                                                                                                                    | Test hole (11-2) nr stream            | 6                   | 13                                      | 1.00 <sup>2/</sup>                | 47                        | 4.4                         | 1.7                      | 1.0                        | 174                                          | 1.9                                     | .0                         | .0                        | .1                                      | 158                                                            | 156                              | 0             | 266                                                    | 7.3 | --    |
| Part B--Ground water from wells completed in bedrock.                                                                                         |                                       |                     |                                         |                                   |                           |                             |                          |                            |                                              |                                         |                            |                           |                                         |                                                                |                                  |               |                                                        |     |       |
| Mt. McKinley Hotel and Alaska Railroad                                                                                                        | W-1<br>Depth 246 ft<br>Apr. 2, 1963   | --                  | 6.0                                     | 1.05 <sup>3/</sup>                | 105                       | 69                          | 5.6                      | 2.1                        | 498                                          | 130                                     | 13                         | .3                        | .3                                      | 576                                                            | 543                              | --            | 962                                                    | 7.7 | --    |
|                                                                                                                                               | W-2<br>Depth 166 ft<br>Oct. 1, 1962   | --                  | 17                                      | -- <sup>4/</sup>                  | 70                        | 179                         | 5.1                      | 8.2                        | 896                                          | 166                                     | 5.0                        | .6                        | 1.1                                     | 893                                                            | 912                              | --            | 1410                                                   | 7.6 | --    |
|                                                                                                                                               | W-4<br>Depth 186 ft<br>Apr. 4, 1963   | --                  | 4.6                                     | 2.0 <sup>5/</sup>                 | 44                        | 56                          | 3.7                      | 2.0                        | 370                                          | 34                                      | 1.0                        | .1                        | 1.2                                     | 329                                                            | 338                              | --            | 583                                                    | 8.0 | --    |
|                                                                                                                                               | W-4<br>Depth 404 ft<br>May 11, 1963   | --                  | 7.4                                     | 2.0 <sup>6/</sup>                 | 50                        | 64                          | 15                       | 4.9                        | 456                                          | 48                                      | 1.0                        | .2                        | 0.1                                     | 410                                                            | 397                              | --            | 696                                                    | 8.5 | --    |

1/ Turbid, cloudy when pumped from ground.

2/ This sample has "irony" taste.

Also 1.1 mg/l manganese.

3/ Dissolved.

4/ While drilling in progress.

5/ At completion of drilling.





UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

Water Resources Division  
218 "E" Street, Skyline Bldg.  
Anchorage, Alaska 99501

January 12, 1978

Mr. Jerry Witucke  
Chief, Water Resources  
Western Service Center  
National Park Service  
450 Goldengate  
Box 36025  
San Francisco, California 94102

Dear Mr. Witucke:

Enclosed for your use are 8 copies of the report, "Water-Resources Investigations of Mount McKinley National Park, Alaska," approved by the Director of the Geological Survey for transmittal to the National Park Service. Will you please return the preliminary copies sent you earlier this year.

If we can be of additional service to you, please feel free to call upon us again.

Sincerely yours,

  
Harry Hulsing  
District Chief

Enclosures (8)





