



WATER-RIGHT DOCKET

Virgin Islands National Park

Docket No: 9

WELL #9, CINNAMON BAY

Supporting Hydro Data

00-00-0000: summary of water supply at cinnamon bay

Table 1.—Summary of water supply at Cinnamon Bay, St. John, V. I.

Source	Estimated safe yield gpm	Field chloride ppm	Possible use	Proposed type pump
NPS-6	2,000	400	Discharge to cistern	Submersible
NPS-9	3,000 to 5,000	290	Discharge to cistern	Submersible
NPS-11	500 to 1,000	240	Drinking water	Deep well cylinder hand pump
NPS-12	500 to 3,000	350-5,000	Sanitary purposes	Shallow well centrifugal
*Spring	0 to 2,000	400	Discharge to cistern	Gravity flow
**Well points	500 to 1,000 ea.	500-5,000	Sanitary purposes	Shallow well centrifugal

*Present supply.

**Not in existence at present.

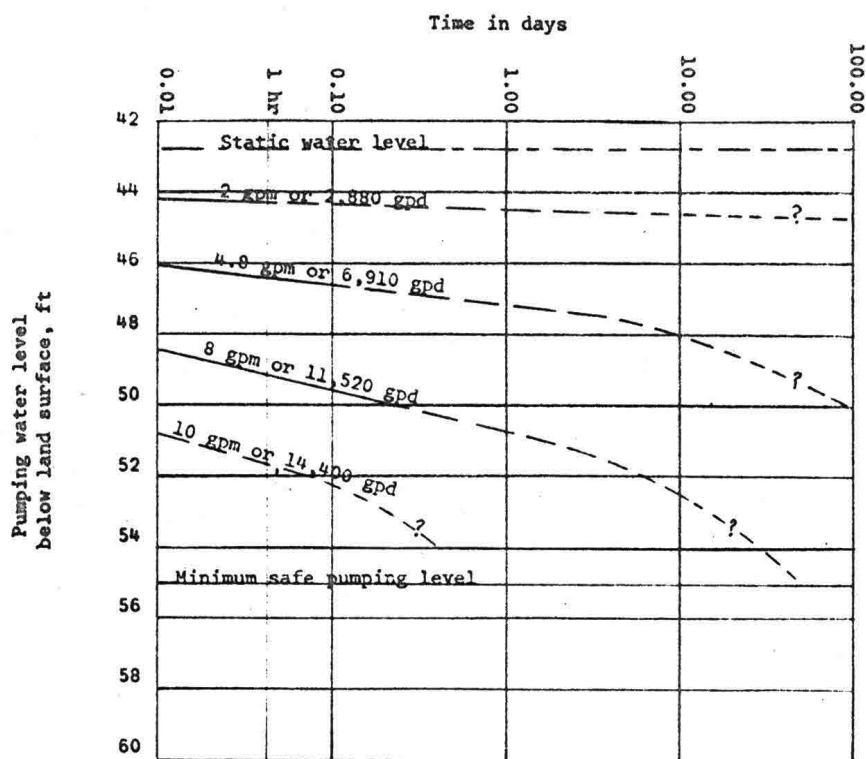


Figure 1.--Actual and projected pumping water levels at various pumping rates in well NPS-9 Cinnamon Bay, St. John, Virgin Islands.

Solid lines represent test data; dashed lines are projections. The degree of reliability is proportional to the length of the dashes, the longest indicating greatest reliability.

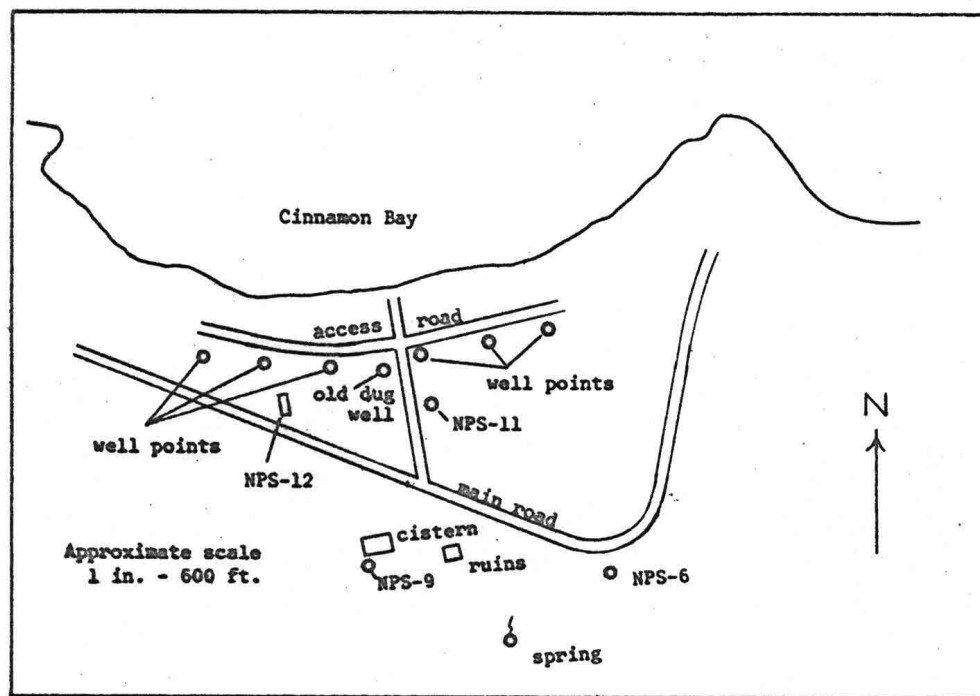


Figure 2.--Sketch of the Cinnamon Bay area showing locations of wells

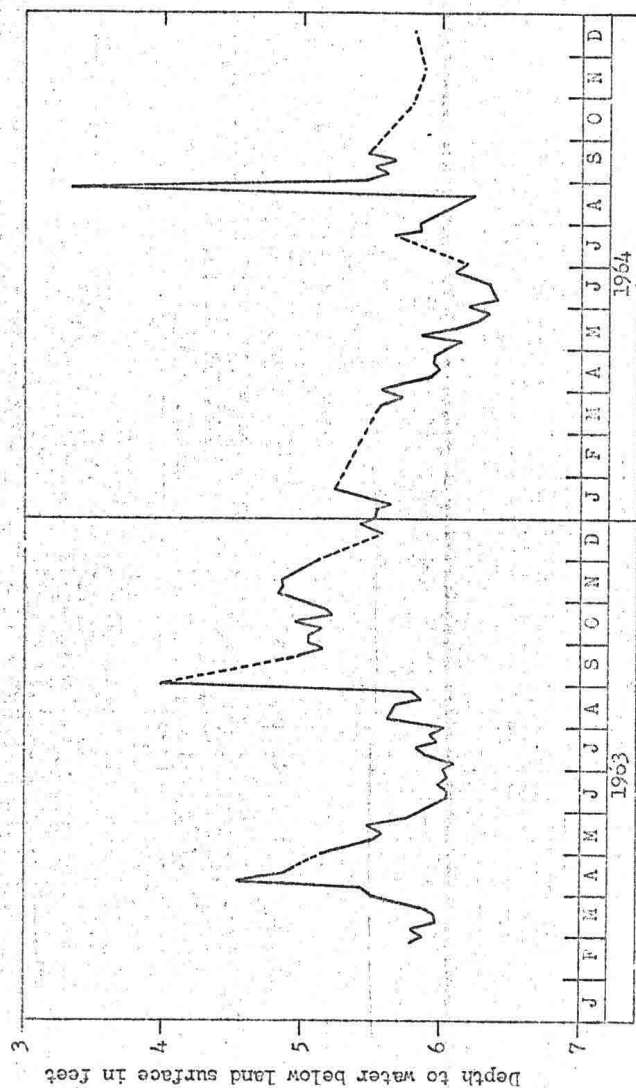


Figure 1.--- Highest daily water level below land surface, dug well NPS #12.
Cinnamon Bay, St. John, V. I.

Table 3.--Chloride content, as determined from
field analyses, of water from well NPS-9 Cinnamon Bay, St. John

Date	Meter reading, gallons	Temperature, °F	Chloride, ppm
11-18-64	5,560	80	270
11-20-64	-	80	280
11-23-64	12,940	80	270
11-24-64	14,150	82	280
11-25-64	15,590	81	280
11-27-64	18,110	84	270
12-3-64	27,410	80	290
12-4-64	29,160	82	290
12-11-64	45,130	79	290
12-17-64	-	-	330

Table 1.--Records of drilled test wells, Virgin Islands

DESIGNATION		CONSTRUCTION DATA						HYDROLOGIC DATA						SUPPLEMENTARY DATA			
Well number	Location	Date completed	Type	Depth (feet)	Casing record		Finish Depth (feet)	Type of lift	Surface altitude (feet)	Water-bearing material	Yield (gpm)	Temp. °F	Remarks				
					Diameter (inches)	From To											
NPS-2	Cruz Bay	Drilled	1964	99	4	0	20	0	20	99	None						
NPS-3	Cruz Bay	do	1964	54	6	0	25	0	25	54	None						
NPS-4	Lind Point	do	1964	200	6	-	-	0	0	200	None						
NPS-5	Trunk Bay	do	1964	60	6	0	12	0	12	60	None						
NPS-6	Cinnamon Bay	do	1964	70	6	0	50.7	0	50.7	70	None						
NPS-7	Hawksnest Bay	do	1964	36	6	0	27	0	27	36	None						
NPS-8	Cinnamon Bay	do	1964	50	6	-	-	0	0	50	None						
NPS-9	Cinnamon Bay	do	1964	60	6	0	39	0	39	60	Submersible						
NPS-10	Lameshur	do	1964	66	6	0	52	0	52	66	None						

Finish: O - open hole, S - slotted.

Water-bearing material: Vb, volcanic breccia; Vt, volcanic tuff; V, volcanic undifferentiated.

Use: T, test; O, observation; P, public supply.

National Park, St. John, V. I.

HYDROLOGIC DATA		SUPPLEMENTARY DATA					
		Water level		Temp. °F	Remarks		
Surface altitude	Depth below land	Date measured	Water-bearing material			Yield (gpm)	Use
60	40.0	6-64	Vt	1	T, O	82	
40	26.5	6-64	Vt	5	T, O	83	
176	Dry	6-64	-	-	-		Casing pulled, hole destroyed.
60	32.1	7-64	Vb	6	T, O	80	
60	56.9	11-64	Vt	8	T, O	80	
40	17.1	8-64	Vb	12	T, O	80	
20	Dry	9-64	-	-	T		Casing pulled, hole destroyed.
50	42.9	10-64	Vt, Vb	8	P	80	
40	28.5	10-64	V	2	O	84	

Table 2.--Chemical quality of water from drilled test wells, Virgin Islands National Park, St. John, V. I.

PARTS PER MILLION														Dis-charge (gpm)	pH		
Well Number	Location	Date of collec- tion	Silica	Iron	Cal- cium	Mag- nesium	Sodium	Po- tas- sium	Sul- fate	Chlo- ride	Fluo- ride	Ni- trate	Dis- solved solids			Hardness as CaCO ₃	Specific conduct- ance
			(SiO ₂)	(Fe)	(Ca)	(Mg)	(Na)	(K)	(SO ₄)	(Cl)	(F)	(NO ₃)		Cal- cium, car- bon- ate	micro- mhos at- 25° C		
NPS-2	Cruz Bay	5-18-64	31	0.00	66	67	320	-	46	470	0.6	4.9	1,400	440	0	2,490	7.9
NPS-3	Cruz Bay	6-3-64	34	.00	94	77	377	-	45	480	.5	4.4	1,420	551	33	2,270	7.8
NPS-4	Cruz Bay housing	Dry hole															5
NPS-5	Trunk Bay	7-17-64	38	.05	80	61	188	-	462	39	300	.0	.0	988	450	55	7.9
NPS-6	Cinnamon Bay	8-2-64	34	.00	46	81	224	-	390	47	400	.3	.4	1,060	448	128	8.2
NPS-7	Hawnsnest Bay	8-8-64 ^{1/}	35	.00	68	88	214	-	272	57	505	.1	2.2	1,260	534	308	7.9
NPS-7	Hawksnest Bay	8-8-64 ^{2/}	38	.05	106	577	628	-	360	276	2,425	.0	.4	5,640	2,637	2,342	7.5
NPS-8	Cinnamon Bay	Dry hole															12
NPS-9	Cinnamon Bay		36	.00	58	71	183	-	504	30	275	.5	.0	964	436	23	8.4
NPS-10	Iameshur Bay		23	.04	70	111	-	-	-	1,003	.3	.9	2,380	631	183	4,090	7.8

1/ Sample taken at beginning of test, 5 minutes pumping.

2/ Sample taken at end of test, 12 hours pumping.

WATER SYSTEM DATA

- AREA Virgin Islands DATE _____ COLLECTED BY U.S.G.S.
- Name of System: Cinnamon Bay
 - Location: State _____ County _____ General Area _____
Reference to permanent landmark _____
 - Source of Supply: Well No. 9 Capacity Safe Yield 5,000 gpd
(Well, Spring, Stream, Impoundment, etc.)
 - Type of System: Pumped
(Pumped, Gravity, etc.)
 - Treatment: Chlorination
(Filtration, Chlorination, Aeration, etc.)
 - Distribution Mains: Size 1" Length 500'; Size Rigid Plastic (P.V.C.)
Size _____ Length _____; Size _____ Length _____
Size _____ Length _____; Size _____ Length _____
 - Pump Unit: Make _____; Type Reciprocating; Model No. _____
Serial No. _____; Outlet 1 1/2 in.; Inlet 1 1/2 in.
(Size) (Size)
 - Power Source: Electric Motor: Make _____; HP 3/4
(Elec., Gas, Generator)
Serial No. _____; Voltage 115; Amps _____;
RPM _____; Type _____; Phase _____;
Cycles 60; Others _____; Stages _____
 - Control: Automatic Electrode - Pressure; Manual _____
(Float, Electrode, Pressure, Time)
Other Hydropneumatic System
(Explain)

10. Pump Design: Capacity gpm 1,000 gph gpm
(Actual) (Design)
Head ft. 60 psi ft.
(Actual) (Design)

11. Pump Housing: Type Const. Concrete Block; ; Size
(Walls) (Roof)

12. Storage: Pneumatic; Type Const. Steel
(Pneumatic, Elevated, Underground, etc.) (Concrete, Wood, Steel)
Size ; Capacity 120; Inlet ft. in.
(Elev.) (Size)
Outlet ft. in.; Pressure Setting 75 psi
(Elev.) (Size) (If pneumatic)

13. Distribution: Water Closets X; Lavatory X; Urinal X;
Drinking Fountain X; Hose Bids X; Residences ;
Other ; ; ;

14. Metered or Nonmetered: Metered; No. ; Size
No. ; Size
No. ; Size

15. Fire Protection: Fire Hydrants ; Yard Hydrants

16. Water Analysis: Chloride 200 ppm
Hardness 300 ppm

17. Condition of System:
(Repairs needed itemize)

Virgin Islands Cooperative Water-Resources Investigations

Water Resources Division
U. S. Geological Survey

INFORMATION RELEASE VI-17
St. John, Virgin Islands

Ground Water, V. I. National Park
St. John, V. I.

Annual Summary

The Virgin Islands National Park and the Virgin Islands in general have been experiencing a drouth since late in 1963. Ground-water levels reached a high in September 1963 and since generally have been declining as shown by hydrographs of selected wells, figures 1 and 2. Hydrographs of other wells show similar trends.

Table 1 summarizes well information and table 2 gives data on chemical quality of water from the test wells. Detailed well information on test wells completed in the National Park is given in previous Information Releases and Monthly Reports.

In general, the information gained from the test drilling has been very encouraging. Ground water of fair chemical quality and in significant quantities is available in most areas of the National Park and should be considered as a source of supply for all future development. It is the least expensive and the most reliable of all natural sources in the National Park.

During December 1964, field chloride determinations (table 3) of water samples from NPS-9 at Cinnamon Bay, which was recently placed in operation, show a slight increase in chloride content. The chloride content may stabilize, but if periodic analyses of the water continues to show increasing chloride it will be necessary to rest the well for longer periods and to pump for shorter intervals. In conjunction with this, it would be advisable to put into operation NPS-6 and NPS-12 as noted in Information Release VI-15.

Cinnamon Bay Spring has been dry since February 1964 except for short periods after rains that cause some surface runoff. The flow from the spring at these times is essentially surface flow and near-surface runoff, and not ground water in the true sense. Before ground-water flow is re-established it will be necessary for the ground water reservoir to be recharged from rainfall. Water levels must rise several feet, perhaps as much as 4 feet, judging from ground-water levels in similar areas in the Islands.

During the coming months the program of measuring water levels and stream flow will continue on St. John, and periodic reports summarizing the results will be made.

2

INFORMATION RELEASE VI-17

The information contained in this release is preliminary and is subject to revision. It may be used internally by the cooperating agencies and their representatives, but may not be published.

January 15, 1965

San Juan, Puerto Rico

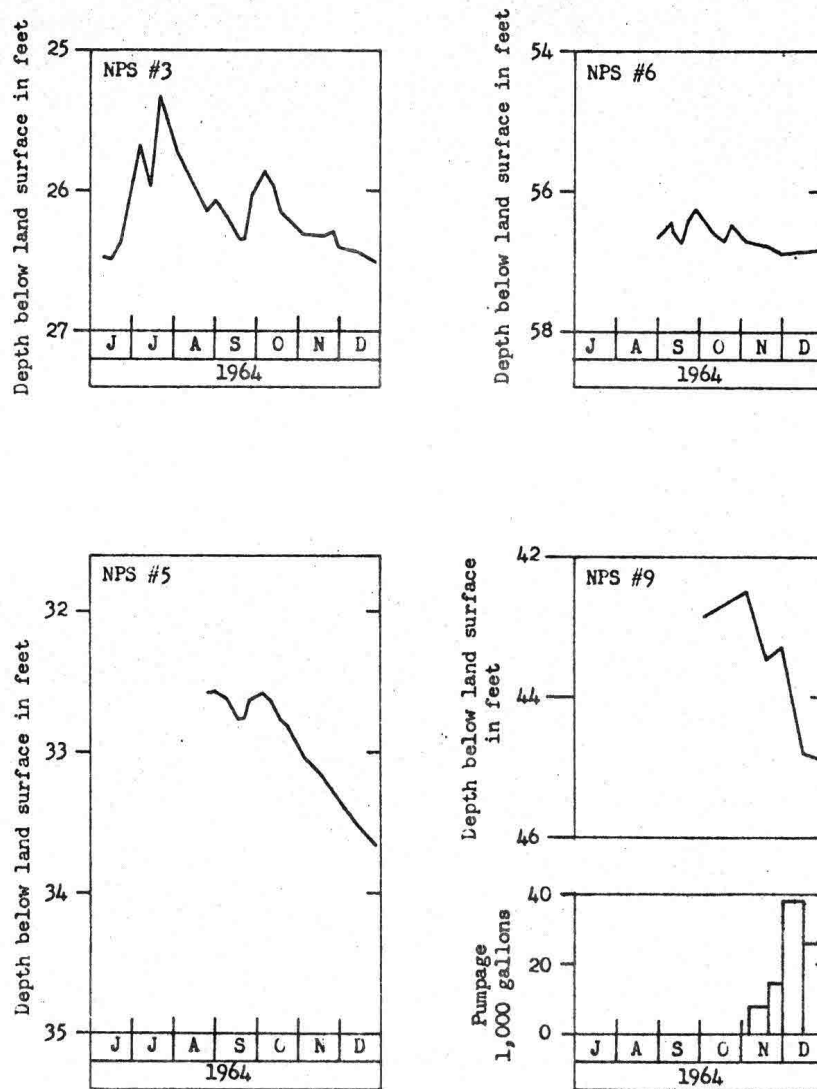


Figure 2.-- Water levels in selected wells, St. John, V. I.

12 Arroyo Street
Hato Rey, Puerto Rico 00918

January 13, 1965

Mr. Frank R. Givens, Superintendent
National Park Service
Virgin Islands National Park
P. O. Box 1707 St. Thomas
Virgin Islands 00802

Dear Mr. Givens:

Cinnamon Bay

On January 7 we made an inspection of well NPS-9 because earlier water samples from the well had shown a slight increase from the original chloride content of 270 ppm (parts per million). The last sample taken by Park Service personnel was on December 17, 1964, which showed 330 ppm chloride. Our sample on January 7 also showed 330 ppm. This is an increase of 60 ppm since pumping began in November but in the past three weeks no increase has been noted. This is encouraging but since ample water is available in the cistern it would be advisable to rest the well for a period of about 30 to 60 days or until the one side of the cistern is about one third to half full.

Total pumpage from the well to date is 106,000 gallons. The average use during the period since the well was installed is less than 1,000 gpd (gallons per day).

The period of rest for the well will offer an excellent opportunity to make an accurate check on quantity of water used at Cinnamon Bay. Park Service personnel should make a daily measurement of the cistern. Rain-fall records and records of guests are kept by Mr. Woodside. The Geological Survey is willing to compile the information and to compute the use.

We suggest that one side of the cistern remain empty so that if a large storm occurs, storage space will be available for water from the spring.

When the well is returned to operation it should be set to produce the average use determined during the rest period. Messrs. Jordan and Cosner are available for consultation and assistance, and we suggest a conference with your operating personnel at an early date.

Sincerely,

Dean B. Bogart
Chief, Caribbean District, WRD

OJC/gmp

Provisional, subject to revision

Virgin Islands Cooperative Water-Resources Investigation

Water Resources Division
U. S. Geological Survey

INFORMATION RELEASE VI-15
ST. JOHN, V. I.

Well Completions for National Park Service, St. John, V. I.

Two test wells, NPS-9 at Cinnamon Bay and NPS-10 at Lameshur Bay, were drilled in the Virgin Islands National Park on St. John during October 1964. In addition, dug wells at Cinnamon Bay and at Mary Creek, St. John, were tested.

Well NPS-9

National Park Service well No. 9 at Cinnamon Bay, St. John, is capable of producing about 5,000 gpd (gallons per day). The water is potable and is of fair chemical quality. Pertinent well data follow:

Depth	60 ft
Static water level	42.9 ft
Yield	8 gpm for 6 hr
Drawdown	7.2 ft
Finish	6" casing to 42 ft; 4" plastic casing from surface to bottom, perforated from 50 to 60 ft
Recommended depth of pump intake	55 ft
Approximate surface altitude	50 ft
Date completed	10-5-64
Quality of water	
Chloride	290 ppm
Hardness	360 ppm

The data in figure 1 are from short-term pumping tests of NPS-9 and the projections of these data are based on past experience in similar wells. Only a limited amount of drawdown would occur if the well were pumped continuously at 2 gpm for 100 days. If pumping rates were increased the drawdown also would increase; at 10 gpm the water level would reach the intake of the pump in less than 24 hours. However, the well could be pumped at 10 gpm for short periods such as 1 hour by allowing rest periods between pumping periods. A preliminary estimate of safe yield for this well is 5,000 gpd. After the well has been operated for a period of a few months a better estimate of the safe yield can be made.

For the present a maximum pumping rate of 5 gpm should be used and a daily production of 3,000 gpd should not be exceeded. This amount of water is far in excess of the estimated maximum use for the present facilities at

Cinnamon Bay Camp. The water from the well should be sampled and analysed daily so that any deterioration of chemical quality will be quickly noticed. The Geological Survey will furnish bottles for this purpose and the samples will be processed locally. The Geological Survey will make periodic water-level measurements and keep records of total discharge.

A desirable pump and metering installation is described in Monthly Report No. 18 for July and August 1964.

Well MPS-10

Preliminary tests indicate that National Park Service well No. 10 at Lameshur Bay, St. John, is capable of producing about 2,000 gpd. The water is of poor quality, but is suitable for most domestic purposes. Pertinent well data follow:

Depth	66 ft	
Static water level	28.5 ft	2
Yield	2 gpm for 5 hrs	
Drawdown	12.5 ft	
Finish	6" casing to 53 ft; 4" plastic casing to bottom, perforated from 36 to 66 ft	
Approximate surface altitude	40 ft	
Date completed	10-28-64	
Quality of water		
Chloride	950 ppm	
Hardness	570 ppm	

Well MPS-10 was pumped for 5 hours at 2.2 gpm. The water level stabilised after 2 hours 40 minutes with 12.3 feet of drawdown. No additional drawdown was detected during the remaining 2 hours 20 minutes of pumping. However, at higher rates the drawdown is excessive. After only 26 minutes at 6.4 gpm the water level had reached the level of the pump intake, amounting to about 30 ft of drawdown.

The water is rather highly mineralized. It has a mineral taste but water of similar quality is considered potable in some parts of the United States. The water is of marginal quality for drinking, but it could be used for most other campgrounds and domestic purposes.

If the well is placed in production it should be pumped at a low rate such as 2 gpm, and total daily production should not exceed 2,000 gpd.

Well NPS-12

National Park Service well No. 12, the trench well at Cinnamon Bay, was test pumped on October 5, 6, 7, and 8, 1964. In one 12-hour test period 2,500 gallons of water was removed with a total drawdown in water level of 1.17 ft. The well has a large storage capacity, estimated to be in excess of 7,500 gallons. However, the recovery rate is rather slow. In 10.5 hours the water level rose only 0.24 ft which means only about 500 gallons of water entered the well during this time. Rainfall should influence productivity, causing the safe yield to be high after rainy periods and to drop off gradually during periods of drought. Based on information available, the safe yield should be between 500 and 1,000 gpd during dry weather and perhaps as much as 3,000 gpd during wet weather.

The chemical quality of the water deteriorated during the period of inactivity since the well was constructed in July 1963. At that time the chloride, from field determination, was 350 ppm; at the beginning of testing on October 5, 1964, the chloride was 5,350 ppm. The increase in chloride content is attributed to a slug or slugs of sea water moving inland during periods of high surf, either on the surface or as a subsurface wave. As pumping progressed the chloride gradually dropped--the last sample taken on October 8, contained 2,830 ppm. It appears that with additional pumping the chloride content might approach the original value of 350 ppm.

Well NPS-13

The dug well at Mary Creek, about 100 ft south of the road leading to the warehouse at Mary Point, is designated National Park Service well No. 13. About 1,400 gallons of water was pumped from NPS-13 during an 11-hour test on October 14, 1964. The water is of fair chemical quality, and is suitable for domestic use. The water level had declined to the bottom of the well at the end of the pumping period, but about 12 hours after pumping stopped, the water level had recovered fully. The well would be suitable for the planned installations at Mary Point. It should be cleaned and a sanitary cover placed over it before it is used.

Summary of Water Supply

Based on short-term tests, the existing wells and spring at Cinnamon Bay shown on figure 2 can supply as much as 10,000 gpd of potable water during periods of normal rainfall. During periods of drought such as we are experiencing now, the spring is supplying no water and the wells will produce about 5,500 gpd. In addition, a supply of variable quality water suitable for sanitary purposes is available and could be expanded to meet the foreseeable needs.

Table 1 shows the estimated yields, chemical quality, proposed uses, and suggested types of pumps for each existing and proposed source of supply.

It must be emphasized that the estimates of safe yield are based on short-term testing and thus are conditional until further testing and operating experience are obtained.

Suggested Plan for Development of Water Supply

The rest rooms serving the cottages probably account for more than 90% of the total water use at Cinnamon Bay. Each guest will use about 30 gpd and with the cottages full about 40 guests will be using the facilities, creating a demand of 1,200 gpd. For beach showers the estimated use is 5 gallons each time the shower is used - and 10 gallons per bather per day. In maximum-use days this would add 400 gpd for the cottages and about the same for the tent area. The peak demand for sanitary purposes is about 2,000 gpd.

The only method of finding the safe yield of wells in fractured rock such as NPS-6 and NPS-9 is to put them into production and observe the behavior of the water level and changes in chemical quality of the water over a long period of time.

It is possible that the installation of a pump in NPS-9 will satisfy the demands for some time to come. However, the following suggestions are offered for development of the sources of supply at Cinnamon Bay after the planning of installation at NPS-9.

- Step 1. Install pump in NPS-6 and connect to the cistern.
- Step 2. Install a pump and pressure tank in NPS-12 and connect directly to the rest rooms serving the cottages. During prolonged periods of high use the cistern could be used to augment this supply. This system could also be used for beach showers.
- Step 3. If NPS-12 fails to supply sufficient water for normal use well points should be installed along the east-west service road to augment the supply.

Docket Information

Number of Documents in Docket 17

Documents Dated from 1/13/1965 to 1/15/1965

Docket Compiled: 7/28/2011