USF200001862

MILITARY CONSTRUCTION LINE ITEM DATA

1. DATE: Jan 1963	2. FISCAL YEAR: 1965	3. DEPARTMENT: ARMY	4. INSTALLATION: FORT HUACHUCA
5. PROPOSED AUTHORIZATION: $ 1,197,000	6. PL OR AUTHORIZATION: P.L. None	7. CATEGORY CODE NUMBER: 84190	8. PROGRAM ELEMENT NUMBER: T 08600
			9. STATE/COUNTRY: ARIZONA
10. PROPOSED APPROPRIATION: $ 1,197,000	11. BUDGET ACCOUNT NUMBER: 5770	12. LINE ITEM NUMBER: None	13. LINE ITEM TITLE: Development of Spring Water Supply in Huachuca & Garden Canyons

SECTION A - DESCRIPTION OF LINE ITEM

14. TYPE OF CONSTRUCTION

a. PERMANENT	X
b. SEMI-PERMANENT	
c. TEMPORARY	

15. TYPE OF WORK

a. NEW FACILITY	
b. ADDITION	X
c. ALTERATION	
d. CONVERSION	
e. OTHER (specify)	
16. REPLACEMENT	
17. TYPE OF DESIGN	
a. STANDARD DESIGN	
b. SPECIAL DESIGN	X
c. DRAWING NO.	

18. PHYSICAL CHARACTERISTICS OF PRIMARY FACILITY

a. NO. OF BLDGS. N/A b. NO. OF STORIES N/A c. LENGTH N/A d. WIDTH N/A
e. DESIGN CAPACITY N/A f. GROSS AREA N/A
g. COOLING N/A DAP N/A COST N/A

19. DESCRIPTION OF WORK TO BE DONE: Remove and salvage existing pipe lines, remove and stockpile usable sand, rock and gravel for re-use in locations of infiltration galleries. Excavate to bedrock in locations of dams, infiltration gallery headers and lines, form and pour concrete dams, infiltration gallery headers. Lay pipe lines, install chlorination equipment, drill, case and test wells, install deep well pump, clear well and booster pump, balance recharging system and place in operation.

SECTION B - COST ESTIMATES

20. PRIMARY FACILITY		QUANTITY	UNIT COST	COST
Pipe Lines	LF	85,745	$6.41	$ 550
a.				
b.				
c.				
d.				
				$ 647
21. SUPPORTING FACILITIES				
a. Demolition Excavation	Job	1	L.S.	103
b. Concrete Work	Job	1	L.S.	229
c. Valves	Job	1	L.S.	9
d. Infiltration galleries	Job	1	L.S.	65
e. Chlorination Systems	Job	1	L.S.	6
f. Painting Pipe Lines	Job	1	L.S.	15
g. Well Drilling, Testing	Job	1	L.S.	184
h. Supervision by U.S.G.S.	Job	1	L.S.	36
22. TOTAL LINE ITEM COST				$1,197,000

SECTION C - BASIS OF REQUIREMENT

Factor developed by U. S. Geological Survey over a 5-year period

23. QUANTITATIVE DATA (U/M LF)

a. TOTAL REQUIREMENT	645,605	
b. EXISTING SUBSTANDARD	0	
c. EXISTING ADEQUATE	559,860	
d. FUNDED, NOT IN INVENTORY	0	
e. ADEQUATE ASSETS (c+d)	559,860	
	AUTHORIZED	FUNDED
f. UNFUNDED PRIOR AUTHORIZATION	0	
g. INCLUDED IN FY ____ PROGRAM	0	0
h. DEFICIENCY (a-e-f-g)	85,745	1,197,000
i. RELATED LINE ITEMS: None		

25. REQUIREMENT FOR LINE ITEM

Water used at this Installation as well as surrounding communities is supplied from the same underground basin at a depth of some 475 feet. A continuous lowering (18 feet since 1954) of the static level of this basin has become a problem of grave concern to this Installation. The demand for water on the Installation as well as surrounding communities has increased over the past 8 years from approximately 1,140,000 gallons per day to 6,600,000 gallons per day.

This project proposes to supplement the existing post water system which presently supplies approximately 4,000,000 gallons per day during the peak months, March through June, by utilizing to every extent possible, the water supply afforded by the springs in Huachuca and Garden Canyons as recommended by the U. S. Geological Survey, Ground Water Branch and concurred in by this Command.

The method of utilization herein proposed will reduce pumping during the summer months and eliminate pumping completely during the winter season. Presently, withdrawals from subterranean sources have the effect of permanently reducing the supply. This project is designed to replenish the underground supply and will stabilize the water table by replacing withdrawals faster than will occur in the natural recharge.

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Development of Spring Water Supply in Huachuca & Garden Canyons

1. General.

The water supply system must accommodate an average 24-hour population of 12,000. The peak water consumption which occurs during the months of March through June exceeds 4,000,000 gallons per day. The following is a tabulation of the water consumption in gallons during the past six years:

Year	Average Day	Maximum Day	Year Total
1956	1,226,000	2,622,000	447,005,000
1957	1,524,000	3,207,000	556,121,000
1958	1,874,000	3,460,000	683,968,000
1959	2,055,000	3,540,000	750,228,000
1960	2,200,000	4,205,000	802,806,000
1961	2,250,000	3,990,000	821,217,000
1962	2,476,000	4,461,000	903,730,000

This project will produce, water for domestic use, in excess of 350,000,000 gallons per year, (average flow) of which it is estimated 250,000,000 gallons can be utilized directly to provide a portion of the Post domestic water supply. Since the cost of producing water at this Installation is 14 cents per thousand gallons, a savings of some $35,000.00 per year would result, however the principal consideration is not in a monetary savings to the Government but in the conservation of a critical natural resource which is being depleted. This depletion is evident by the lowering of the underground water table, at this Installation, as verified by the U. S. Geological Survey, (records from 1959 through present) of some 2.4 feet per year. Furthermore, the rate of this depletion is continually increasing as more and more new wells are drilled adjacent to this Installation by the City of Sierra Vista and Fry.

2. Data on Accommodations Now in Use.

The existing water system consists of six deep wells with clear wells, booster pumps and storage capacity of 5,450,000 gallons, which is made up of one 500,000 gallon elevated steel tank, one 3,000,000 gallon concrete ground level reservoir, one 1,500,000 gallon concrete reservoir and the two old masonry reservoirs in the main post area with a combined capacity of 450,000 gallons. There also exists two booster stations, one in the Wherry Housing area which delivers water to the 1,500,000 gallon reservoir and one at the base of this reservoir which delivers water to the 450,000 gallon masonry reservoirs on the ridge above the main Post. This system of wells and well booster pumps is capable of maximum production of approximately 4,200,000 gallons per day with all wells and booster pumps operating on a full 24-hour schedule. (See Supplemental Data Sheets for detail description of existing system).

The proposed project will augment the water producing capabilities of the existing system, which is presently utilized to its maximum limit during peak water consumption. Under present conditions the existing system is capable of producing 4,200,000 gallons per day as compared to a peak consumption of 4,461,000 gallons per day. The excess consumption over the productive capabilities, some 300,000 gallons, is supplied from in-storage facilities. It is quite obvious if this maximum day consumption extends over a period of several days the in-storage facilities could be depleted to the extent of jeopardizing the Installations fire fighting capabilities.

3. Analysis of Deficiency.

Records maintained by the U. S. Geological Survey as well as data on file at this Installation indicate that the underground water table in the existing well field has declined an average of 18 feet during the period of 1954 to 1962 on an average of 2.4 feet per year. This rate of decline in the water table has not been a uniform 2.4 feet per year but rather is in proportion to the water withdrawn by pumping from the aquifer. The ever increasing demands on this underground water basin created by heavy water usage at this Installation (as indicated under General paragraph above) as well as

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the ever increasing demand in adjacent well fields in surrounding communities (Sierra Vista consumes at present 1,400,000 gallons per day) results in an ever increasing rate of decline in the static water level. This Installation is constantly drawing upon a steadily decreasing resource at a steadily increasing rate. The inevitable result will be a complete depletion of a critical natural resource.

Recorded water flow figures, as developed by the U. S. Geological Survey, for Garden and Huachuca Canyon Springs indicate an average monthly flow of 30,250,000 gallons, which is lost to transpiration and evaporation (a very small quantity of this water penetrates the earth to recharge the underground water basin).

This proposed project will utilize to every extent possible all the water being lost from these two sources. This project will operate as follows:

a. During periods of maximum demand the entire volume of spring water production will be delivered into the domestic water supply storage system. This spring supply will be supplemented by pumping from wells as necessary to maintain full storage capacity at all times.

b. During periods of minimum demand, when the volume of spring water production exceeds the requirements of the Post, the excess above Post requirements will be diverted to the recharging well and utilized to restore the water table elevation in the cone of depression created by withdrawal through the wells during operation of pumps. Since the periods of minimum demand for water on the Post, i.e., during the winter months of December through March, which period accounts for approximately 23 per cent of annual demand and approximately 75 per cent of annual spring water production, there will be a substantial balance of spring water for recharging during this period. Also, during these four months it should not be necessary to operate the pumps at all, or, if pumping is necessary, it should be only for short periods at intervals immediately following peak withdrawal from storage.

The principal features of construction are as follows:

a. Construction of concrete dams and collection works at various springs in Huachuca and Garden Canyons.

b. Construct 85,745 feet of pipe line (sizes 4" to 20") between collection works and Post ground storage reservoirs.

c. Drill and case recharge well 24" diameter and install pumping equipment. Drill and case three (3) 8" diameter observation wells.

d. Supervision of recharging and construction of collection works at the springs will be done by U. S. Geological Survey Ground Water Branch.

4. Analysis of Alternative Facilities and Locations.

The following alternate courses of action have been investigated:

a. Extending present wells to greater depths to intercept additional water bearing materials. Studies of the geology, prepared by U. S. Geological Survey, indicate that the productive aquifer lies between 450 feet and 600 feet from the ground surface. All existing wells are of such a depth as to intercept the entire aquifer. Well number 6 was drilled to a depth of 1,230 feet as a test hole and no additional water was intercepted between 600 feet to 1,230 feet. The above facts indicate that: (1) Obtaining additional water at greater depths is dubious and would require test drilling in the well field area as well as test pumping from greater depths (if test-drilling indicates additional water stratums at greater depths). This operation would result in expenditure of funds in the thousands of dollars and could be a total loss. (2) Pumping of water from depths of 1,500 feet would be a costly operation (present water costs including maintenance is 14 cents per

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DATE	FISCAL YEAR	MILITARY CONSTRUCTION LINE ITEM DATA (Continued)		INSTALLATION
Jan 1963	1965		Army	Fort Huachuca
LINE ITEM NUMBER		LINE ITEM TITLE		
None		Development of Spring Water Supply in Huachuca & Garden Canyons		

1,000 gallons pumping from 600 feet) approximately 23 cents per 1,000 gallons produced.

b. Drill additional wells to supply the required water. This would be a solution to the immediate problem of additional water, however since any additional wells would draw from the same aquifer utilized by the present well field, this solution would accelerate the complete depletion of the underground water supply.

5. Analysis of Criteria for a New Construction.

The conservation of a critical natural resource is the main factor influencing the proposed construction. In addition the existing wells are producing water at or near their economical limit (operations are on a 24-hour day during peak demand months).

6. Statement of Program for Related Equipment.

No related equipment is required in support of this project.

7. Disposition of Present Accommodations.

The existing pipe lines in Huachuca and Garden Canyons, installed in early 1900's by Post personnel, is in poor condition. These pipe lines vary in size from 2" to 8" and those portions which are serviceable will be utilized in the proposed project. Since this project is for the purpose of augmenting the existing water supply system, none of the existing facilities will be replaced or abandoned.

T. F. SEIGLER
Colonel, SigC
Deputy Post Commander

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1. DATE	2. FISCAL YEAR	MILITARY CONSTRUCTION LINE ITEM DATA (Continued)	Army	INSTALLATION
Jan 1963	1965			Fort Huachuca

5. LINE ITEM NUMBER	6. LINE ITEM TITLE
None	Development of Spring Water Supply in Huachuca & Garden Canyons

HISTORY OF DEVELOPMENT OF POST WATER SUPPLY

SUPPLEMENTAL DATA

1. The original Army Post at the base of the Huachuca Mountains was established in March 1877. The water supply was obtained from springs in Huachuca Canyon for a period of almost thirty-four years. In 1911, a collecting works was constructed near the junction of Garden and McClure Canyons with small pipe lines up the canyons to several springs and an eight inch steel pipeline seven miles long was constructed from the collecting box to a 250,000 gallon masonry storage reservoir. During the same year, investigations were started, and considerable money was expended in prospecting for additional water supplies. A number of test holes were drilled near the mouths of Garden and Huachuca Canyons to depths up to 1,000 feet without any great measure of success. As a result of this exploration, an 8 inch well was developed in Garden Canyon which was capable of delivering 35 gallons per minute using an air lift pump. This supply was used to augment the spring flow in times of drought. (This well is no longer in use due to small capacity and remote location). In the years between 1919 and 1936, concrete inlet boxes, dams, and catch basins were constructed in the canyons to utilize all available spring flow. This work, however was undertaken by inexperienced Post personnel, and results were not satisfactory.

2. In 1936, the water problem again became acute, and in that year a six inch diameter well was drilled 290 feet west of the Main Gate (located in Building 13130 and is abandoned). The well was capable of producing 100 gallons per minute and was equipped with a plunger type pump in September 1938. This new source was further developed in January 1939, when a fourteen inch diameter well was drilled 380 feet west of the Main Gate (Well No. 1), which has been in service 23 years and is supplying 550 gallons per minute to the old Post reservoirs.

3. In 1940, further development was carried on with the drilling of a second fourteen inch diameter well 900 feet west of the Main Gate (Well No. 2), which has been in service approximately 21 years and is supplying 730 gallons per minute to the Old Post reservoirs.

4. In 1941, during the initial development of mobilization training facilities at Fort Huachuca, one 500,000 gallon elevated steel storage tank was erected on the north side of Railroad Avenue and connected into the Post water system.

5. In 1942, with the mobilization for World War II, Wells No. 3, 4 and 5 were drilled, each having a capacity of approximately 700 gallons per minute and a three million gallon ground storage reservoir, as well as another 500,000 gallon steel tank were constructed. This, together with the installation of distribution and supply mains, were constructed to support some 42,500 population with a maximum daily consumption of 3,900,000 gallons.

6. In 1956, a 1,500 gallon per minute booster station was installed in support of 500 units of Wherry family housing. This booster station consisted of three 500 gallon per minute pumps taking suction from the 3 million gallon reservoir and discharging into a 10,000 gallon pressure tank, which fed into the Wherry Housing distribution system.

7. In 1958, a 1½ million gallon concrete ground reservoir was constructed at an intermediate elevation between the three million gallon reservoir and the 450,000 gallon reservoirs. This reservoir was constructed to provide additional storage in support of 575 units of Capehart Housing as well as MCA construction projects. The 10,000 gallon pressure tank which serviced the Wherry Housing project was removed from the system and the three 500 gallon per minute pumps discharged into the new 1½ million gallon reservoir as well as into the distribution system.

8. In 1958, Well No. 6 was drilled to a depth of 1,312 feet. This well was then developed and tested under the supervision of the Ground Water Branch of the Geological Survey Department of Interior and is capable of producing 750 gallons per minute over a sustained period of years.

9. In 1960, pumping equipment was installed in Well No. 6 and connected into the system. This well is capable of delivering 750 gallons per minute discharging into a 50,000 gallon concrete surge

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SUPPLEMENTAL DATA (Continued)

tank from which a 750 gallon per minute booster pump takes suction and discharges through supply mains into the 3 million gallon reservoir.

10. In 1961, a booster pumping station consisting of three 500 gallon per minute pumps was installed at the base of the 1½ million gallon reservoir. This booster station lifts water from the intermediate zone (1½ million gallon reservoir) to the high level or 450,000 gallon reservoirs. In the same year one additional booster pump, (500 gallon per minute) was added to the Wherry booster pumping station increasing capacity of the station to 2,000 gallon per minute.

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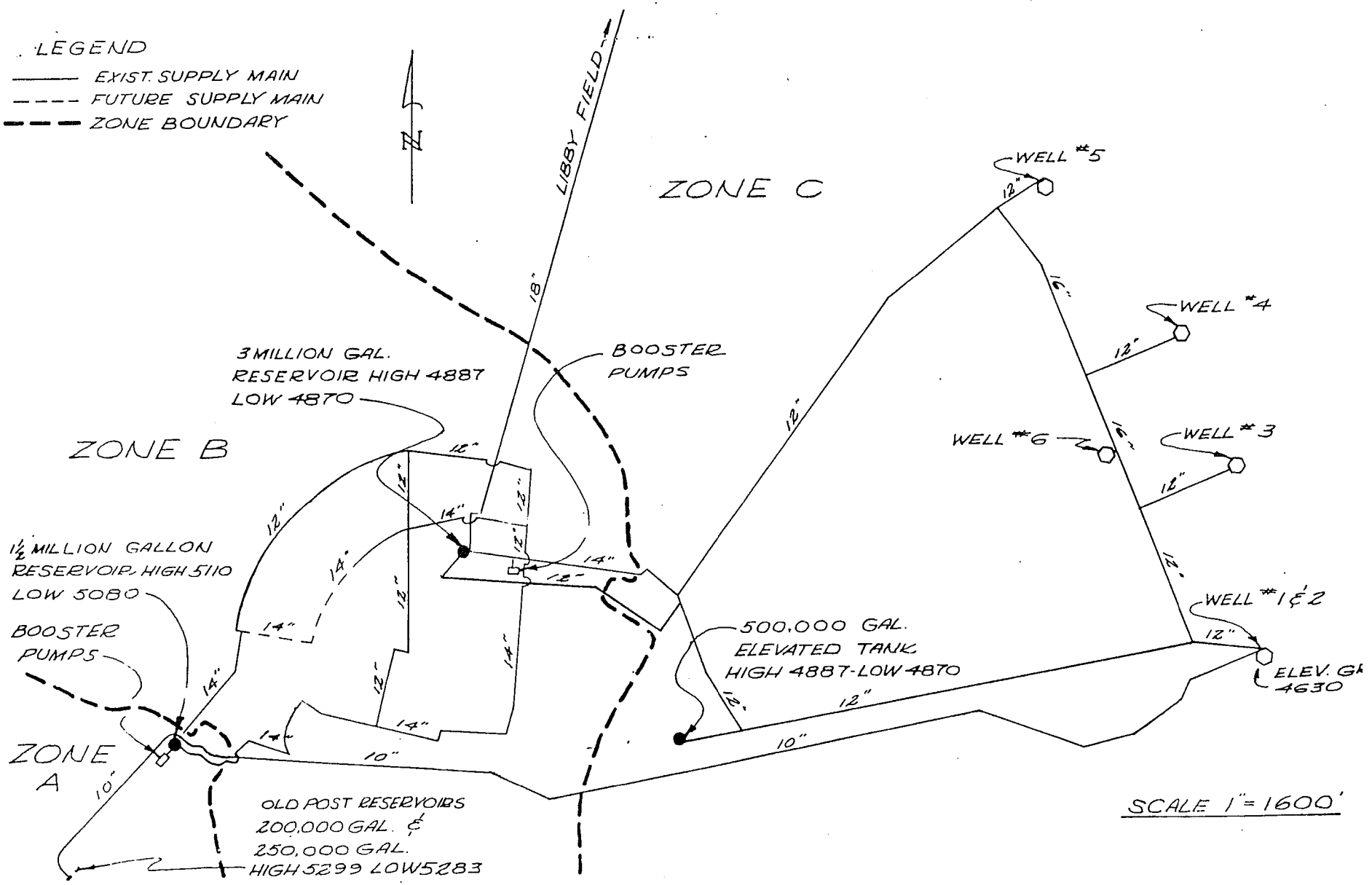

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