



**US Army Corps  
of Engineers**  
Facilities Engineering  
Support Agency

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# **PHASE I REPORT**

## **OPERATOR ASSISTANCE PROGRAM WATER TREATMENT SYSTEM**

### **FORT HUACHUCA**

### **SIERRA VISTA, ARIZONA**

**GOVERNMENT CONTRACT  
DACA31-85-D-0051  
WORK ORDER 0004**

**AUGUST 1986**

SECTION 1  
EXECUTIVE SUMMARY

Under a contract issued by the U. S. Army Corps of Engineers, Facilities Engineering Support Agency (FESA) Malcolm Pirnie, Inc. conducted an on-site, diagnostic evaluation of the water supply and treatment system at Fort Huachuca, Arizona. Examination of the treatment system records showed that the plant is currently in compliance with the State of Arizona and U. S. EPA Drinking Water Regulations. The plant currently supplies approximately 2.9 million gallons per day (mgd).

Examination of the system showed several critical operating problems. These are as follows:

1. The overflow capacity for the 1.5 million gallon (MG) and 3.0 MG storage facilities is questionable for the current flows. Severe structural tank damage and pressurization problems could occur if not corrected.
2. At Raw Water Booster No. 2 a manifold connection exists between a high pressure pump and a lower pressure pump. Severe pressure damage could occur if the manifold valve were to be opened under these conditions.
3. An exposed 5000 V knife-switch exists at Booster No. 2 Pumphouse. This represents a severe electrical safety hazard.
4. Booster Pump No. 1 at the East Range is out of service.
5. Many wells have shown signs of oil and require bailing to remove the floating oil.
6. The remote control system for the East Range system has never been debugged and is consequently out of order at the time of the site visit.
7. A floor-mounted transformer at Well No. 6 would be an electrical hazard during a major leak.
8. A high voltage connection exists in the same sump as Booster No. 1 and would be an electrical hazard during a major leak.

At this time the Phase II activities have been placed on hold due to the scheduled change at the installation to an outside contractor for the operation and maintenance of the facilities.

## SECTION 3

### WATER TREATMENT SYSTEM DESCRIPTION

#### 3.1 System Description - Hydraulic

The potable water supply for Fort Huachuca is supplied by eight deep groundwater wells located in a dispersed manner throughout the main post area (See Figure 3.1). The total pump capacity is rated at 5,810 gallons per minute (gpm) or 8.4 MGD. Pertinent well data are given in Table 3-1.

Each well is housed in a wooden pumphouse with concrete floors. Wells No. 1 through 6 feed directly into two 50,000 gallon surge tanks located at each well site. Wells No. 7 and 8 pump jointly to a 100,000 gallon surge tank facility. Wells No. 1 through 6 are controlled by float switches located in the surge tank. As the surge tank level drops the switch electronically triggers the pump operation. Wells No. 7 and 8 are controlled by storage level in the adjacent 100,000 gallon storage tank.

From the surge tanks booster pumps are utilized to feed either the distribution system or fill the storage facilities. Pumps No. 1, 2A, 3, 4, 5 & 6 discharge to the system while Booster Pumps 2B and East Range Boosters 1, 2 and 3 discharge to storage. Flow and valve schematics are given in Figure 3-2. Current storage capacity totals 5.55 MG (including surge tanks) according to the specifications listed in Table 3-2.

Flow data from Wells No. 1 through 6 are calculated monthly using recorded pump hours and rated pump capacities. Wells No. 7 and 8 are programmed to be computer activated and measured; however, the system is not currently in-use.

From the storage facilities, distribution to the system is through 6 inch to 16 inch diameter cast iron and steel and transite mains. System pressure within the distribution network is maintained at 65 to 70 pounds per square inch (psi) with four in-line distribution booster pumping stations.

The ages of the various components of the system vary widely. Some distribution mains and storage facilities are 60 years old and more. Some facilities have been constructed in the last 10 years. Data were not available for the exact construction dates.

Additional water supply could be obtained on an emergency basis from a spring located in Huachuca Canyon near the old post of Fort Huachuca. The estimated capacity from this alternate source is 400 gpm. No interconnection currently exists with the surrounding community of Sierra Vista.

### 3.2 System Description - Treatment

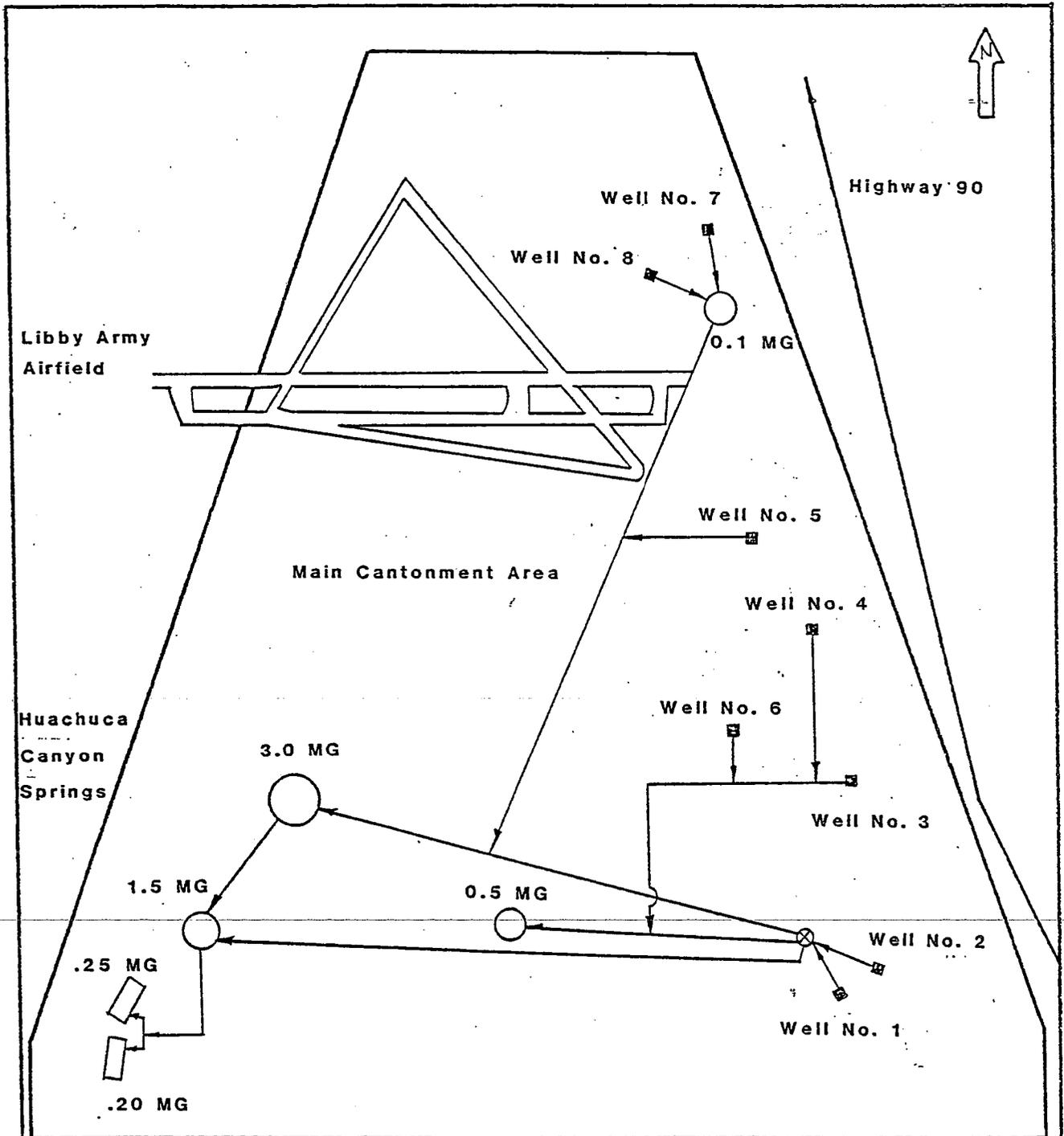
Potable water treatment at Fort Huachuca consists of chlorination and fluoridation.

#### 3.2.1 Chlorination

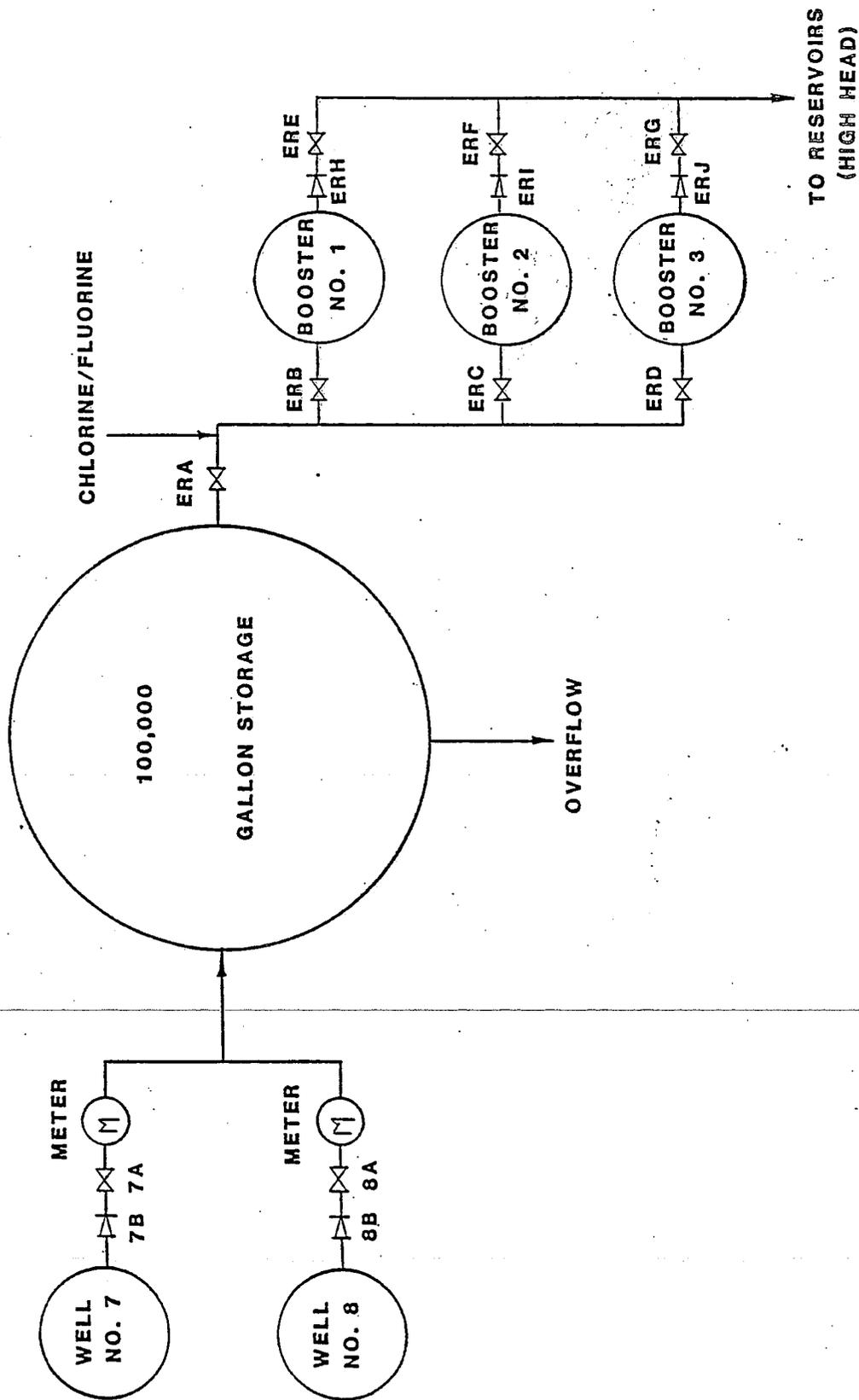
Individual chlorination facilities are located adjacent to all wells except Nos. 7 and 8 where the facilities are located adjacent to the storage facilities. Chlorine is provided by twin 150 pound cylinders connected by manifold to a vacuum type, V-notch chlorinator. The chlorine is injected on the suction side of the booster pumps. Chlorine usage is measured by scales at all facilities. Storage space for spare cylinders is provided at each site.

#### 3.2.2 Fluoridation

Individual fluoridation facilities are located at each well site with the exception of Wells No. 7 and 8. For these wells the facilities are located within the storage facility of the booster pump station. Fluoride is fed into the raw water line prior to the surge tanks at Wells No. 1 through 6, while at Wells No. 7 and 8 the fluoride is fed prior to the booster pumps. A 4 percent feed of sodium fluoride solution is used with an automatic, water operated, meter-paced unit. The solution tank is protected from the supply line by an air gap in the tank. Feed rates and dosage rates were not available; however a 0.8 to 1.0 mg/L fluoride residual goal was stated.



**FIGURE 3-1 WATER SUPPLY AND DISTRIBUTION SYSTEM**



WELLS NO. 7 and 8 (EAST RANGE)

FIGURE 3-2 (cont.)

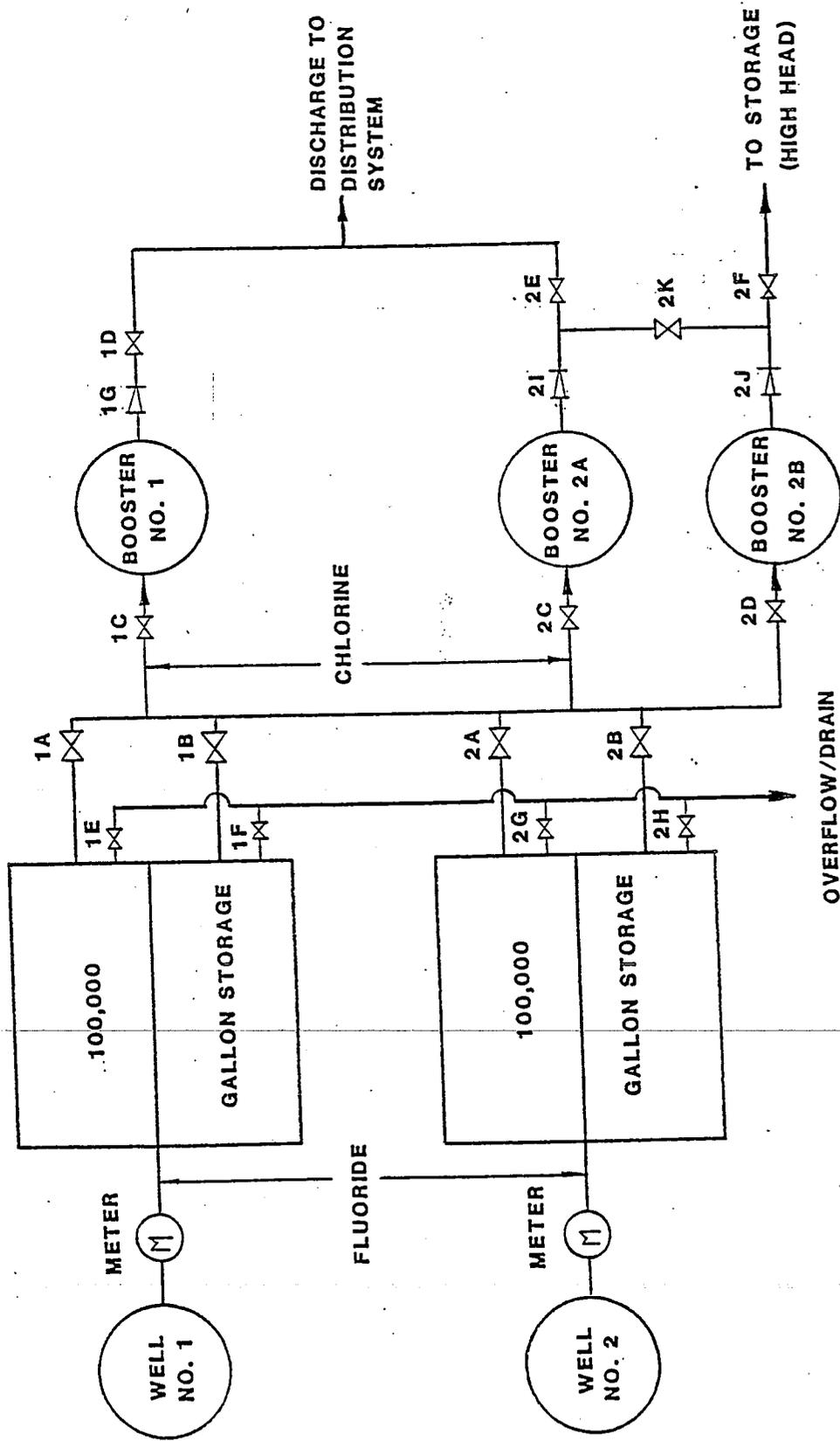
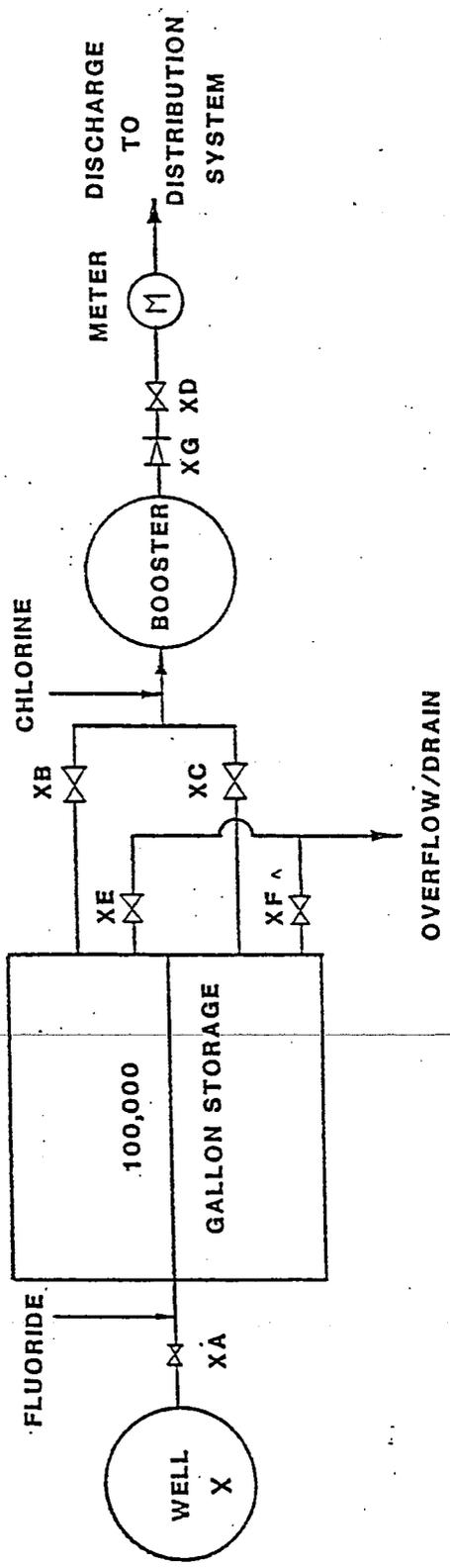


FIGURE 3-2 (cont.) WELLS NO. 1 and 2

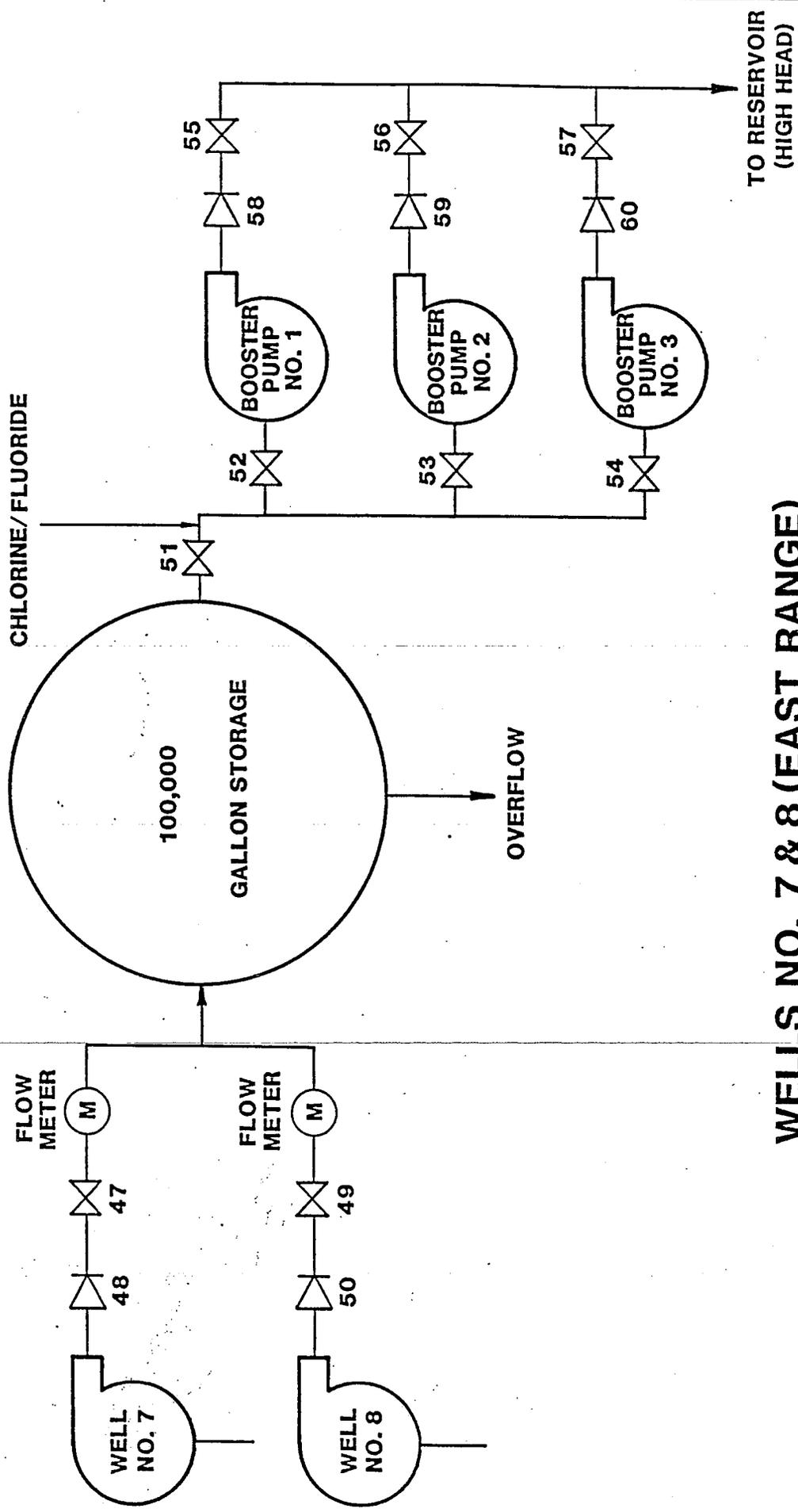


WELLS NO. 3 THRU 6

FIGURE 3-2 FLOW AND VALVE SCHEMATICS

TABLE 3-2  
WATER STORAGE TANKS

Structure #	Structure Material	Type	Volume
61609	Concrete	Surface	3.0 MG
22020	Concrete	Surface	1.5 MG
49001	Steel	Elevated	0.5 MG
15663	Steel	Elevated	0.1 MG
22002	Concrete	Surface	0.2 MG
22001	Concrete	Surface	0.25 MG
90013	Concrete	Surface	0.05 MG
90014	Concrete	Surface	0.05 MG
90431	Concrete	Surface	0.05 MG
90672	Concrete	Surface	0.05 MG
90860	Concrete	Surface	0.05 MG
79692	Concrete	Surface	0.05 MG



**WELLS NO. 7 & 8 (EAST RANGE)**