

LONG RANGE PLAN FOR THE DOTHAN WATER SYSTEM 2012 UPDATE

THE CITY OF DOTHAN, ALABAMA
DOTHAN CITY COMMISSION RESOLUTION NO. 2009-454



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EXECUTIVE SUMMARY

This report evaluates the ability of the Dothan Water System to adequately meet the City's short range and future water supply, infrastructure and maintenance needs. The report evaluated the projected water demand and supply needs for the Dothan Water System from 2010 to 2060 utilizing customer growth and historical water usage data dating back to 1983. More specifically, this report evaluated four (4) water supply source alternatives that led to the recommendation that the Panhandle Wellfield alternative best meets the City of Dothan's long term water supply needs. The Panhandle Wellfield option proposes the construction of thirteen (13) new water supply wells spaced out over a period of many years. The first eight (8) wells are recommended to be constructed by year 2030 which would meet supply needs through Year 2045. The remaining five (5) wells would be constructed as dictated to meet water supply demands past Year 2045. Reduced pumping of existing wells would be implemented in 2030 to extend the life of the existing wells.

Improvements over the next twelve (12) years include the construction of the three (3) water supply wells shown as Immediate Supply Needs, completing recommended water system infrastructure improvements, required maintenance, and developing a test well in the Tuscaloosa Formation. According to the Geological Survey of Alabama and as discussed in this report, the Tuscaloosa Formation has the potential to supply water to the City beyond the scope of this study; thus a test well is recommended to evaluate the full potential of this source.

The capital improvements costs through Year 2025 have been summarized as follows:

RECOMMENDED IMPROVEMENTS (Ref. Page IX-5)		
WATER SYSTEM NEEDS	YEARS	ESTIMATED COSTS
Three (3) 1500 GPM Water Supply Wells and Connecting Mains (Immediate Supply Needs)	2014 – 2025	\$6,500,000
Tuscaloosa Test Hole and Test Well	2013 – 2014	950,000
Transmission Main Improvements as determined from Hydraulic Modeling of Water System	2014 – 2023	8,500,000
Tank & Well Upgrade and Maintenance	2014 – 2021	5,050,000
Red Water Main Replacement	2014 – 2025	1,200,000
Fire Hydrant Maintenance	2014 – 2022	450,000
New Generators to Provide Auxiliary Power to Wells	2015 – 2023	750,000
New Elevated Tank (2.0 MG)	2019 – 2020	2,300,000
Property Acquisition for Well & Tank Sites	2023 – 2025	700,000
TOTAL		\$26,400,000

Through the efforts of Dothan Utilities over the past twelve (12) years, unaccounted water has decreased, water conservation by the customers has increased, and eliminating dead-end water mains when feasible to minimize flushing of mains has contributed to reduced demands on the water system.

TABLE II-1 CITY OF DOTHAN POPULATION 1900 - 2011			
YEAR	POPULATION	PERSONS/ YEAR	COMPOUNDED ANNUAL RATE
1900	3,275	-----	-----
1910	7,016	374.10	7.90 %
1920	10,034	301.80	3.60 %
1930	16,046	601.20	4.80 %
1940	17,194	114.80	0.70 %
1950	21,584	439.00	2.30 %
1960	31,440	985.60	3.80 %
1970	36,733	529.30	1.60 %
1980	48,750	1,201.70	2.90 %
1990	53,589	483.90	0.95 %
2000*	57,737	414.80	0.75 %
2001	58,513	776.00	1.34 %
2002	59,288	775.00	1.32 %
2003	60,064	776.00	1.31 %
2004	60,840	776.00	1.29 %
2005	61,616	776.00	1.27 %
2006	62,392	776.00	1.26 %
2007	63,168	776.00	1.24 %
2008	63,944	776.00	1.22 %
2009	64,720	776.00	1.21 %
2010*	65,496	776.00	1.19 %
2011	66,271	<u>775.00</u>	<u>1.18 %</u>
Overall Average		586.70	2.25 %

*census data

II.2 RATE OF ANNUAL INCREASE METHOD

The last two columns in Table II-1 show annual population increases between census years since 1900, both in numbers of persons per year and as a compounded annual percentage rate.

TABLE II-9**TOTAL PROJECTED NUMBER OF CUSTOMERS**

YEAR	AVG # OF RESIDENTIAL & COMMERCIAL CUSTOMERS	AVG # OF INDUSTRIAL CUSTOMERS > 500,000 GALS	AVG # OF IRRIGATION CUSTOMERS	AVG # OF TOWNSHIP CUSTOMERS	AVG # OF CITY ACCOUNTS	AVG # OF TOTAL CUSTOMERS
* 2000	27,907	33	2,396	2	60	30,398
* 2005	29,662	36	3,334	5	102	33,139
* 2010	29,275	36	3,273	3	111	32,698
2015	31,357	36	4,097	3	110	35,603
2020	33,440	36	4,678	3	110	38,267
2025	35,522	38	5,259	3	112	40,934
2030	37,605	38	5,840	3	112	43,598
2035	39,687	38	6,421	3	112	46,261
2040	41,770	40	7,001	3	112	48,926
2045	43,852	40	7,582	3	114	51,591
2050	45,935	40	8,163	3	114	54,255
2055	48,017	42	8,744	3	114	56,920
2060	50,100	42	9,325	3	114	59,584

**TABLE III-1
WATER PRODUCTION/CONSUMPTION, 1983-2011**

YEAR	WATER PRODUCTION (1000 GALS)	WATER CONSUMPTION (1000 GALS)	DIFFERENCE (1000 GALS)	% LOSS
1983	3,520,172	2,899,795	620,377	17.62
1984	3,746,252	3,468,734	277,518	7.41
1985	3,764,852	3,264,980	499,872	13.28
1986	3,891,534	3,409,094	482,440	12.40
1987	3,894,814	3,365,341	529,473	13.59
1988	3,777,049	3,452,942	324,107	8.58
1989	3,852,901	3,496,557	356,344	9.25
1990	4,365,878	4,084,942	280,936	6.43
1991	4,279,556	3,752,785	526,771	12.31
1992	4,507,878	4,049,438	458,440	10.17
1993	4,660,359	4,242,268	418,091	8.97
1994	4,506,455	4,157,555	348,900	7.74
1995	4,870,317	4,342,753	527,564	10.83
1996	4,720,697	4,229,910	490,787	10.40
1997	4,496,804	4,154,140	342,664	7.62
1998	5,072,726	4,806,005	266,721	5.26
1999	5,039,790	4,828,420	211,370	4.19
2000	5,424,710	5,126,074	298,636	5.51
2001	4,836,774	4,482,615	354,159	7.32
2002	4,562,348	4,289,003	273,345	5.99
2003	4,002,443	3,768,493	233,950	5.85
2004	4,525,564	4,071,856	453,708	10.03
2005	4,380,115	4,023,322	356,793	8.15
2006	4,993,154	4,589,163	403,991	8.09
2007	5,153,971	4,743,270	410,701	7.97
2008	4,805,280	4,522,062	283,218	5.89
2009	4,289,367	3,744,629	544,738	12.70
2010	4,627,164	4,197,498	429,666	9.29
2011	4,674,941	4,403,334	271,607	5.81

Table III-2 shows the total quantity of water produced by the Dothan Water System since 1958 with the exception of six (6) years between 1968 and 1973 when records were not available.

The per capita productions shown in Table III-2 include unaccounted-for water, water used for irrigation, city uses and water consumed by large non-residential users as well as water sold to customers outside the City limits and therefore may be of value as a forecasting tool. For example, the per capita production has decreased since the water rate increase ordinance was adopted by the City in 2002. However, you could use an average of 215 gallons per capita (Table III-4) to predict future production needs based on the population. For instance, a future population in 2025 is predicted to be 75,716 persons which would require an average production demand of 16,278,940 GPD. The maximum peak day demand (Table III-3) could be in excess of 27,674,198 GPD. This is a very helpful tool in long term planning to quickly look at water production needs.

In analyzing demands on any water system both maximum 3-day and average day demands are of interest. **The existing supply source should meet average day demands while operating at an average of 12 hours/day. Maximum 3-day demands will be evaluated with supply sources operating 18 hours/day. Peak day demands utilize available storage and 18 hours/day of operating time for water supply wells.**

Using daily water production data since 1984, Table III-3 was generated to provide a correlation of data between average day, peak day, maximum 3-day, and maximum 90 day demands. The data from Table III-3 is graphically illustrated in Figure III-1.

Table III-4 shows how per capita water production has varied since 1984 between wet, normal, and dry years. Populations shown in Table III-4 are interpolated between census years.

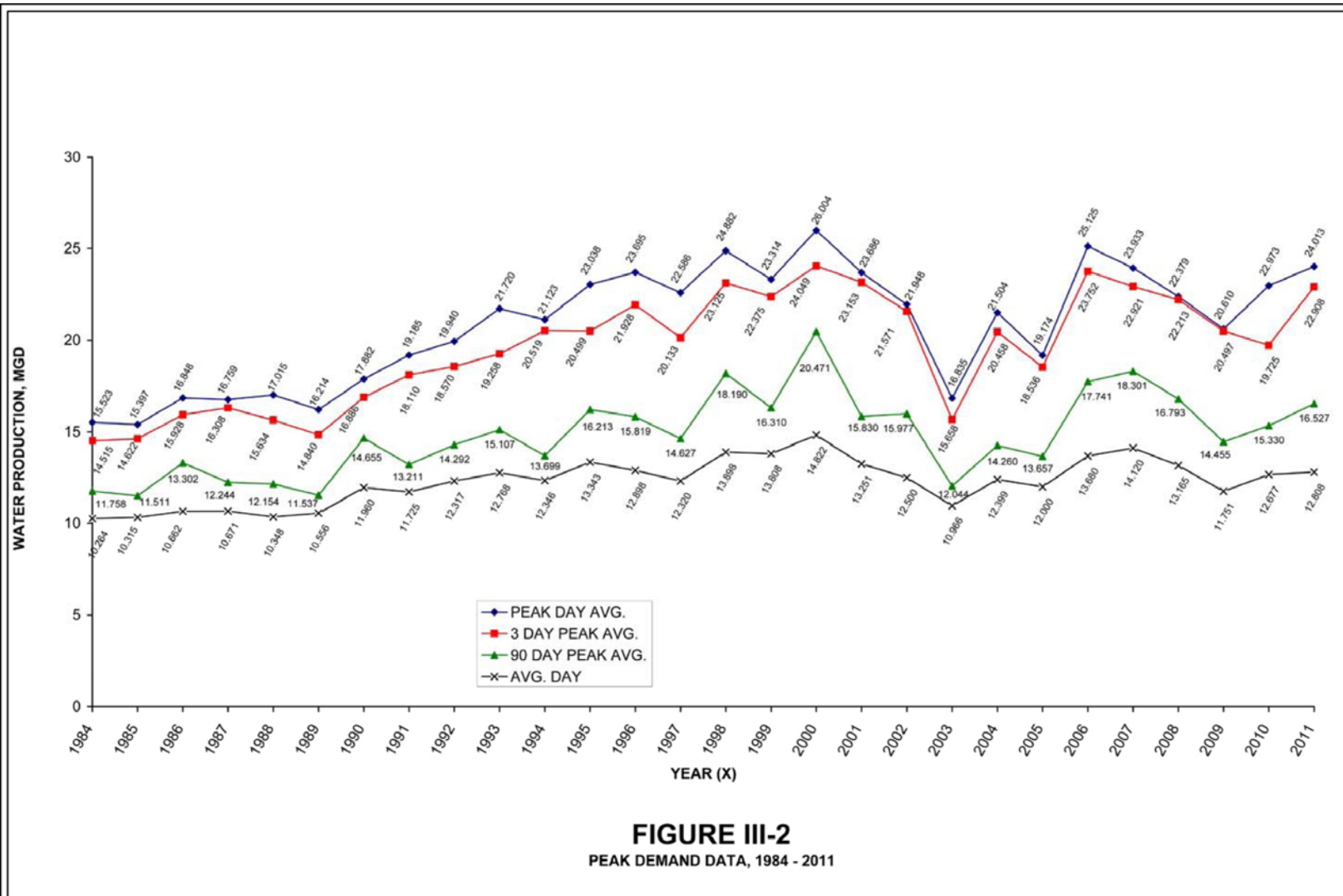


FIGURE III-2
PEAK DEMAND DATA, 1984 - 2011



FIGURE III-2
PEAK DEMAND DATA, 1984 - 2011



TABLE III-4
PER CAPITA WATER PRODUCTION, 1984-2011

YEAR	EST. POPULATION	AVG DAILY PRODUCTION	GPCD	WEATHER
1984	50,686	10,264,000 Gals.	202.5	Normal
1985	51,170	10,315,000 Gals.	201.6	Normal
1986	51,653	10,662,000 Gals.	206.4	Dry
1987	52,137	10,671,000 Gals.	204.7	Dry
1988	52,621	10,348,000 Gals.	196.6	Normal
1989	53,105	10,556,000 Gals.	198.8	Wet
1990	53,589	11,961,000 Gals.	223.2	Dry
1991	54,004	11,725,000 Gals.	217.1	Wet
1992	54,419	12,317,000 Gals.	226.3	Dry
1993	54,833	12,768,000 Gals.	232.8	Dry
1994	55,248	12,346,000 Gals.	223.5	Wet
1995	55,663	13,343,000 Gals.	239.7	Normal
1996	56,078	12,898,000 Gals.	230.0	Wet
1997	56,493	12,320,000 Gals.	218.1	Normal
1998	56,907	13,898,000 Gals.	244.2	Normal
1999	57,322	13,808,000 Gals.	240.9	Normal
2000	57,737	14,822,000 Gals.	256.7	Dry
2001	58,367	13,251,436 Gals.	226.5	Dry
2002	58,998	12,499,584 Gals.	210.8	Normal
2003	60,036	10,965,600 Gals.	182.6	Wet
2004	61,287	12,398,808 Gals.	203.8	Normal
2005	62,713	12,000,315 Gals.	194.7	Normal
2006	64,053	13,679,874 Gals.	219.3	Dry
2007	65,447	14,120,469 Gals.	223.5	Dry
2008	66,447	13,165,151 Gals.	205.9	Dry
2009	67,583	11,751,690 Gals.	181.6	Wet
2010	65,496	12,677,161 Gals.	193.6	Dry
2011	66,271	12,808,057 Gals.	193.3	Dry
AVG		12,297,853 Gals.	214.2	

TABLE III-6
COMPARISON OF HISTORICAL DATA AND 2001 PROJECTED DEMANDS

2001 PROJECTIONS FROM STUDY					
YEAR	NORMAL YEAR AVERAGE ANNUAL	DRY YEAR AVERAGE	DRY YEAR PEAK 90 DAYS	DRY YEAR PEAK 3 DAYS	DRY YEAR PEAK DAY
1995	13.04	13.62	16.48	19.43	21.11
2000	14.35	14.97	18.11	21.23	23.20
2005	15.74	16.51	20.37	25.32	27.63
2010	17.26	18.11	26.42	27.87	30.43
ACTUAL PRODUCTION DATA					
YEAR	ACTUAL WEATHER	AVERAGE	PEAK 90 DAYS	PEAK 3 DAYS	PEAK DAY
1995	Normal	13.34	16.21	20.50	23.04
2000	Dry	14.82	20.47	24.05	26.00
2005	Normal	12.00	13.66	18.54	19.17
2010	Dry	12.67	14.86	19.59	20.83

III.3 WATER PRODUCTION/CONSUMPTION PROJECTIONS

A. Large Non-Residential User Projections:

Because of the significance of industrial/commercial water use in Dothan, it is important that this use be identified and accounted for.

In this study, customers using more than 500,000 gallons per month were separated from the data and analyzed. As can be seen from Table III-10, the large user consumption has been decreasing since 2005. The Dothan area has lost several large industries over the past six (6) years which has reduced the demand on the system. The 2011 usage was 1,984,000 GPD while in 2005 it was 3,864,000 GPD. With this decrease in demand very little growth will be projected for users using more than 500,000 gallons per month. If the system experienced growth in this area of the customer base, the projections in this study could be easily updated to include the increased demand.

B. City Uses:

The City of Dothan is one of the larger users of water from the Dothan Water System. All water used by the City is metered and thus accounted for but not included in the large non-residential user category above. Future City water use has been projected separately in Figure III-4 using the same method as for irrigation usage and demand. The quantity can be calculated for each year from the City's comprehensive database going back to 1997.

C. Townships:

Due to the number of existing water system connected to the City of Dothan for emergency water supply needs (Houston County, Cowarts, Kinsey, Taylor & Cottonwood) and the potential for large customer growth in the eastern portion of the County, a 1.0 MGD supply need will be added to the demands beginning in 2015 and increasing to 2.0 MGD in 2025.

TABLE III-14
SUMMARY OF RESIDENTIAL/COMMERCIAL USER
CUSTOMER DEMANDS, 1986-2011

PER CUSTOMER CONSUMPTIONS (GALS/DAY)				
	<u>ANNUAL AVERAGE</u>	<u>MAX 90 DAY</u>	<u>MAX 3 DAY</u>	<u>MAX DAY</u>
Wet Years	293.2	353.2	561.7	606.50
Normal Years	271.90	369.50	559.30	613.30
Dry Years	302.5	422.2	605.9	651.1
All Years	291	362.4	581.3	629.1
5 YR Highs	352	480.3	647.60	723.90
RATIO TO ANNUAL AVERAGE CONSUMPTION				
	<u>MAX 90 DAYS</u>	<u>MAX 3 DAYS</u>	<u>MAX DAY</u>	
Wet Years	1.20	1.91	2.07	
Normal Years	1.35	2.06	2.22	
Dry Years	1.39	2.00	2.15	
All Years	1.25	2.00	2.16	
5 YR Highs	1.36	1.84	2.06	

TABLE III-15
RECOMMENDED DEMAND CUSTOMER CONSUMPTIONS, GALS/CUST/DAY

	<u>ANNUAL AVG</u>	<u>MAX 90 DAY</u>	<u>MAX 3 DAY</u>	<u>MAX 1 DAY</u>
	<u>DEMAND</u>	<u>DEMANDS</u>	<u>DEMANDS</u>	<u>DEMAND</u>
Average Year	275	370	560	615
Dry Year	305	425	610	660

TABLE III-21
DRY YEAR AVERAGE AND PEAK DEMAND PROJECTIONS, MGD

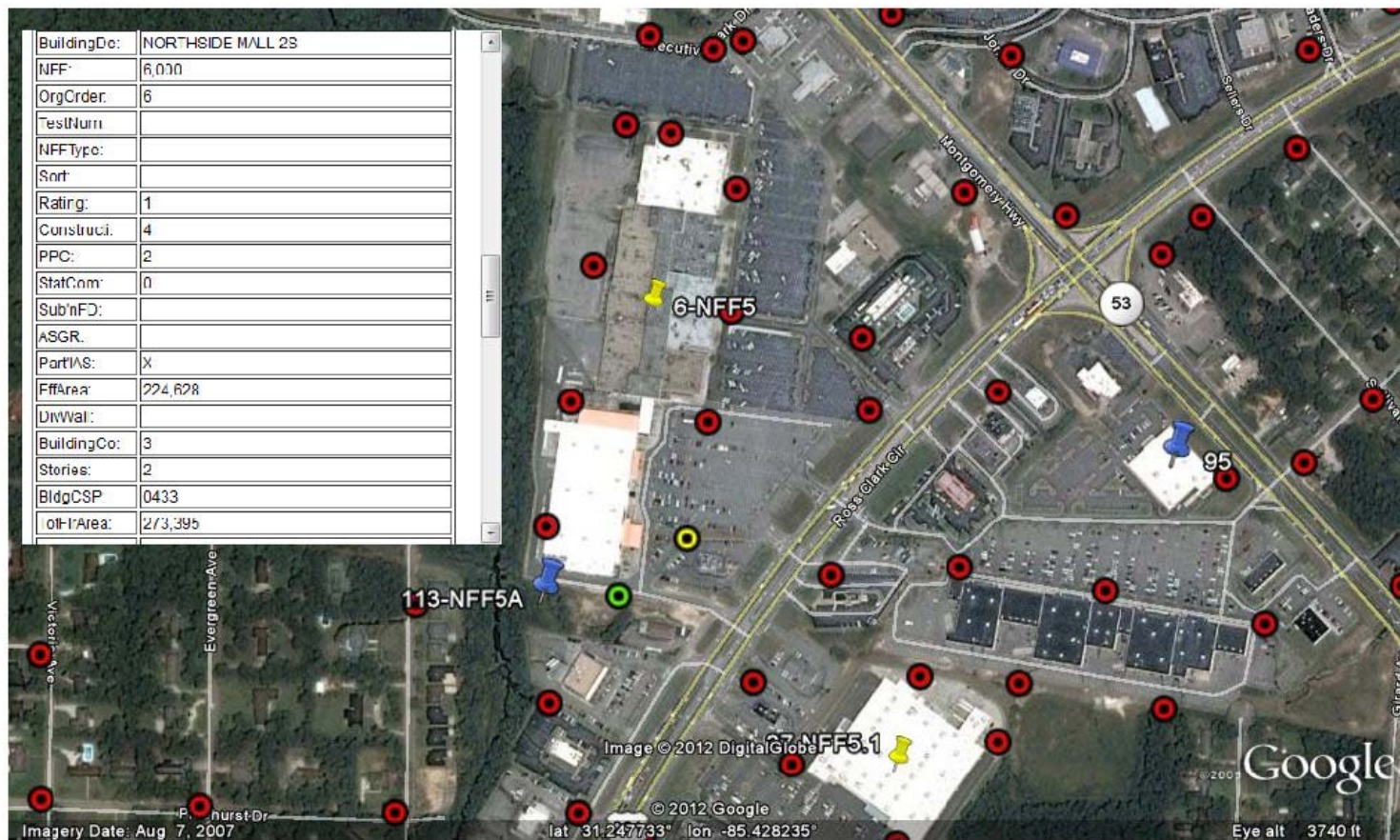
YEAR	AVERAGE	PEAK 90 DAYS	PEAK 3 DAYS	PEAK 1 DAY
2000	14.67*	20.47*	24.05*	26.00*
2005	12.00*	13.66*	18.54*	19.17*
2010	12.677*	15.330*	19.725*	22.973*
2015	16.109	19.881	25.685	27.254
2020	17.116	21.144	27.337	29.011
2025	19.217	23.496	30.075	31.880
2030	20.214	24.542	31.706	33.588
2035	21.221	26.000	33.349	35.335
2040	22.319	27.340	35.083	37.174
2050	24.324	29.852	38.358	40.657
2060	26.431	32.460	41.737	44.244
* Actual Data Recorded				

TABLE V-10
TARGET PRODUCTION SUMMARY

WELL GROUP	TARGET AVG DAILY PROD. EXIST. PUMPS (MGD)	TARGET AVG DAILY PROD. UPGRADED PUMPS (MGD)	TARGET PEAK PROD. EXISTING PUMPS (MGD)	TARGET PEAK PROD. UPGRADED PUMPS (MGD)
Shallow	1.638	1.8	2.457	2.7
Middle	6.113	6.113	9.169	9.169
Deep	9.612	9.612	14.418	14.418
TOTAL	17.363	17.525	26.044	26.287

TABLE VII-1
SUMMARY OF EXISTING WATER STORAGE TANK DATA

TANK	LOCATION	STORAGE CAPACITY (GALS)	FOUNDATION ELEVATION	OVERFLOW ELEVATION	DATE ERECTED	LAST RECOAT	LAST INSPECTION/ CONDITION
Standpipe (Dixie)	East Powell ST & North St. Andrews ST	180,000	367.0'	462.33'	1897	2006	2006/Excellent
Napier Field	Napier Field RD	400,000	380.21'	539.21'	1942	2006	2006/Excellent
Cherry Street	East Newton ST and Cherry ST	750,000	363.49'	462.33'	1938	2005	2005/Excellent
Greentree Avenue	West North ST	1,000,000	355.67'	462.33'	1954	2007	2007/Excellent
Twitchell	Murray RD and Twitchell RD	500,000	328.75'	462.33'	1967	2013	2013/Excellent
Cottonwood Road	Cottonwood RD and Farm Center	500,000	340.43'	462.33'	1967	2008	2008/Excellent
Westgate	Westgate PKWY and Forest DR	1,500,000	327.0'	462.33'	1980	1995	2012/Excellent
Pettus Street	Pettus ST and Selma ST	3,000,000	288.67'	323.92'	1986	1996	2010/Good
HWY 52 East	AL HWY 52 East	750,000	330.33'	462.33'	1986	2004	2004/Excellent
Honeysuckle	Honeysuckle School	1,500,000	328.0'	462.33'	1993	New	2010/Good
Hodgesville	Hodgesville RD at Inez RD	1,500,000	330.0'	462.33'	1997	New	Good
Wicksburg	HWY 84 West	1,500,000	359.0'	462.33'	2000	New	Very Good
Wallace	Wallace DR	1,500,000	388.0'	539.21'	2000	New	Very Good
Troy Campus	Brannon Stand RD	1,500,000	323.75'	462.33'	2009	New	New
	TOTAL	16,080,000					



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VI. CONSIDERATION OF ALTERNATIVE SOURCES OF SUPPLY

VI.1 EXISTING SUPPLY SOURCES

The City of Dothan obtains its water supply from various sources of groundwater. The current 5-year average daily pumping for the City is approximately 12.90 million gallons per day (MGD) and for the year 4.723 billion gallons. The 5-year average maximum peak usage is 22.78 million gallons per day (MGD) while the maximum peak daily usage recorded was 26.00 million gallons in Year 2000. All of this supply comes from a total of thirty-four (34) water supply wells that are ready for use 24 hours per day, 365 days per year. The pumping rates for the wells range from 300 GPM (shallow wells) to 1700 GPM (deep wells). The wells are basically located in three (3) water bearing zones that are separated in this report as Zone 1-Shallow Well System, Zone 2-Intermediate Well System, and Zone 3-Deep Well System. In this study and previous studies to extend the life of the water supply wells, a reduction in pumping capacities is considered at a rate of 10 percent for Zone 1 wells, 15 percent for Zone 2 wells and 20 percent for Zone 3 wells. A brief summary of available and reduced pumping capacities for each well zone follows:

A. Shallow Well System

1. Lisbon, Tallahatta and Hatchetigbee Formations
2. **6-Water Supply Wells with pumping capacities totaling 2275 GPM**
3. Present average daily pumping capacity = 1.638 MGD
4. Present maximum daily pumping capacity = 2.457 MGD
5. Reduced average daily pumping capacity = 1.474 MGD (10% reduction)
6. Reduced maximum daily pumping capacity = 2.228 MGD (10% reduction)

B. Intermediate Well System

1. Nanafalia, Salt Mountain and Ripley Formations
2. **17-Water Supply Wells with pumping capacities totaling 8,490 GPM**
3. Present average daily pumping capacity = 6.113 MGD
4. Present maximum daily pumping capacity = 9.169 MGD
5. Reduced average daily pumping capacity = 5.196 MGD (15% reduction)
6. Reduced maximum daily pumping capacity = 7.793 MGD (15% reduction)

C. Deep Well System

1. Clayton, Providence Sands and Ripley Formations
2. **11-Water Supply Wells with pumping capacities totaling 13,350 GPM**
3. Present average daily pumping capacity = 9.612 MGD
4. Present maximum daily pumping capacity = 14.418 MGD
5. Reduced average daily pumping capacity = 7.69 MGD (20% reduction)
6. Reduced maximum daily pumping capacity = 11.534 MGD (20% reduction)

A. Long Range Supply Sources

- I. Panhandle Wellfield Option** – Develop up to thirteen (13) new water supply wells in the panhandle of the County that would each produce 1250 GPM from the Nanafalia, Clayton and Providence Sands Formations. These wells would be spaced approximately one (1) mile apart east to west, and two (2) miles apart north to south. These wells could be added as demand dictates additional supply is needed by the City. Based on discussions with the Geological Survey of Alabama, the proposed wells are sustainable at the spacing and production noted above. The advantages/disadvantages for this supply source are as follows:

<u>Advantages</u>	<u>Disadvantages</u>
1. Only treatment required is chlorination.	1. Limited production from any one water supply well.
2. Wells can be added when needed, thereby distributing cost over many years.	2. City is totally dependent on groundwater sources.
3. Operators are already trained in operation of water supply wells.	3. A total of thirteen (13) well sites would need to be acquired by the City. A tank site would also need to be acquired.
4. Water Quality is very good.	With no treatment required, source water
5. Water Supply Wells are very reliable.	4. protection is vital to prevent any contamination to aquifers.
6. Operating costs is less for water supply wells versus other options.	
7. Least cost option for consumer.	
8. Blending of this source with existing supply sources is not an issue.	

- ii. **Dothan Tuscaloosa Wellfield and Treatment System** – Develop a wellfield in Dothan and tap the Gordo Sands which is a deep aquifer considered part of the Tuscaloosa Formation. The wellfield would ultimately consist of nine (9) water supply wells spaced on a separation of 2 miles apart north to south and 1.5 miles apart east to west. The wells would be designed to produce 2500 GPM. Due to high sodium chloride concentrations this water would require treatment utilizing Reverse Osmosis process. The R/O treatment facility would be built in phases as the wells are developed with the treatment system being capable of delivering 20.0 MGD at build-out. The advantages/disadvantages for this supply source are as follows:

Advantages

1. A supply source that is sustainable with no threat of supply reduction due to pumping.
2. No other entity is utilizing this source in the Dothan area.
3. Treated water quality would be good.
4. Water Supply Wells are reliable and easily maintained.
5. Additional wells for future demands can be developed as needed.
6. Drought conditions would not affect this aquifer.

Disadvantages

1. The treated supply to the consumer yields 75 percent of the raw water supply. Twenty-five (25) percent is lost in the treatment process.
2. Raw water mains would be constructed that could not be tapped by the consumer.
3. The R/O Systems are packaged systems but the operators would require training.
4. Higher O&M costs to the consumer.

iii. **Surface Water Option** – Permit and develop withdrawal from the Chattahoochee River to treat and deliver 10 MGD to the Dothan Water System in year 2025. The plant would operate at a continuous rate of 10 MGD, 24 hours per day. To meet demands past year 2040, an additional 10 MGD phase would need to be operational by year 2045. The pipeline to transmit the water from the treatment facility to Dothan would need to be constructed with the first phase of the treatment plant construction. The advantages/disadvantages for this supply source are as follows:

Advantages

1. Water supply source will meet Dothan's future water supply needs under normal weather conditions.
2. Blending of this source with existing supply sources is not an issue as long as the treatment meets the water quality of the existing water supply wells.
3. Treated water quality would be very good.
4. Provides available water supply to eastern portion of County for several municipalities.

Disadvantages

1. Treatment of the river supply will require a water treatment plant to produce water to meet ADEM requirements.
2. City would have to hire and train operators for this treatment process.
3. Transmission of water to Dothan adds some additional cost to this option.
4. Total operating costs for this option would be second highest of the four (4) options being considered.
5. If severe drought hits Southeast U.S., water withdrawal from river could be limited by Georgia Environmental Protection Division (GEPD).
6. Most expensive cost option for consumer.

- iv. **North Dothan Tuscaloosa Wellfield** – The development of a wellfield in the Tuscaloosa Formation north of Dothan is an available option. The Tuscaloosa Formation north of Dothan north yields good water quality requiring no treatment. To produce the water to meet Dothan's Long Range Plan, a total of eight (8) water supply wells each yielding 2000 GPM would be required. For average day demands the wells would pump an average of 12 hours/day, and for maximum day demands the wells would pump an average of 18 hours/day. The wells would be spaced as referenced in the 2010 GSA (Cook) Report 1.5 miles apart east to west and 2 miles apart north to south.

Advantages

1. Permitting the wells and mains would require review from Alabama agencies.
2. Based on data from the Alabama Geological Survey, the wells are sustainable.
3. Water Supply Source will meet Dothan's future water supply needs under normal weather conditions.
4. Treated water quality would be good.

Disadvantages

1. A well in the same formation exceeds the MCL for radionuclides and has been shut down. This is a concern when considering developing other wells in this formation.
2. The eight (8) wells are out of County and would create additional O&M cost for the City.
3. No customers could be added to the transmission mains until you reached the Dothan City Limits.
4. The investment of infrastructure would be out of Houston County.
5. Source water protection is vital to prevent contamination to the aquifers.
6. Higher cost to the consumer.

- v. **Shallow Well Option** – The additional development of five (5) 400 GPM shallow wells between HWY 52 East and US HWY 231 South. These wells would require an additional treatment facility similar to the facility located on Water Street. This is a limited source and would only be developed when other sources are not available or have been fully developed.

TABLE VI – 5
PANHANDLE WELLFIELD COST ESTIMATE

1.	21,450 L.F. of 30" D.I. Pipe Water Main @ \$125.00/L.F.	\$ 2,681,250.00
2.	29,625 L.F. of 24" D.I. Pipe Water Main @ \$100.00/L.F.	2,962,500.00
3.	22,900 L.F. of 20" D.I. Pipe Water Main @ \$75.00/L.F.	1,717,500.00
4.	10,500 L.F. of 18" D.I. Pipe Water Main @ \$70.00/L.F.	735,000.00
5.	23,500 L.F. of 16" D.I. Pipe Water Main @ \$60.00/L.F.	1,410,000.00
6.	28,000 L.F. of 12" D.I. Pipe Water Main @ \$50.00/L.F.	1,400,000.00
7.	42 Ea. of Horizontal Directional Drills@ \$200,000.00/Ea.	8,400,000.00
8.	34 Ea. of Main Line Gate Valves@ \$30,000.00/Ea.	1,020,000.00
9.	160,000 Lbs. of D.I. Pipe Fittings @ \$10.00/Lb.	1,600,000.00
10.	2 Ea. of Flow Control Valves and Meter Assemblies @ \$100,000/Ea.	200,000.00
11.	2.0 MG Elevated Water Storage Tank @ \$3,000,000	3,000,000.00
12.	13 Ea. of 1250 GPM Water Supply Wells @ \$1,400,000/Ea.	18,200,000.00
13.	Mobilization, Testing, Disinfection, Etc., Lump Sum	500,000.00
Estimated Construction Cost		\$43,826,250.00
Contingencies @ 7.5%		3,286,950.00
Property Acquisition		650,000.00
Engineering, Project Management and Inspection		5,000,000.00
Legal Fees		186,800.00
Three (3) Water Supply Wells (Imm. Needs)		5,000,000.00
Estimated Project Costs		\$ 57,940,00.00

TABLE VI – 8
DOTHAN TUSCALOOSA WELLFIELD COST ESTIMATE

1.	20 MGD Reverse Osmosis/Nanofiltration Facility @ \$1.70/gallon	\$34,000,000.00
2.	80 Foot x 150 Foot Building @ \$125/S.F.	1,500,000.00
3.	Electrical, On-Site Generators, Etc.	1,500,000.00
4.	Disinfection	600,000.00
5.	High Service Pumps	750,000.00
6.	2.0 MG Raw Water Tank Facility	1,600,000.00
7.	2.0 MG Finished Water Tank Facility	1,600,000.00
8.	Reject Disposal, Deep Well Injection	2,000,000.00
9.	Site Work	750,000.00
10.	9 Ea. of 2500 GPM Deep Wells @ \$1,275,000/EA.	11,475,000.00
11.	48,000 L.F. of 16-inch (C905) Water Main @ \$60.00/L.F.	2,880,000.00
12.	21,000 L.F. of 24-inch (C905) Water Main @ \$75.00/L.F.	1,575,000.00
13.	Miscellaneous Appurtenances (valves, fittings, etc.)	250,000.00
14.	Finished Water Connection Mains	300,000.00
15.	Mobilization, Testing, Disinfection, Etc. Lump Sum @	500,000.00
Estimated Construction Cost		\$61,280,000.00
Contingencies @ 7.5%		4,596,000.00
Property Acquisition		175,000.00
Engineering, Permits, Etc.		6,250,000.00
Legal & Appraisal Fees		160,500.00
Three (3) Water Supply Wells (Immediate Needs)		5,000,000.00
Estimated Project Costs		\$77,461,500.00

TABLE VI – 11
RIVER SUPPLY COST ESTIMATE

1.	80,000 L.F. of 36" D.I. Pipe Water Main @ \$150.00/L.F.	\$12,000,000.00
2.	15,200 L.F. of 30" D.I. Pipe Water Main @ \$125.00/L.F.	1,900,000.00
3.	3,200 L.F. of 24" D.I. Pipe Water Main @ \$100.00/L.F.	320,000.00
4.	45 Ea. of Horizontal Directional Drills @ \$200,000.00/L.F.	9,000,000.00
5.	21 Ea. of Main Line Gate Valves @ \$40,000.00/Ea.	840,000.00
6.	250,000 Lbs. of D.I. Pipe Fittings @ \$10.00/Lb.	2,500,000.00
7.	1 Ea. of Flow Control Valve and Meter Assembly @ \$100,000.00/Ea.	100,000.00
8.	5.0 MG Ground Water Storage Tank and High Service Pumps @ \$4,000,000.00	4,000,000.00
9.	20.0 MGD River Intake Structure and Pumps @ \$2,000,000.00	2,000,000.00
10.	10.0 MGD Surface Water Treatment Plant (Phase I) @ \$30,000,000.00	30,000,000.00
11.	10.0 MGD Surface Water Treatment Plant (Phase II) @ \$25,000,000.00	25,000,000.00
12.	Mobilization, Testing, Disinfection, Etc., Lump Sum @ \$500,000.00	500,000.00
Estimated Construction Cost		\$88,160,000.00
Contingencies @ 7.5%		6,612,000.00
River Modeling		350,000.00
Engineering, Project Management and Inspection		9,400,000.00
Property Acquisition		50,000.00
Legal Fees		125,000.00
Three (3) Water Supply Wells (Immediate Needs)		5,000,000.00
Estimated Project Costs		\$109,697,000.00

TABLE VI – 14
NORTH DOTHAN TUSCALOOSA WELLFIELD COST ESTIMATE

1.	95,525 L.F. of 36" D.I. Pipe Water Main @ \$150.00/L.F.	\$14,328,750.00
2.	20,650 L.F. of 30" D.I. Pipe Water Main @ \$125.00/L.F.	2,581,250.00
3.	15,000 L.F. of 24" D.I. Pipe Water Main @ \$100.00/L.F.	1,500,000.00
4.	10,230 L.F. of 20" D.I. Pipe Water Main @ \$75.00/L.F.	767,250.00
5.	6,050 L.F. of 18" D.I. Pipe Water Main @ \$65.00/L.F.	393,250.00
6.	34,100 L.F. of 16" D.I. Pipe Water Main @ \$60.00/L.F.	2,046,000.00
7.	42 Ea. of Horizontal Directional Drills @ \$250,000.00/Ea.	10,500,000.00
8.	44 Ea. of Main Line Gate Valves @ \$35,000.00/Ea.	1,540,000.00
9.	350,000 Lbs. of D.I. Pipe Fittings @\$10.00/Lb.	3,500,000.00
10.	2 Ea. of Flow Control Valves and Meters @ \$100,000.00/Ea.	200,000.00
11.	2.0 MG Elevated Water Storage Tank @ \$3,000,000.00	3,000,000.00
12.	8 Ea. of 2000 GPM Water Supply Wells @ \$1,700,000.00/Ea.	13,600,000.00
13.	Mobilization, Testing, Disinfection, Etc., Lump Sum @ \$500,000.00	500,000.00
Estimated Construction Cost		\$54,456,500.00
Contingencies @ 7.5%		4,084,250.00
Property Acquisition		350,000.00
Engineering, Project Management and Inspection		6,000,000.00
Legal Fees		160,250.00
Three (3) Water Supply Wells (Immediate Needs)		5,000,000.00
Estimated Project Costs		\$70,051,000.00

the withdrawal must approximate water transfer back into the river basin. The treatment facility needs to be designed to meet a demand that will justify the infrastructure costs to deliver the water back to Dothan. The treatment facility would need to operate at an average daily production of not less than 10.0 MGD to justify the infrastructure costs. Using these criteria as a guide, the withdrawal from the Chattahoochee River is not recommended as the supply source to develop. Development of the Shallow Well System would not be considered an option due to the limited supply. Development of the North Dothan Tuscaloosa Formation would require the development of a minimum of five (5) wells to produce the minimum flow and velocity in the transmission main from the wellfield area back to the existing Dothan distribution system. Development of the Panhandle Wellfield option would also require the development of eight (8) wells to produce the minimum flow and velocity in the transmission main back from the wellfield back to the existing Dothan distribution system.

When considering all the above options, this report recommends the following to meet the long term water demands for the City of Dothan:

- **Phase I – Complete the three (3) water supply wells discussed on Page VI – 4 of the report.** These three (3) wells would meet the projected 2030 Average Day and 2025 Maximum 3-Day Demands. The selected alternate source of supply would be on line and operational by Year 2030 to accompany the Phase I improvements. The ADF and MDF for these three (3) wells are 3.24 MGD and 4.85 MGD.
- **Phase II – Develop and implement an alternate source of supply to be operational by year 2030.** The supply source would need to meet projected demands through year 2045 with the capability of being expanded to meet projected demands through year 2060 and beyond. **Four (4) sources of supply were evaluated and are ranked in order of the recommended source to develop:**
 - (i) **Panhandle Wellfield Option (Up to 13 water supply wells – 11.70/17.55 MGD)**
 - a. Construct eight (8) wells and be operational in 2030 to meet demands thru Year 2045;
 - b. Add three (3) wells in 2045 to meet demands through 2055; and
 - c. Add two (2) wells in 2055 to meet demands
 - (i) Dothan Tuscaloosa Wellfield Option (Up to 9 wells – 12.15/18.255 MGD)
 - (ii) Chattahoochee River Supply Option (Phase I – 10 MGD; Phase II – 10 MGD)
 - (iii) North Dothan Tuscaloosa Wellfield Option (Up to 8 wells – 11.52/17.28 MGD)
- **Phase III – Implement the recommended reduction of production from the existing water supply wells beginning in year 2030.** To prevent such a major impact on the existing water supply system, it is recommended the well reduction be phased in as follows:
 - Zone 1 Wells (Shallow) - Year 2030
 - Zone 2 Wells (Intermediate) - Year 2031
 - Zone 3 Wells (Deep) - Year 2032

TABLE V-13 PROPOSED SEQUENCING OF ADDITIONAL SUPPLY SOURCES THROUGH 2060								
YEAR	DRY YEAR PROJECTED AVG DAY DEMANDS (MGD)	EXISTING AVAILABLE PRODUCTION (MGD)	PROPOSED SEQUENCING OF NEW WATER SUPPLY FAC.	PROJECTED TOTAL AVAILABLE PRODUCTION (MGD)	AVG DAY SURPLUS (DEFICIT) (MGD)	PROJECTED 3-DAY MAX DEMANDS (MGD)	PROJECTED TOTAL AVAILABLE PEAK PRODUCTION (MGD)	3-DAY MAX SURPLUS (DEFECIT) (MGD)
2010*	12.677*	17.363		17.363	4.686	19.725*	26.044	6.319
2012	14.297	17.363		17.363	3.066	22.700	26.044	3.344
2015	16.109	17.363	1-1500 GPM Deep Well-(1.08)(1.62)	18.443	2.938	25.685	27.664	2.974
2020	17.116	17.363	1-1500 GPM Deep Well-(1.08)(1.62)	19.523	2.407	27.337	29.284	1.947
2025	19.217	17.363	1-1500 GPM Deep Well 1.08/1.62	20.603	1.386	30.075	30.904	0.829
2030	20.214	17.363	8 wells 7.20/10.80	27.803	7.589	31.706	41.704	9.998
2035	21.221	17.363	-----	27.803	6.582	33.349	41.704	8.355
2040	22.319	17.363	-----	30.503	8.184	35.083	41.704	6.621
2045	23.326	17.363	3 Wells 2.70/4.050	30.503	7.177	36.726	45.754	9.028
2050	24.324	17.363	-----	30.503	6.179	38.358	45.754	7.396
2055	25.423	17.363	2 Wells 1.80/2.70	32.303	6.88	40.094	48.454	8.360
2060	26.431	17.363	-----	32.303	5.872	41.737	48.454	6.717
*Actual data recorded.								

With the addition of the three (3) new water supply to be constructed and on-line in Year 2015, 2020 and 2025, the Dothan Water System can meet the projected Average Day demands through 2030 and Maximum 3-Day demands through Year 2025.

Beginning in Year 2030 the City should be phasing in an alternate source of water supply to meet demands in Year 2030 and beyond.

As shown in the above Table, if additional wells are phased in beginning in Year 2030 and add wells as indicated, the Dothan Water System can meet projected demands beyond 2060.

The existing available supply shown in the table does not include any reduction of pumping proposed to begin in 2030 for the existing water supply wells. Also, all wells are assumed to be in production for the available production of 17.363 MGD.

TABLE IX-1 PROPOSED WATER SYSTEM IMPROVEMENTS							
WATER PROJECTS (*)	YEAR 2013	YEAR 2014	YEAR 2015	YEAR 2016	YEAR 2017	YEAR 2018	YEAR 2019
New Deep Well (J.B. Chapman RD)	—		\$225,000	\$1,300,000	—	—	—
New Deep Well (Brannon RD)	—	—	—	—	—	—	\$275,000
New Deep Well (County RD 9)	—	—	—	—	—	—	—
Tuscaloosa Test Hole & Well	\$200,000	\$750,000	—	—	—	—	—
Transmission Main (J.B. Chapman RD)	—		\$100,000	\$800,000	—	—	—
Transmission Main (County RD 9)	—	—	—	—	—	—	—
Transmission Mains (Per Model)		\$1,800,000	\$300,000	.	\$1,000,000	\$1,000,000	\$1,000,000
Tank & Well Rehab Maintenance (1)			\$600,000	\$750,000	\$750,000	\$1,200,000	\$750,000
Red Water Mains Replacement		\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
Fire Hydrant Maintenance (2)		\$50,000	\$50,000	\$50,000	\$50,000	\$50,000	\$50,000
Generators @ Wells 27, 25, 35, 29 & 30		—	<i>Well 30</i> \$150,000	—	<i>Well 25</i> \$150,000	—	<i>Well 29</i> \$150,000
Elevated Water Storage Tank (New)	—	—	—	—	—	—	\$300,000
Property Acquisition (Well & Tank Sites)	—	—	—	—	—	—	—
TOTALS	\$200,000	\$2,700,000	\$1,525,000	\$3,000,000	\$2,050,000	\$2,350,000	\$2,625,000
*Based on recommendations of updated Long Range Water Plan							

- Over the next twelve (12) years a capital improvements and maintenance program will require \$26,400,000 to allow the Dothan Water System to meet projected system demands through year 2030.
 - To determine the water quality of the Gordo Sands in the Tuscaloosa Formation, it is recommended that a test hole and well be developed in Year 2014 to evaluate water quality, quantity and treatability of this formation in the Dothan Area. The site to locate this well could be on City owned properties that has enough room to also construct the Reverse Osmosis Treatment Facility.
 - System Demand may influence the proposed construction dates of future wells.
- \$500,000 currently budgeted annually for well and tank maintenance. Costs shown above in Table IX-1 are additional funds required to meet Long Range Plan objectives.
 - \$50,000 currently budgeted annually for fire hydrant maintenance. Costs shown above in Table IX-1 are additional funds required to meet Long Range Plan objectives

TABLE IX-1 (CONT.)
PROPOSED WATER SYSTEM IMPROVEMENTS

WATER PROJECTS (*)	YEAR 2020	YEAR 2021	YEAR 2022	YEAR 2023	YEAR 2024	YEAR 2025
New Deep Well (J.B. Chapman RD)	—	—	—	—	—	—
New Deep Well (Brannon RD)	\$1,400,000	—	—	—	—	—
New Deep Well (County RD 9)	—	—	—	—	\$300,000	\$1,500,000
Tuscaloosa Test Hole & Well	—	—	—	—	—	—
Transmission Main (J.B. Chapman RD)	—	—	—	—	—	—
Transmission Main (County RD 9)	—	—	—	—	\$100,000	\$500,000
Transmission Mains (Per Model)	—	\$1,000,000	\$1,000,000	\$1,400,000	—	—
Tank & Well Rehab Maintenance (1)	—	\$1,000,000	—	—	—	—
Red Water Mains Replacement	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000
Fire Hydrant Maintenance (2)	\$50,000	\$50,000	\$50,000	—	—	—
Generators @ Wells 27, 25, 35, 29 & 30	—	<i>Well 35</i> \$150,000	—	<i>Well 27</i> \$150,000	—	—
Elevated Water Storage Tank (New)	\$2,000,000	—	—	—	—	—
Property Acquisition (Well & Tank Sites)	—	—	—	\$200,000	\$200,000	\$300,000
TOTALS	\$3,550,000	\$2,300,000	\$1,150,000	\$1,850,000	\$700,000	\$2,400,000

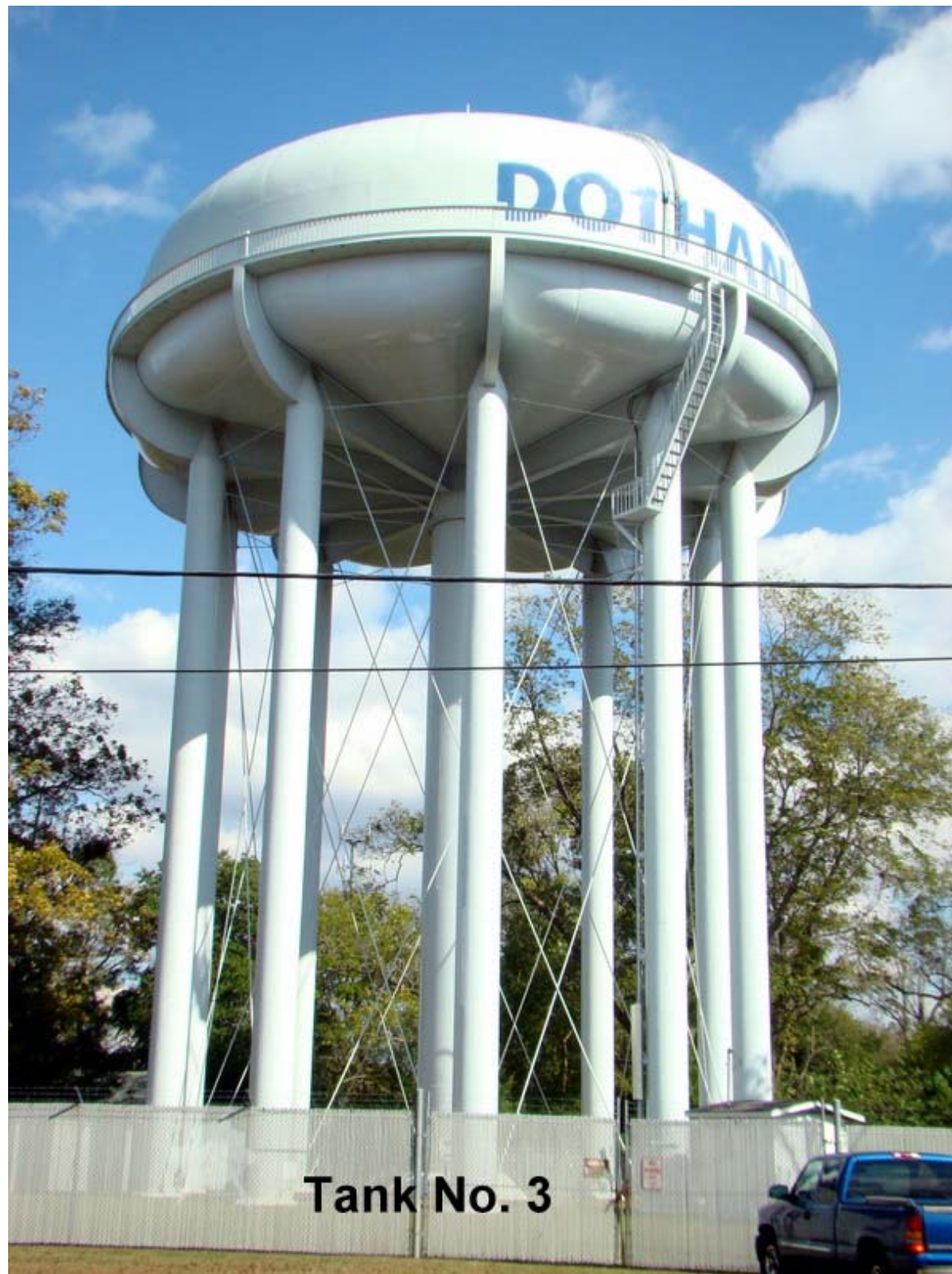
*Based on recommendations of updated Long Range Water Plan



Tank No. 1



Tank No. 2



Tank No. 3

Tank No. 4



Tank No. 5



Tank No. 6





Tank No. 7



Tank No. 8



Tank No. 9



Tank No. 10



Tank No. 11



Tank No. 12



Tank No. 13

Tank No. 14







Well#10

Well No. 10



Well No. 12

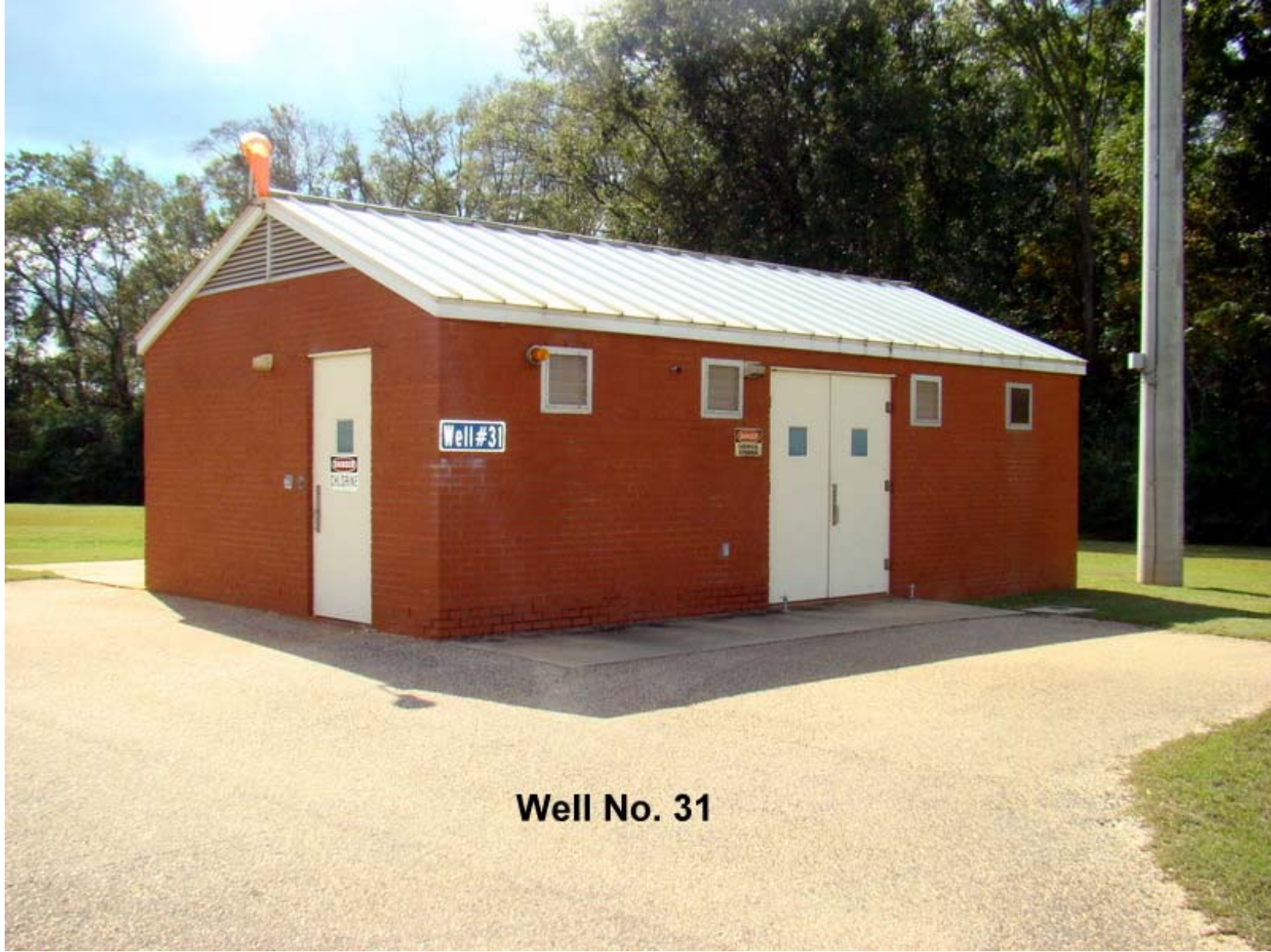




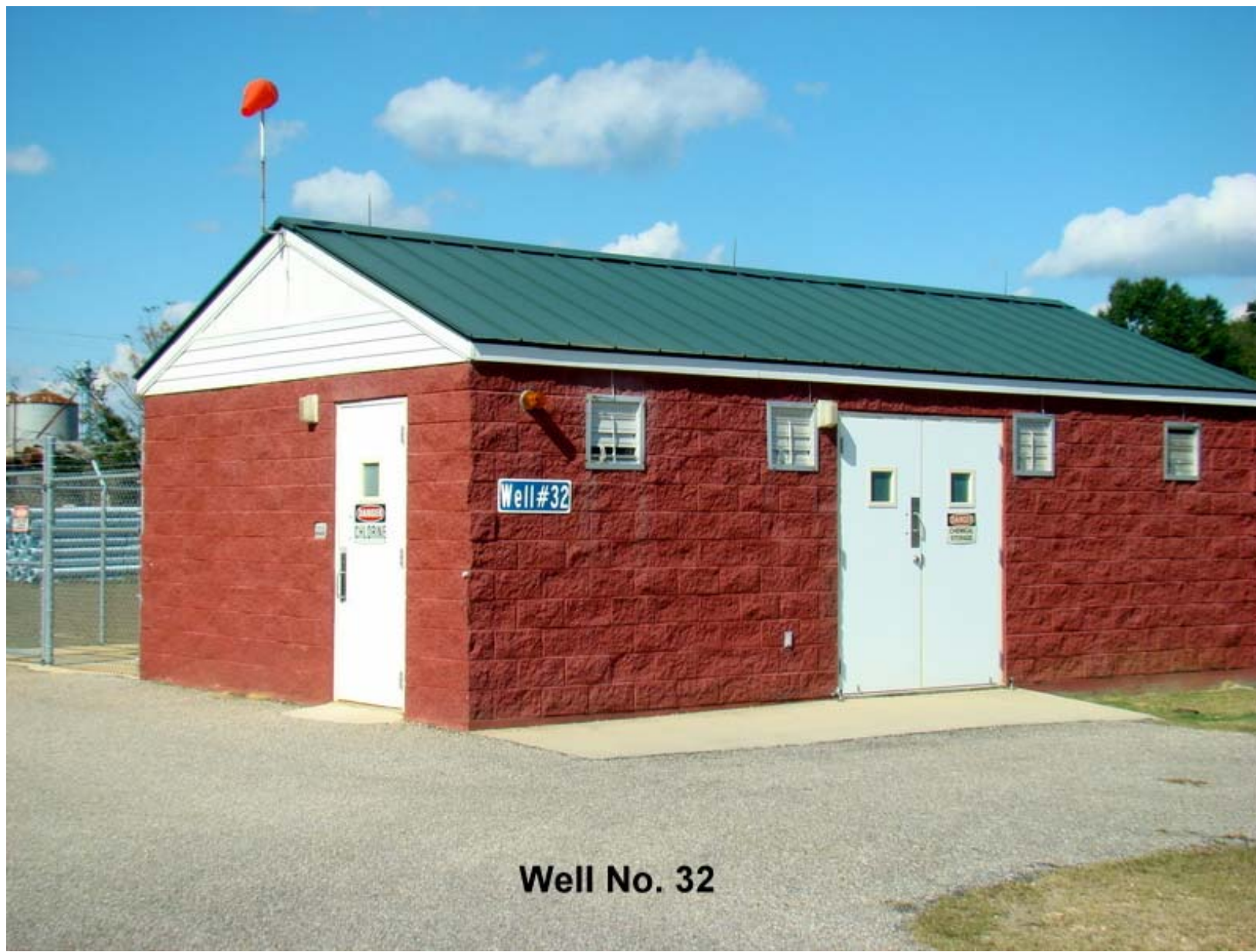
Well No. 15



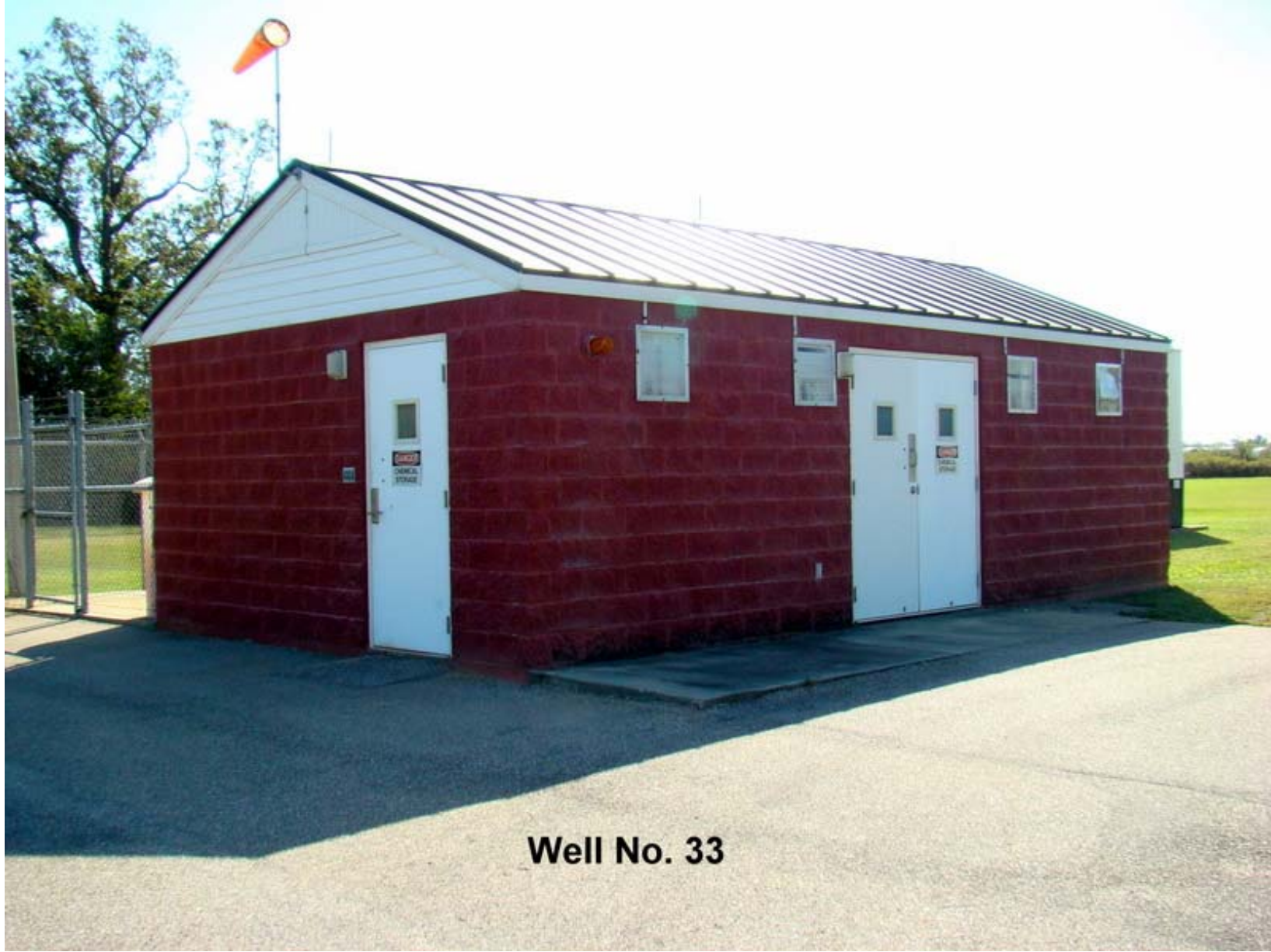
Well No. 30



Well No. 31



Well No. 32



Well No. 33



Well No. 34



Well No. 35



Well No. 35



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