

Well Implementation Plan

This section summarizes Zone 7 well capacity issues and provides the proposed well construction schedule and associated cost estimate for the preferred alternative and several related variations. Table 4.0-1 provides information on the number of wells and associated maximum production rates for wellfield alternatives discussed in this section.

This Well Implementation Plan should be viewed as a flexible road map for construction of new wells for Zone 7 that is subject to modification as new information becomes available. This section reflects work originally presented to Zone 7 the Draft Technical Memorandum *Well Implementation Plan* (CH2M HILL, 2003b).

4.1 Drought Requirements

Zone 7 needs to increase its well production capacity to meet customer demand during drought periods when State Water Project allocations are reduced. Based on recent State Water Project allocation figures, Zone 7 projects that it will need a total of about 45 mgd of groundwater production capacity to meet projected 1- and 6-year drought demands.

Results of groundwater modeling conducted as part of this study indicate that Zone 7 can produce 45 mgd of groundwater from the basin during drought conditions with only minimal exceedance of historical low water levels under a number of wellfield alternatives. These alternatives are illustrated schematically in Figures 4.1-1 through 4.1-3. Precise locations of new wells need to be identified as part of future work.

Modeled alternatives require construction of about seven to 15 new wells in “outer” wellfields to pump about 27 mgd of groundwater, with the remainder (18 mgd) coming from existing Zone 7 wells. Existing wells cannot be counted on to produce more than 18 mgd of groundwater when new adjacent wellfields are operating without risk of potentially significant declines of water levels below historical lows. Fewer wells are required (possibly as few as seven) if the Chain of Lakes and Gravel Pit Wellfields prove productive and are preferentially developed. This alternative, Scenario 2d, is herein referred to as the “preferred alternative” (Figure 4.3-1). More wells will be required (possibly as many as 15) if marginal wellfields are developed (such as Stanley Avenue and Isabel Wellfields) or the Chain of Lakes and Gravel Pit Wellfields prove less productive than currently projected.

4.2 Construction Schedule

The well construction schedule is driven by increases in demand as illustrated in Table 4.2-1 and Figure 4.2-1. Based on these increases in drought demands, the Well Implementation Plan indicates the need to construct about one new well each year for the next 5 years and two additional wells in following years (Table 4.2-1 and Figure 4.2-1). As previously discussed, Zone 7’s total instantaneous well capacity under the preferred alternative is

about 52 mgd—25 mgd from existing Zone 7 wells and 27 mgd from new Zone 7 wells. Modeling indicates that this 52 mgd of production can be sustained for at least 4 days while maintaining water levels above historical lows, but that after 30 days water levels fall significantly below historical lows in the northern portion of the basin.

The relationship of projected well capacity and the 75-percent maximum day target is illustrated in Figure 4.2-2. This figure indicates that under current conditions wells can meet about 50 percent of MDD, and that after full buildout of the wellfields they can meet about 62 percent of the future MDD (Table 4.2-1 and Figure 4.2-2).

4.3 Cost Estimate

Construction cost estimates for wellfield alternatives discussed in this section are summarized in Table 4.3-1. These cost estimates assume that new wells are serviced by individual treatment systems using on-site chlorine generation. This table indicates that construction of enough new wells to meet drought demands will cost between 23 and 36 million dollars. The higher cost estimates are associated with development of marginal wellfields, including the Stanley Avenue and Isabel Avenue Wellfields. Current information suggests that a total of 3 to 8 additional wells would be required to meet both the drought and future 70 mgd MDD target. The incremental costs for these wells is estimated to be about 10 to 25 million dollars, assuming that the wells are built in the Chain of Lakes and Gravel Pit Wellfields as simple extensions of the preferred alternative.

4.4 Recommendations for Future Work

Based upon findings of this Well Master Plan the following work is recommended:

- Open discussions with DHS regarding drilling high-capacity municipal water supply wells in the Chain of Lakes and Gravel Pit Wellfields. Of key concern is testing that DHS might require to determine if municipal wells in these areas are “under the direct influence to surface water.” If DHS determines that testing is required, then test procedures and protocols should be agreed upon and implemented as soon as possible. The ability to use existing wells and/or small test wells for this purpose should be explored with DHS.
- Assuming discussions with DHS are favorable, install test wells at the Chain of Lakes and Gravel Pit Wellfields as soon as possible. These wells should be 4 to 6 inches in diameter and placed at each location where a production well might be installed. The wells should be tested to assess local aquifer properties and sampled to determine local water quality. Water quality sampling should include general mineral and physical parameters, California Title 22 drinking water standards, and testing that may be required by DHS to comply with potential “groundwater under the direct influence of surface water” concerns.
- Review the groundwater model as the above data are collected. If observed aquifer properties are in line with those used in the model, then well spacing and total production rates developed in this report will remain valid. If observed values are

significantly lower than those used in the model, then the model should be adjusted and potential wellfield expansion scenarios reassessed.

Wellfield		Number of Wells			Total Max Q (mgd)		
		Drought Relief			Drought Relief		
		Scenario-2d	Scenario-2e	Scenario-2f	Scenario-2d	Scenario-2e	Scenario-2f
		Scen506c	Scen507	Scen508	Scen506c	Scen507	Scen508
Existing Wellfields							
	Hopyard	2	2	2	7.0	7.1	7.1
	Mocho	2	2	2	7.6	7.6	7.6
	Stoneridge	1	1	1	4.1	4.1	4.1
New Wellfields							
	Bernal	1	2	3	3.6	4.3	5.8
	Busch-Valley	1	1	2	2.9	1.4	2.9
	Chain of Lakes	2	2	0	8.6	8.6	0.0
	Gravel Pit	3	3	3	12.2	7.2	8.6
	Isabel	0	1	2	0.0	1.4	2.8
	Stanley Ave.	0	2	3	0.0	2.9	4.3
	Valley	0	1	2	0.0	1.4	2.8
Totals							
	Existing wells	5	5	5	18.7	18.8	18.8
	New wells	7	12	15	27.3	27.2	27.2
	Total	12	17	20	46.0	46.0	46.0

Wellfield Locations.xls -- Summary -- 10/13/2003

TABLE 4.0-1
NUMBER OF WELLS IN EACH WELLFIELD
AND MAXIMUM UTILIZED CAPACITY
FOR SELECT SIMULATIONS (MGD)
 ZONE 7 WATER AGENCY
 WELL WATER PLAN

YEAR	Valleywide Max-Day Demand	Zone 7 GW Demand During Drought	Zone 7 Drought Pumping from Existing Wells	Number of New Zone 7 Wells	New Zone 7 Well Capacity	Total Zone 7 Well Capacity	Total Zone 7 Drought Well Capacity	Valley-Wide Emergency Well Capacity ¹	Percent Valley Wide MDD	Busch-Valley		Chain of Lakes		Gravel Pit		Bernal	
										Well Q	Number of Wells	Well Q	Number of Wells	Well Q	Number of Wells	Well Q	Number of Wells
	mgd	mgd	mgd		mgd	mgd	mgd	mgd		mgd		mgd		mgd		mgd	
2001	82.0	21.0	20.0			20.0	20.0	40.9	50%								
2002	84.2	21.0	25.1			25.1	25.1	46.0	55%								
2003	87.6	21.0	25.1			25.1	25.1	46.0	53%								
2004	91.1	23.0	25.1			25.1	25.1	46.0	51%								
2005	94.6	25.0	17.9	1	2.9	28.0	20.8	48.9	52%	2.9	1						
2006	98.3	29.0	17.9	1	7.2	32.3	25.1	53.2	54%			4.3	1				
2007	98.7	31.0	17.9	1	11.5	36.6	29.4	57.5	58%			4.3	1				
2008	101.3	33.0	17.9	1	15.8	40.9	33.7	61.8	61%					4.3	1		
2009	103.7	35.0	17.9	1	20.1	45.2	38.0	66.1	64%					4.3	1		
2010	105.8	37.0	17.9		20.1	45.2	38.0	66.1	62%								
2011	107.8	39.5	17.9	1	23.7	48.8	41.6	69.7	65%					3.6	1		
2012	110.0	41.0	17.9		23.7	48.8	41.6	69.7	63%								
2013	111.9	41.0	17.9		23.7	48.8	41.6	69.7	62%								
2014	113.0	41.0	17.9		23.7	48.8	41.6	69.7	62%								
2015	113.9	41.0	17.9	1	27.3	52.4	45.2	73.3	64%							3.6	1
2016	114.7	41.8	17.9		27.3	52.4	45.2	73.3	64%								
2017	115.5	42.6	17.9		27.3	52.4	45.2	73.3	63%								
2018	116.2	43.4	17.9		27.3	52.4	45.2	73.3	63%								
2019	117.0	44.2	17.9		27.3	52.4	45.2	73.3	63%								
2020	117.6	45.0	17.9		27.3	52.4	45.2	73.3	62%								
TOTALS				7	27.3	52.4	45.2	73.3		2.9	1	8.6	2	12.2	3	3.6	1

Well construction schedule v1.xls - Data - Scan506c - 10/13/03

TABLE 4.2-1
SCENARIO 2D: WELL CONSTRUCTION
SCHEDULE TO MEET DROUGHT DEMANDS
 ZONE 7 WATER AGENCY
 WELL WATER PLAN

	Drought Demand		
Scenario	Scenario-2d	Scenario-2e	Scenario-2f
Simulation run number	506c	507	508
Number of new wells	7	12	15
Cost Elements			
Well Drilling, Construction, & Testing	\$2.8	\$4.2	\$4.6
Well Pump & Mechanical Equipment	\$1.1	\$1.5	\$1.7
Wellhead Pipe, Valves & Fittings (On-site Piping)	\$0.9	\$1.2	\$1.3
Chemical Treatment System Equipment	\$0.9	\$1.3	\$1.3
Buildings, Residential Area, \$150/sf	\$2.1	\$3.3	\$3.6
Civil Site Work, Residential Area	\$0.3	\$0.4	\$0.4
Electrical\$0.5		\$0.6	\$0.7
Instrumentation and Controls	\$0.7	\$1.1	\$1.2
Water Main, 4 ft cover, ac replacement	\$3.9	\$5.8	\$5.4
General Conditions	\$1.3	\$1.9	\$2.0
Construction Contingency	\$4.3	\$6.4	\$6.7
Engineering & Legal	\$4.7	\$6.9	\$7.3
Total Cost	\$23.3	\$34.6	\$36.3

Notes:

All costs are in millions of dollars

All costs are for preliminary planning purposes only and are not site specific

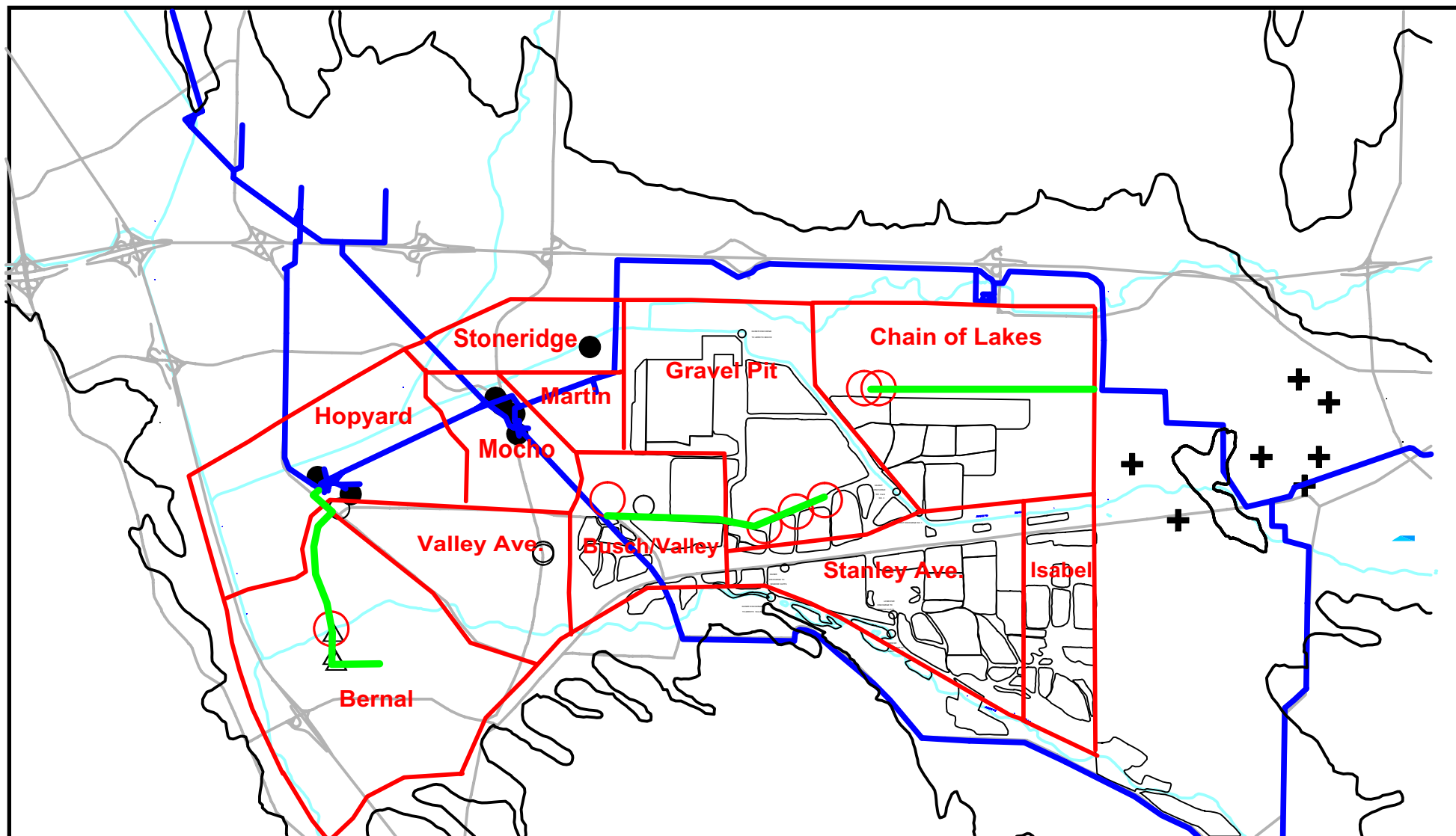
All costs are based on 2002 prices.

Water main costs do not include any special utility, street or other crossing.

TABLE 4.3-1
PRELIMINARY CAPITAL CONSTRUCTION COST ESTIMATES
FOR SELECT SCENARIO 2d ALTERNATIVES (MILLIONS)

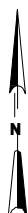
ZONE 7 WATER AGENCY
WELL WATER PLAN

Zone 7 Cost Sheet for implementation plan v4.xls -- Cost Summary -- 10/09/2003



LEGEND

- New Zone 7 Wells
- Zone 7 wells
- City of Pleasanton wells
- △ City of San Francisco wells
- + Cal-Water wells

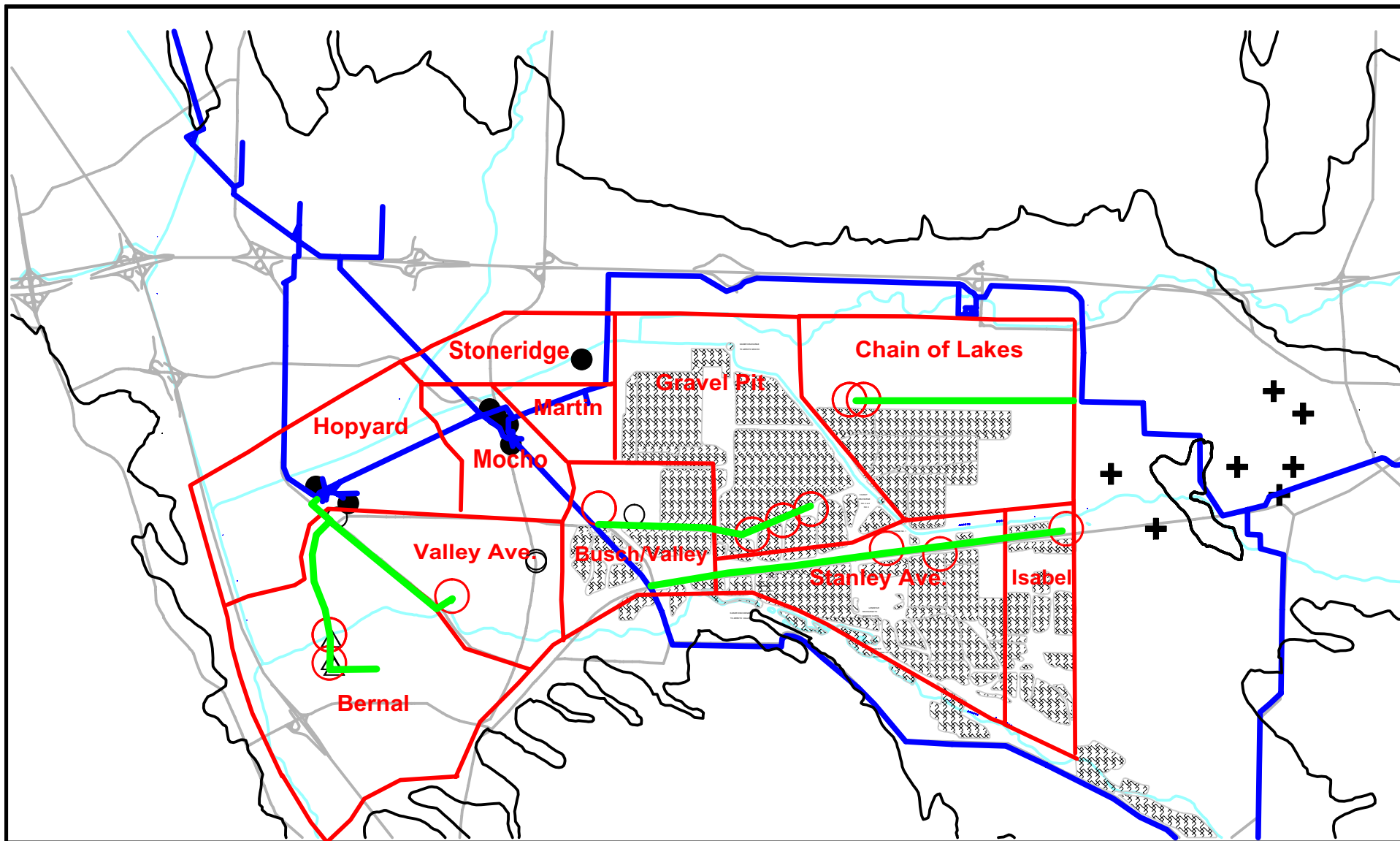


0 feet 5280 feet 10560 feet 15840 feet

FIGURE 4.1-1
SCHEMATIC WELLFIELD LAYOUT
PREFERRED ALTERNATIVE

SCENARIO-2D:506C
 ZONE 7 WATER AGENCY
 WELL WATER PLAN

CH2MHILL



LEGEND

○ New Zone 7 Wells

● Zone 7 wells

○ City of Pleasanton wells

△ City of San Francisco wells

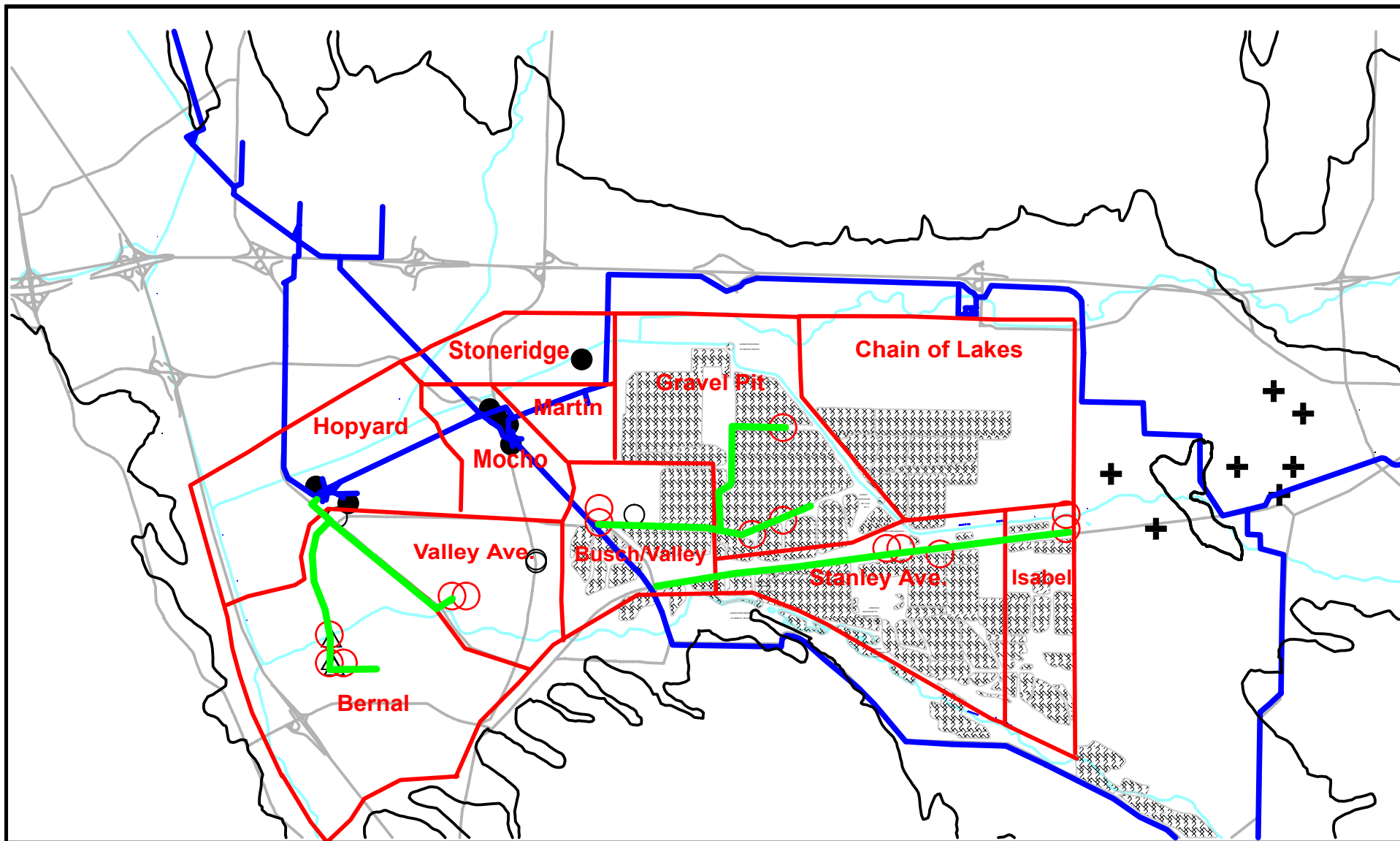
+ Cal-Water wells



0 feet 5280 feet 10560 feet 15840 feet

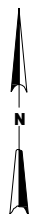
FIGURE 4.1-2
SCHEMATIC WELLFIELD LAYOUT
PREFERRED ALTERNATIVE

SCENARIO-2D:805
 ZONE 7 WATER AGENCY
 WELL WATER PLAN



LEGEND

- New Zone 7 Wells
- Zone 7 wells
- City of Pleasanton wells
- △ City of San Francisco wells
- ⊕ Cal-Water wells



0 feet 5280 feet 10560 feet 15840 feet

FIGURE 4.1-3
SCHEMATIC WELLFIELD LAYOUT
PREFERRED ALTERNATIVE

SCENARIO-2D:806
 ZONE 7 WATER AGENCY
 WELL WATER PLAN

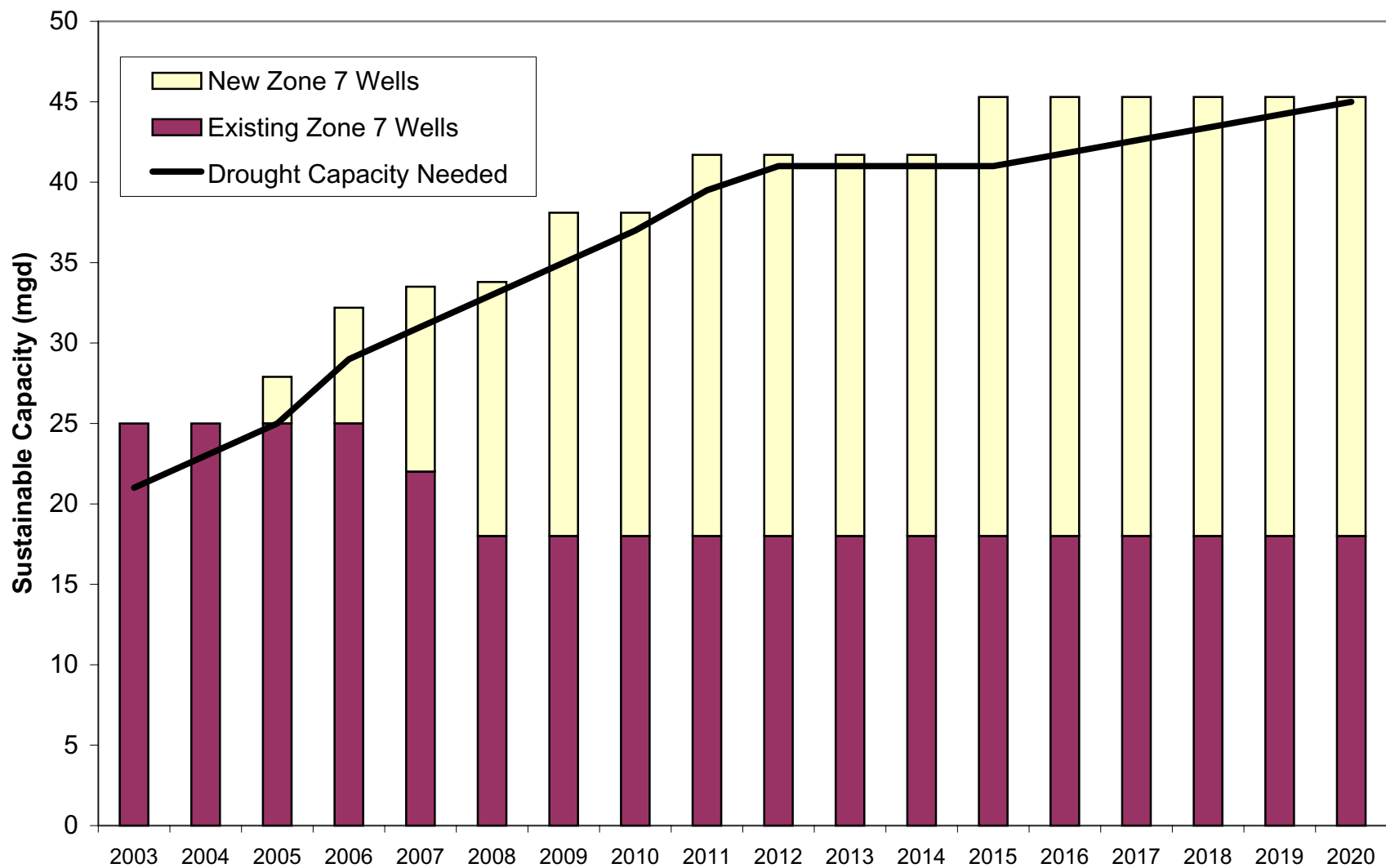
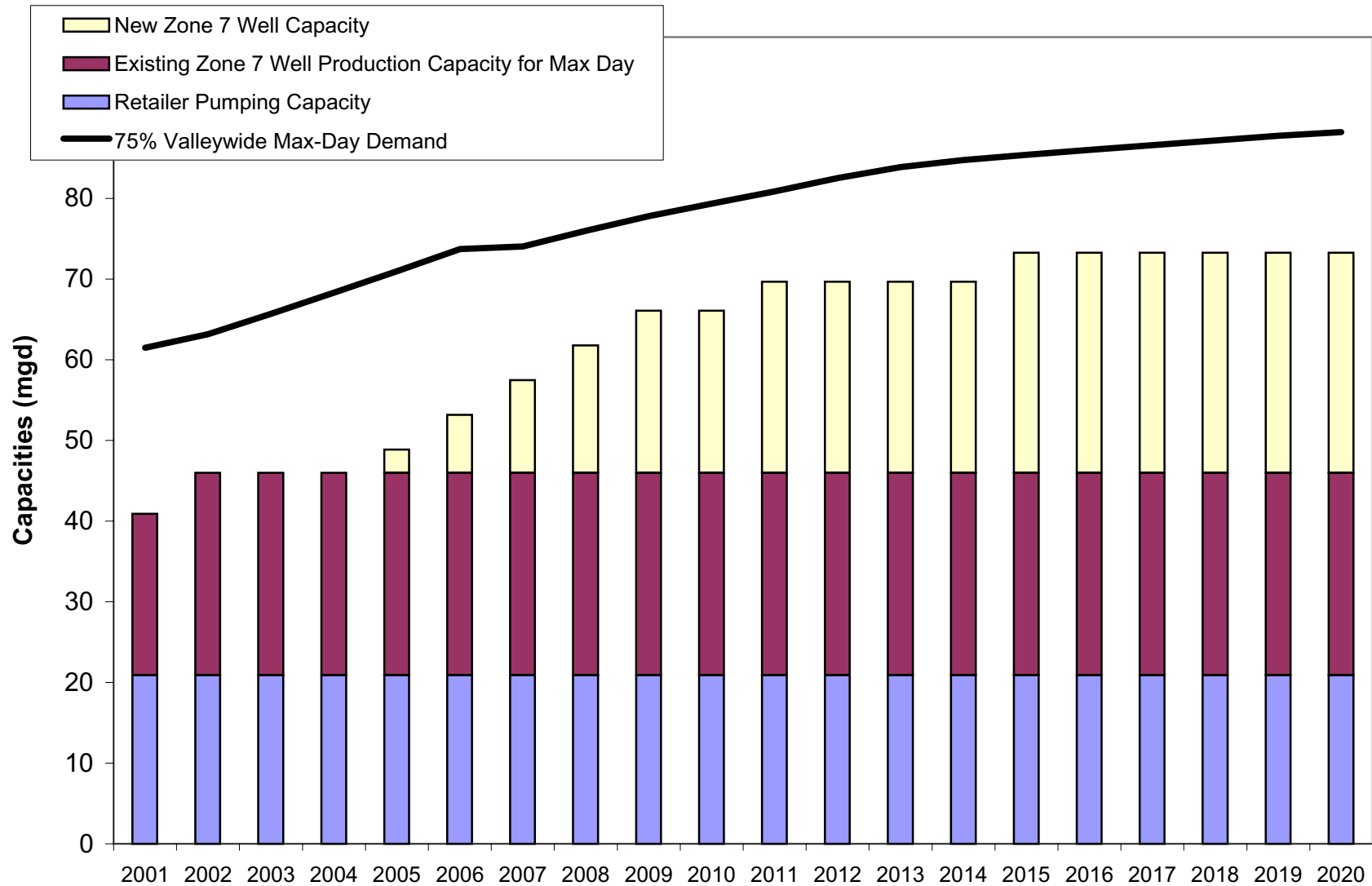


FIGURE 4.2-1
ZONE 7 WELL CAPACITY FOR DROUGHT PROTECTION
ZONE 7 WATER AGENCY
WELL WATER PLAN



Well construction schedule v1.xls - C-506c - 10/09/2003

FIGURE 4.2-2
WELL CAPACITY PROJECTIONS
FOR SCENARIO 2d FOR MGD
 ZONE 7 WATER AGENCY
 WELL WATER PLAN