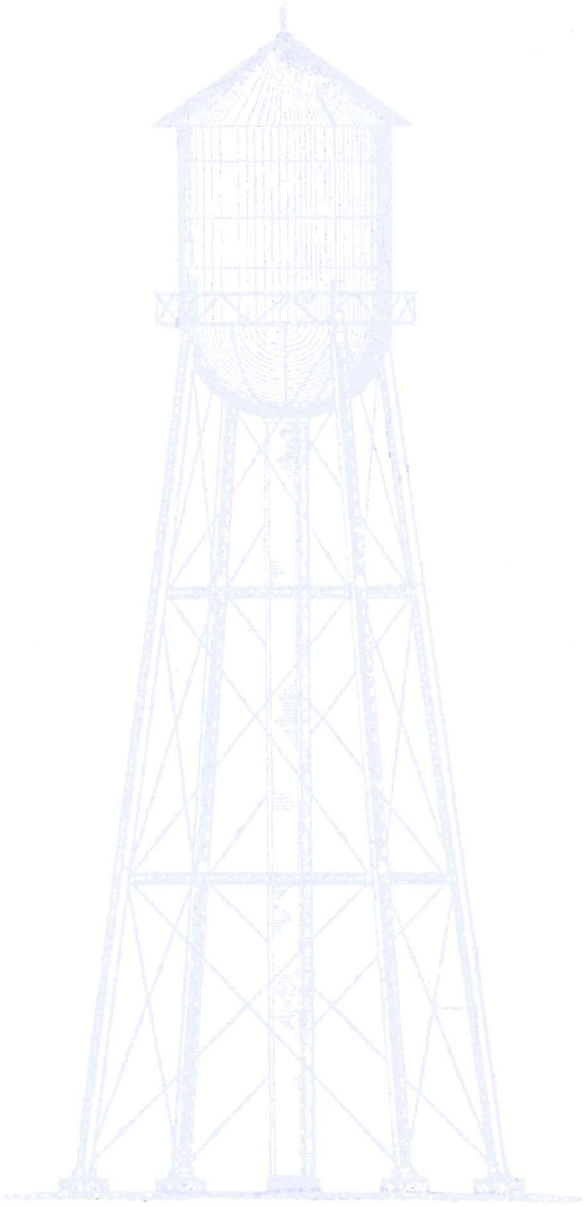
CITY OF ORLAND

WATER SYSTEM MASTER PLAN



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Acknowledgements

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Council Member	Salina Jessie-Edwards
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Section 1

Introduction

1.0 Purpose

This Water System Master Plan was authorized by the Orland City Council to provide water resources planning for current and future development of residential, commercial and industrial areas within the Planning Area of the city of Orland. The main objectives of this report are to (1) determine current and future needs, (2) evaluate all possible means to meet the identified needs and (3) select the most economical methods to satisfy the anticipated requirements.

The principal elements of this study include the following:

- Description of the existing water system.
- Evaluation of the existing water use characteristics.
- Evaluation of the adequacy of existing pumping, storage and distribution system facilities to meet present water requirements.
- Projections of future population and water requirements.
- Evaluation of the requirements for pumping, storage and distribution system facilities to meet future projected water requirements.
- Development of a water system computer model and conduct hydraulic analyses to determine the required improvements to Orland's water system to satisfy present and future water requirements.
- Preparation of a Capital Improvement Program that identifies a prioritized schedule of recommended improvements and replacement of facilities.
- Development of cost estimates to complete the recommended Capital Improvement Program and identify the impact on operating and connection fee revenues.

1.1 Sources of Information

The majority of the background information including city maps, record drawings and operational record data were obtained from the Orland Department of Public Works. Pumping capacities of existing city wells were obtained from pump test results performed by Lely Pump Company in 2001.

Population projections and planned land use within the Planning Area of the city of Orland were obtained from the Amendment to the City of Orland General Plan prepared by Pacific Municipal Consultants and adopted by the City Council in March of 2003.

Water quality information sited in the text of the report is taken from the 2002 Consumer Confidence Report which is included in this report as Appendix A.

1.2 Computer Modeling Network Program

The existing water system was modeled using the *AutoWater* module of "AutoCivil" software developed by Research Engineers. *AutoWater* is a water supply program running inside AutoCAD and utilizes the water network analysis program "K-Y Pipes," which is a widely used water supply program.

Using the existing AutoCAD drawing for the city water distribution system, system data such as pipe sizes, pipe characteristics, elevation differences within the system, storage tank size and pump sizes were input into the computer model. The existing water system was evaluated for pressure, flow rate, flow velocity and hydraulic grade for different scenarios to determine its performance under maximum service demands in combination with fire flows.

Section 2

Existing Water System

2.0 Introduction

The city of Orland owns and operates two separate public water systems. The primary water system, Public Water System No. 1110001, serves customers principally within the limits of the city. An auxiliary water system, Public Water System No. 1105003, serves an industrial park at the Haigh Field Airport located approximately 1.2 miles southeast of the city. The auxiliary water system is not connected to the city's primary water system.

Due to the high cost for construction of a lengthy water main to interconnect the two water systems, it is unlikely that the primary and auxiliary water systems will be connected within the planning period of this Water System Master Plan. Therefore, this report addresses only the primary water system which serves the city of Orland.

This section provides a description of the existing water system facilities serving the city of Orland. The existing water system consists of water supply wells, an elevated water storage tank, a distribution piping network, and appurtenant valves, water services and fire hydrants. The information provided is based upon city maps, construction plans, operational record data and field inspections.

2.1 Water Supply

Public Water System Number 1110001 serves the city of Orland and consists of seven wells. The wells are identified as Central Street Well, Railroad Avenue Well, Woodward Avenue Well, Corporation Yard Well, Eighth Street Well, Suisun Street Well and Roosevelt Avenue Well. The wells are distributed throughout the city and range in depth from 150 feet to 400 feet. The wells produce between 600 and 1,200 gallons per minute each, and are automatically regulated by the water level in the elevated water storage tank. Auxiliary standby power is provided at Railroad Avenue Well, Woodward Avenue Well and Suisun Street Well.

The city also owns and operates a well located at the Lely Aquatic Park. The well produces approximately 500 gallons per minute and is used only for irrigation of the park. The well is connected to the water distribution system piping but is isolated from the system by a gate valve that is kept closed. The well is not currently included in Public Water System Number 1110001.

A description of each of the wells owned and operated by the city is contained in Table 2-1 at the end of this Section. Information shown in Table 2-1 is based upon historical records such as well logs, record plans and specifications, site inspections and interviews with Department of Public Works staff.

The water system is operated at 50 to 65 pounds per square inch (psi) pressure under normal demand. The seven wells are capable of producing 6,430 gallons per minute (gpm) at 55 psi system pressure. Under maximum demand conditions, the wells will produce approximately 8,160 gpm at 25 psi system pressure.

2.2 Water Storage

The city has one elevated water storage tank with a capacity of 80,000 gallons. The steel storage tank is located adjacent to an alley west of Fifth Street between Walker Street and Swift Street. The storage tank was constructed by Des Moines Bridge and Iron Company in 1912. The elevation of the tank maintains the water system pressure between 43 psi and 54 psi under gravity conditions.

Each city well is connected to an individual level control switch located in the elevated water storage tank. The level control switches are positioned such that, as the water level in the storage tank lowers, one level switch closes, sending a signal to start one pump. If the pumping rate does not exceed the water demand, the water level in the storage tank continues to drop until a second level control switch closes, starting another pump. When the pumping rate exceeds the water demand, the water level in the storage tank rises until the level control switch opens and the pump connected to that level control switch stops.

City staff alternates the starting order of the pumps on a weekly basis to equalize the amount of time that each pump is operated.

2.3 Water Distribution

The city's water distribution system consists of approximately 34 miles of pipeline ranging in size from 4-inch diameter to 10-inch diameter. A network of 10-inch diameter water mains is planned to connect all of the wells, with 8-inch and 6-inch diameter distribution piping throughout the city.

There are 303 public fire hydrants distributed throughout the city and a total of 14 private fire hydrants located at the fairgrounds, high school and Glenn County Public Works corporation yard.

2.4 Water Services

The 2002 Annual Inspection Report prepared by the State of California Department of Health Services indicates that the City has 2,563 active water services, providing water to a City population of 6,337 persons. All water services within the City are metered services.

2.5 Water Quality

Water quality is a term used to describe the physical, chemical and biological characteristics of water with respect to its suitability for a particular use. National Primary Drinking Water Regulations, or primary standards, are standards that apply to public water systems and protect drinking water quality by limiting the levels of specific contaminates that can adversely affect public health. All primary standards are based upon health effects to the water customers.

Secondary drinking water regulations are standards that apply to contaminates such as taste, odor, color and constituents which may affect the aesthetic quality of drinking water.

The city of Orland is responsible for providing water that meets all primary and secondary drinking water standards that are promulgated by the United States Environmental Protection Agency and

adopted by the State of California Department of Health Services.

The water supplied from Orland wells is of excellent quality. The water is classified as hard. The source water is nonaggressive to pipes and deposits minimal scale in pipes and fixtures.

Chlorine is added to the water from Railroad Avenue Well, Woodward Avenue Well, Corporation Yard Well and Suisun Street Well as a preventive measure due to intermittent positive bacteriological tests of the wells. Water from the Central Street Well, Eighth Street Well and Roosevelt Avenue Well are not treated.

State regulations [Title 22, Chapter 15, Article 20], California Health and Safety Code [Section 116470], require the city to distribute to each water customer an annual report on the quality of the water served and have the most recent water quality information on each water source available for review. A "Consumer Confidence Report" is prepared each year and is based on calendar-year data. Consumer Confidence Reports must be delivered to consumers by July 1 of each year. The 2002 Consumer Confidence Report for Public Water System Number 1110001 is included as Appendix A of this report.

Table 2-1
Existing Water Sources

Water Source	State Well Number	State Source Number	Year Drilled	Capacity (gpm)	Casing Depth (feet)	Sanitary Seal Depth (feet)	Gravel Pack	Power Source	Standby Power
Lely Aquatic Park	None	001	1978	500	150	90	Yes	30 hp	No
Central Street	01	002	1954	860	176	None	No	60 hp	No
Railroad Avenue	02	003	1958	1,240	148	None	No	100 hp	Yes
Woodward Avenue	04	005	1964	890	160	60	No	60 hp	Yes
Corporation Yard	05	006	1964	1,030	160	60	No	100 hp	No
Eighth Street	06	007	1974	620	240	62	No	50 hp	No
Suisun Street	07	008	1983	1,090	360	80	Yes	100 hp	Yes
Roosevelt Avenue	08	009	1992	700	410	94	Yes	50 hp	No
Total				6,930					

See Figure 1 (attached)

Section 3

Existing Water Use

3.0 Introduction

This section presents information on the water production of city wells, unaccounted water and an evaluation of the adequacy of the existing water system source capacity and storage volume to meet current needs.

3.1 Water Production

Each well within the city's water system has a flow meter which indicates the rate of flow in gallons per minute (gpm) and records the total flow volume in gallons. The city maintains monthly water production data for each of the wells within the system. Table 3-1 shows the monthly and annual production data for all city wells for calendar years 1986 through 2003. The data shown in Table 3-1 represents total water produced by all city wells, excluding Lely Aquatic Park Well, for all customer classes including single-family residential, multi-family residential, commercial/institutional, industrial and landscape irrigation.

In 2003, the annual average daily water production was 305 gallons per capita per day, but production varied between 137 gallons per capita per day in March and 575 gallons per capita per day in July.

Table 3-1
Water Production
(in millions of gallons)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1986	22	29	21	29	35	76	78	86	104	50	32	22	584
1987	N	O	T		A	V	A	I	L	A	B	L	E
1988	23	29	54	44	50	70	90	80	94	36	27	29	626
1989	28	32	24	32	44	92	93	82	52	38	27	36	580
1990	34	32	44	56	69	69	108	98	63	63	42	43	721
1991	43	93	25	41	58	78	101	81	74	54	37	25	710
1992	33	27	36	53	56	52	74	104	129	62	42	32	700
1993	23	30	36	45	79	79	118	82	87	54	45	35	714
1994	40	32	47	66	59	93	101	103	74	52	41	40	748
1995	38	38	33	35	79	75	65	115	98	55	56	30	717
1996	35	34	38	49	62	77	116	118	63	68	44	31	735
1997	41	34	45	63	96	94	116	92	66	44	49	35	775
1998	36	31	38	22	37	71	91	182	89	61	35	36	729
1999	38	34	39	55	73	96	108	87	84	67	45	43	769
2000	40	36	46	65	78	103	112	112	98	63	47	35	835
2001	37	37	45	62	119	97	124	126	117	73	54	30	921
2002	38	41	54	69	83	102	108	110	78	58	44	33	816
2003	30	28	27	35	55	100	113	112	80	61	36	29	706

3.2 Unaccounted Water

Unaccounted water is the difference between the total gallons of water produced (pumped) and the total gallons of metered water delivered to customers (billed). All customer water service connections within the city are metered. Water use which is not metered includes water used for park irrigation, water main flushing, construction water, and distribution system losses.

Figure 2 below shows the total gallons of water pumped and the total gallons of water billed for calendar years 1986 through 2003. From 1986 through 1994 the difference between the quantity of water pumped and quantity of water billed remained relatively constant, with the quantity of water billed approximately 20% less than the quantity of water pumped. From 1994 to 2003 the difference between the quantity of water pumped and the quantity of water billed varied between 13.5% in 2001 and 42.0% in 1998.

Typical values for unaccounted water are in the range of 10 to 20 percent. According to city staff, approximately one-third of the total number of city water meters have been replaced during 2001 and 2002 because of inaccurate meters. Inaccurate meters understating the quantity of water delivered (billed) to customers could account for the larger than normal quantity of unaccounted water.

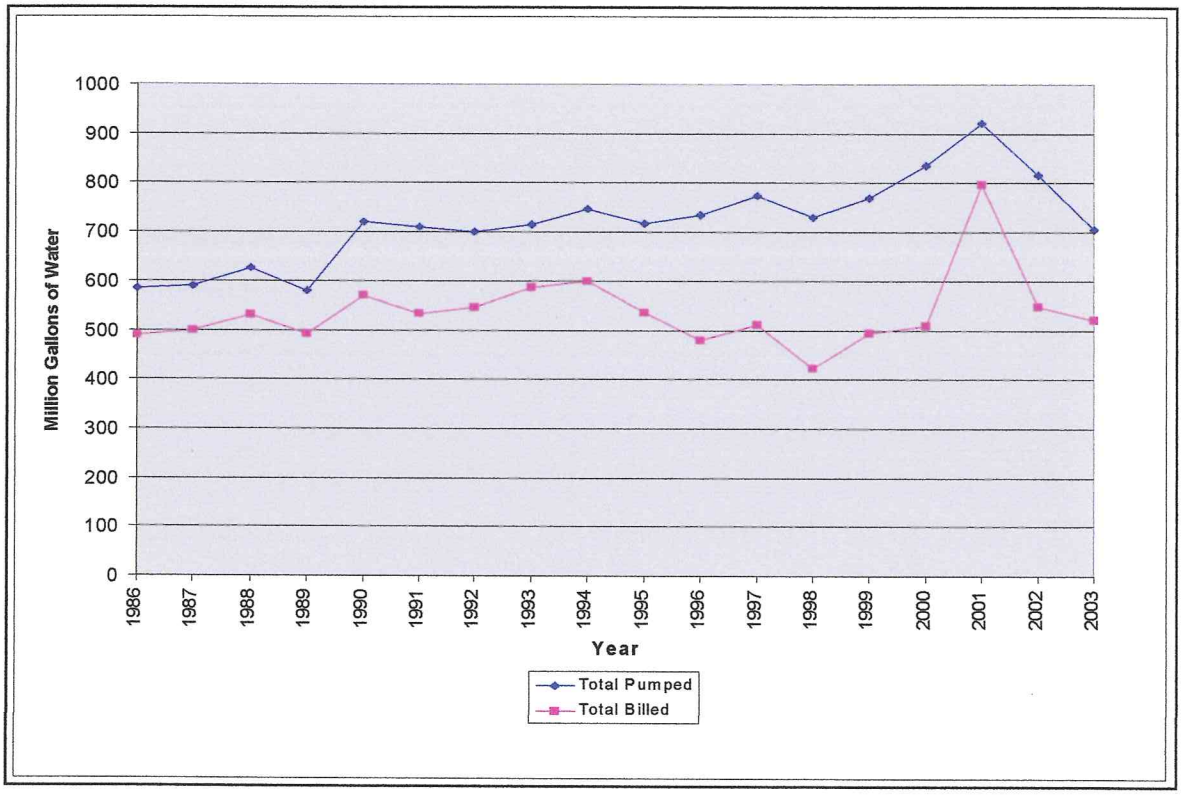

Figure 2 Relationship Between Total Water Pumped and Total Water Billed for Orland

3.3 Adequacy of Existing Source Capacity

At the end of each calendar year city staff submits an Annual Report to the State of California Department of Health Services (DHS) to report monthly water production, bimonthly metered water deliveries and the number of active water service connections. The DHS prepares an Annual Inspection Report that includes the water production and water delivery data provided by the city and an evaluation of the adequacy of the existing water source capacity and storage volume. A copy of the Annual Inspection Report for 2002 is included as Appendix B of this report.

The DHS uses the provisions of Chapter 16, California Water Works Standards, Section 64564 of Title 22 of the California statutes to determine needed source capacity and needed storage volume for the water system.

Based upon the 2002 calendar year data, the DHS determined that the Orland water system is in compliance with the Water Works Standards for source capacity since the needed source capacity is 5,036 gallons per minute (gpm) and the current total source capacity is 6,430 gpm. The DHS evaluation of the needed source capacity is based upon the peak hour demand, but does not include provisions for fire flows.

City staff reports that all existing wells within the water system run simultaneously at times during the summer to meet water demands. Our calculations indicate that the current maximum daily demand is approximately 4,550 gpm and the combined maximum day demand plus fire flow demand is approximately 7,050 gpm. Given the small amount of existing storage volume, the existing source capacity should be increased a minimum of 620 gpm from 6,430 gpm to 7,050 gpm to meet the current combined maximum daily demand plus fire flow demand.

3.4 Adequacy of Existing Storage Volume

The purpose of storage volume is to provide water for demands on the water system in excess of the combined pumping rate of the system wells. Demands on the water system include the maximum daily water demand, water for fire-fighting purposes and emergency storage to sustain the city's needs during periods of power outages or failure of pumping equipment.

In our evaluation, we have not included provisions for emergency storage since auxiliary standby power is provided at the Railroad Avenue Well, Woodward Avenue Well and Suisun Street Well. We have also assumed fire flow requirements to be 2,500 gpm for a duration of four (4) hours.

To compute the required storage volume for the existing water system, we tabulated the hourly demand data for the maximum day as shown in Table 3-2 and depicted in Figure 3. The required storage volume was computed for the following system conditions:

- Pumping rate with Railroad Avenue Well out of service and 2,500 gpm fire flow
- Pumping rate with all pumps in service and 2,500 gpm fire flow
- Pumping rate with Railroad Avenue Well out of service and no fire flow
- Pumping rate with all pumps in service and no fire flow

The required storage volume for all scenarios exceeds the 80,000 gallon capacity of the existing elevated water storage tank.

Calculations of:
Required Water Storage Reservoir Volume and Drawdown for Existing System

Demands:

MDD = 4,550 GPM

						With Fire				Without Fire			
						Pump 1 out of service		All Pumps in service		Pump 1 out of service		All Pumps in service	
TIME		Q_factor	Demand (gpm)	Fire (gpm)	Total (gpm)	Pumping (gpm)	volume change (ft^3)	Pumping (gpm)	volume change (ft^3)	Pumping (gpm)	volume change (ft^3)	Pumping (gpm)	volume change (ft^3)
0	(12:00 AM)												
1		0.45	2,048		2,048	6,460	0	8,000	0	5,190	0	6,430	0
2		0.44	2,002		2,002	6,460	0	8,000	0	5,190	0	6,430	0
3		0.42	1,911		1,911	6,460	0	8,000	0	5,190	0	6,430	0
4		0.41	1,866		1,866	6,460	0	8,000	0	5,190	0	6,430	0
5		0.42	1,911		1,911	6,460	0	8,000	0	5,190	0	6,430	0
6		0.48	2,184		2,184	6,460	0	8,000	0	5,190	0	6,430	0
7		0.76	3,458		3,458	6,460	0	8,000	0	5,190	0	6,430	0
8		1.10	5,005		5,005	6,460	0	8,000	0	5,190	0	6,430	0
9		1.20	5,460		5,460	6,460	0	8,000	0	5,190	-2,166	6,430	0
10		1.20	5,460		5,460	6,460	0	8,000	0	5,190	-2,166	6,430	0
11		1.30	5,915		5,915	6,460	0	8,000	0	5,190	-5,816	6,430	0
12	(12:00 PM)	1.30	5,915	2,500	8,415	6,460	-15,682	8,000	-3,329	5,190	-5,816	6,430	0
13		1.40	6,370	2,500	8,870	6,460	-19,332	8,000	-6,979	5,190	-9,465	6,430	0
14		1.30	5,915	2,500	8,415	6,460	-15,682	8,000	-3,329	5,190	-5,816	6,430	0
15		1.30	5,915	2,500	8,415	6,460	-15,682	8,000	-3,329	5,190	-5,816	6,430	0
16		1.31	5,961		5,961	6,460	0	8,000	0	5,190	-6,180	6,430	0
17		1.35	6,143		6,143	6,460	0	8,000	0	5,190	-7,640	6,430	0
18		1.56	7,098		7,098	6,460	-5,118	8,000	0	5,190	-15,305	6,430	-5,358
19		1.70	7,735		7,735	6,460	-10,227	8,000	0	5,190	-20,414	6,430	-10,468
20		1.65	7,508		7,508	6,460	-8,402	8,000	0	5,190	-18,590	6,430	-8,643
21		1.20	5,460		5,460	6,460	0	8,000	0	5,190	-2,166	6,430	0
22		0.68	3,094		3,094	6,460	0	8,000	0	5,190	0	6,430	0
23		0.60	2,730		2,730	6,460	0	8,000	0	5,190	0	6,430	0
24	(12:00 AM)	0.48	2,184		2,184	6,460	0	8,000	0	5,190	0	6,430	0
	Average =	1.00	4,552			Total =	-90,124	Total =	-16,965	Total =	-107,354	Total =	-24,469
				Total Volume Change (gallons) =			-674,220		-126,917		-803,117		-183,054

Table 3-2
Required Storage Volume for Existing Water System

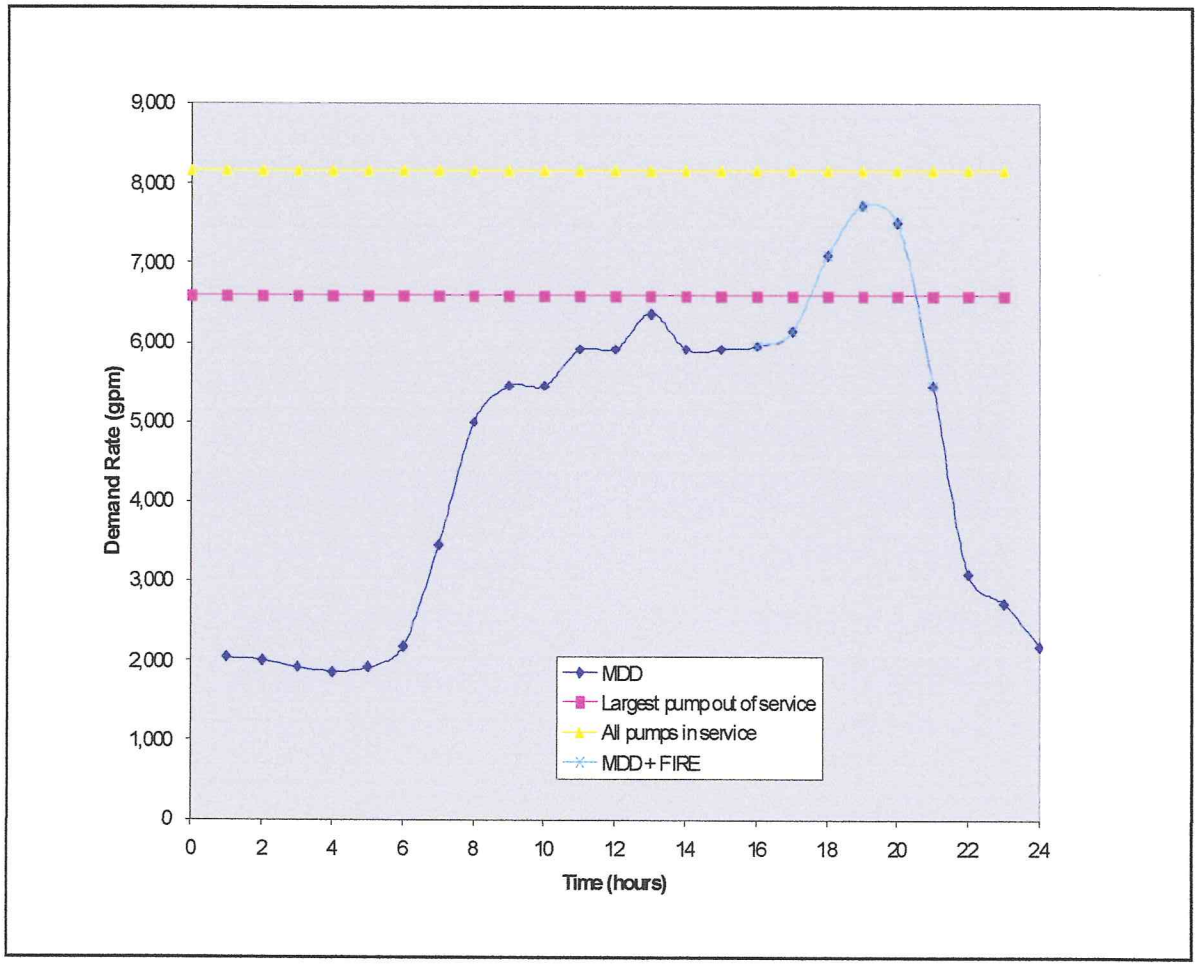

Figure 3 Graphical Representation of Required Storage Volume

Section 4

Future Water Use

4.0 Introduction

This section presents population estimates for the city of Orland through the year 2020 and an estimate of the required source capacity and storage volume to meet the projected population in the year 2020.

4.1 Population Estimates

The recent Amendment to the City of Orland General Plan established three growth rate scenarios to develop population estimates for the city through the year 2020. The three growth rates consist of (1) a "High" growth rate of 2.6 percent average annual growth rate, (2) a "Medium" growth rate of 2.2 percent average annual growth rate and (3) a "Low" growth rate of 1.8 percent average annual growth rate.

For the three growth rate scenarios the resulting 2020 population projections for Orland would be 10,495 persons if the "High" growth rate occurs, 9,706 persons if the "Medium" growth rate occurs, and 8,974 persons if the "Low" growth rate occurs.

4.2 Required Source Capacity

Based upon 2002 data, a total of 2,563 active water service connections provides water to a city population of 6,337 persons. This data indicates an occupancy factor of 2.47 persons per water service connection. Assuming an occupancy factor of 2.50 persons per water service connection, and depending upon the actual growth rate, Orland will have between 3,590 and 4,200 active water service connections by the year 2020.

If the "High" growth rate is assumed, the total number of active water service connections in the year 2020 will be approximately 4,200. Based upon our calculations, the maximum daily demand in the year 2020 will be approximately 6,470 gallons per minute (gpm). The existing source capacity of approximately 6,430 gpm would nearly meet the maximum daily demand if all city wells were operational, but would not meet the maximum hour demand or the maximum daily demand with coincident fire flow demand. Additional source capacity of approximately 2,540 gpm will be needed by the year 2020 if the "High" growth rate occurs. As new development occurs during the planning period, new wells will be a requirement and responsibility of the proposed development.

Based upon Department of Health Services (DHS) methodology of using 1.31 gpm per service connection and a peak hour of the maximum day demand factor of 1.50, the existing source capacity of 6,430 gpm will serve a total of 3,272 water service connections, or an additional 709 water services. Assuming 2.50 persons per water service connection, Orland's population can increase 1,773 persons to a total city population of 8,110 persons before additional source capacity is required by the DHS.

A population of 8,110 persons will be reached in the year 2010 if the city experiences a "High" growth rate, in the year 2012 if the city experiences a "Medium" growth rate, and in the year 2014 if the city experiences a "Low" growth rate.

4.3 Required Storage Volume

Based upon 2,563 metered service connections, the California Water Works Standards require approximately 1.8 million gallons of storage. The existing elevated water storage tank provides 80,000 gallons, or 0.08 million gallons, of storage volume. The DHS has determined that even though the water system does not meet the California Water Works Standards for storage volume, the city has adequate source capacity to offset the needed storage volume.

The cost to construct a new municipal well is far less than the cost to provide additional storage volume. Since the DHS allows the use of source capacity to offset needed storage volume, we have determined the quantity of required storage volume in the year 2020 based upon the required source capacity in the year 2020.

To compute the required storage volume for the year 2020, we have tabulated the hourly demand data for the maximum day as shown in Table 4-1. The computation for the required storage volume assumes a maximum day demand of 6,470 gallons per minute (gpm) and an increase in the existing source capacity of approximately 2,540 gpm. The required storage volume was computed for the following system conditions:

- Pumping rate with Railroad Avenue Well out of service and 2,500 gpm fire flow
- Pumping rate with all pumps in service and 2,500 gpm fire flow
- Pumping rate with Railroad Avenue Well out of service and no fire flow
- Pumping rate with all pumps in service and no fire flow

The required storage volume for the year 2020 is computed to be approximately 342,000 gallons if all system pumps are in service and 869,000 gallons if the highest capacity well is out of service.

Calculations of:
Required Water Storage Reservoir Volume and Drawdown in Year 2020

Demands:

MDD = 6,470 GPM

						With Fire				Without Fire			
						Pump 1 out of service		All Pumps in service		Pump 1 out of service		All Pumps in service	
TIME		Q_factor	Demand (gpm)	Fire (gpm)	Total (gpm)	Pumping (gpm)	volume change (ft^3)	Pumping (gpm)	volume change (ft^3)	Pumping (gpm)	volume change (ft^3)	Pumping (gpm)	volume change (ft^3)
0	(12:00 AM)												
1		0.45	2,912		2,912	9,660	0	11,200	0	7,730	0	8,970	0
2		0.44	2,847		2,847	9,660	0	11,200	0	7,730	0	8,970	0
3		0.42	2,717		2,717	9,660	0	11,200	0	7,730	0	8,970	0
4		0.41	2,653		2,653	9,660	0	11,200	0	7,730	0	8,970	0
5		0.42	2,717		2,717	9,660	0	11,200	0	7,730	0	8,970	0
6		0.48	3,106		3,106	9,660	0	11,200	0	7,730	0	8,970	0
7		0.76	4,917		4,917	9,660	0	11,200	0	7,730	0	8,970	0
8		1.10	7,117		7,117	9,660	0	11,200	0	7,730	0	8,970	0
9		1.20	7,764		7,764	9,660	0	11,200	0	7,730	-273	8,970	0
10		1.20	7,764		7,764	9,660	0	11,200	0	7,730	-273	8,970	0
11		1.30	8,411		8,411	9,660	0	11,200	0	7,730	-5,463	8,970	0
12	(12:00 PM)	1.30	8,411		8,411	9,660	0	11,200	0	7,730	-5,463	8,970	0
13		1.40	9,058		9,058	9,660	0	11,200	0	7,730	-10,652	8,970	-706
14		1.30	8,411		8,411	9,660	0	11,200	0	7,730	-5,463	8,970	0
15		1.30	8,411		8,411	9,660	0	11,200	0	7,730	-5,463	8,970	0
16		1.31	8,476		8,476	9,660	0	11,200	0	7,730	-5,982	8,970	0
17		1.35	8,735	2,500	11,235	9,660	-12,630	11,200	-277	7,730	-8,057	8,970	0
18		1.56	10,093	2,500	12,593	9,660	-23,528	11,200	-11,175	7,730	-18,956	8,970	-9,010
19		1.70	10,999	2,500	13,499	9,660	-30,794	11,200	-18,441	7,730	-26,222	8,970	-16,275
20		1.65	10,676	2,500	13,176	9,660	-28,199	11,200	-15,846	7,730	-23,627	8,970	-13,680
21		1.20	7,764		7,764	9,660	0	11,200	0	7,730	-273	8,970	0
22		0.68	4,400		4,400	9,660	0	11,200	0	7,730	0	8,970	0
23		0.60	3,882		3,882	9,660	0	11,200	0	7,730	0	8,970	0
24	(12:00 AM)	0.48	3,106		3,106	9,660	0	11,200	0	7,730	0	8,970	0
	Average =	1.00	6,473			Total =	-95,151	Total =	-45,740	Total =	-116,165	Total =	-39,671
				Total Volume Change (gallons) =			-711,827		-342,178		-869,030		-296,782

Table 4-1
Required Storage Volume in Year 2020

Section 5

Recommended Water System Improvements

5.0 Introduction

This section provides a prioritized schedule of recommended improvements to the water system to meet current and future needs of the city of Orland. The locations of the recommended improvements are shown on Figure 4, and itemized cost estimates for the improvements are included in Section 6.

Improvements which are recommended as part of a 5-year Capital Improvement Program include:

- Improvements to the Lely Aquatic Park Well
- Construction of a new elevated water storage tank
- Removal of the existing elevated water storage tank
- Improvements to the Central Street Well
- Water Main replacements in two locations to eliminate small diameter water mains

Following are project descriptions for the recommended improvements.

5.1 Lely Aquatic Park Well Improvements

The State of California Department of Health Services (DHS) has determined that the Orland water system is in compliance with the California Water Works Standards for source capacity. The determination by DHS is based upon the fact that the combined pumping rate of all existing city wells exceeds the peak hour demand.

City staff reports that all existing wells within the water system run simultaneously at times during the summer to meet water demands. Our calculations indicate that the current maximum daily demand is approximately 4,550 gallons per minute (gpm) and the combined maximum daily demand plus fire flow demand is approximately 7,050 gpm. Given the small amount of existing storage volume, the existing source capacity should be increased a minimum of 620 gpm from 6,430 to 7,050 gpm to meet the current combined maximum daily demand plus fire flow demand. Increasing the source capacity would also meet peak hour demand without all pumps running and provide an added safety factor if one of the system wells is not operational.

The Lely Aquatic Park Well was drilled in 1978 to provide irrigation water for the park. The well currently has a 30 horsepower pump and produces approximately 500 gpm. The well is connected to the water distribution system piping but is isolated from the system by a gate valve that is kept closed.

Review of the test pumping that was performed at the time the well was drilled indicates that the well is capable of yielding approximately 1,600 gpm at a pumping water level of 52 feet below the ground surface. Water quality testing has been performed on the well and it meets all primary and secondary water quality standards for use as a water source for a public water system.

It is recommended that the Lely Aquatic Park Well be test pumped to verify its current yield and acquire necessary information to select a new pump and motor to increase its pumping capacity. Once the size of the new pump and motor is determined, the well capacity can be increased by installing a new pump, motor and electrical controls. A generator should be installed to provide temporary power for emergency operation during power outages.

After the well is upgraded, the city's existing permit with the State will need to be amended prior to opening the existing gate valve that currently isolates the well from the distribution system.

Upgrading the Lely Aquatic Park Well is the most cost effective and expeditious method to increase the water system source capacity. The cost to upgrade the well is estimated to be $100,000.00.

5.2 New Elevated Water Storage Tank

The existing 80,000 gallon elevated water storage tank was constructed in 1912. The storage tank (1) does not meet the requirements of the California Water Works Standards for needed storage volume for a public water system with the number of water service connections that currently exist, (2) will have been in service for more than 100 years midway through the planning period and (3) does not meet current Uniform Building Code structural design standards to resist the effects of an earthquake.

The two alternatives available to the city to meet existing and future storage volume requirements for the water system are to (1) continue to construct additional wells to provide excess source capacity to offset the lack of adequate storage volume or (2) construct a new elevated water storage tank with adequate storage volume.

With the first alternative, when the existing elevated water storage tank reaches its useful life and must be taken out of service, each well within the water system will have to be equipped with a variable frequency drive motor or pump control valve to operate the pump predicated upon pressure in the distribution system. All system wells will also have to be equipped with a generator to provide power for temporary operation during power outages since no emergency storage volume would exist. The advantage of constructing additional wells is that the initial cost is less than constructing a new elevated water storage tank.

With the second alternative, a new elevated water storage tank would provide the best fire protection dependability, lower electrical costs as the storage tank could meet most daily demands and system pumps would be utilized in off-peak hours, provide uniform distribution pressure, and provide effective control of the system pumps. The primary disadvantage with constructing a new elevated water storage tank is its initial cost.

Based upon the existing water system demands, the computer analysis indicates that the required water storage volume for Orland's water system is currently 183,000 gallons if all system pumps are in service and 803,000 gallons if the highest capacity well is out of service.

Based upon estimated water system demands in the year 2020, and assuming an increase in source capacity of 2,540 gpm by the year 2020, the computer analysis indicates that the required water storage volume for Orland's water system will be approximately 342,000 gallons if all system pumps are in service and 869,000 gallons if the highest capacity well is out of service.

It is recommended that a new elevated water storage tank be constructed with a storage volume of 1,000,000 gallons. The cost to construct a new elevated water storage tank and remove the existing storage tank is estimated to be $2,300,000.00.

5.3 Central Street Well Improvements

With the exception of Central Street Well, all well sites within the city water system have a masonry building to house the pump motor, electrical equipment, flow meter, valves and discharge piping. The well building provides the well equipment protection from the weather and security from vandalism.

The well building at the Central Street Well consists of a wood-frame building with wire mesh over the building window openings. The exterior of the building is stucco and the interior of the building is wood. The well site has a chain link perimeter fence for security of the well building and the appurtenant hydro pneumatic tank.

Because of its poor condition, it is recommended that the existing wood and stucco building be removed and a new masonry building be constructed in its place. The new masonry building would be more secure than the existing building because it would not have any window openings. The new well building would have large louvered wall openings and a rotary roof vent to provide ventilation of the building.

The cost to remove the existing building and construct a new masonry building is estimated to be $42,000.00.

5.4 Water Main Replacements

In the past whenever funding was available, city staff has been diligent in their efforts to install water mains to eliminate dead end water pipes and reinforce the distribution system. Two existing water mains within the distribution system are recommended for replacement with larger pipes to increase water flow and improve fire flows from existing fire hydrants served by the mains.

It is recommended that the existing water mains be replaced at the following locations:

- **East Street-Walters Street Alley:** The existing 2½-inch diameter water main located in the alley between East Street and Walters Street, running north and south between East Chapman and South Street, is recommended to be replaced with an 8-inch diameter water main. The cost to install the new water main, services and appurtenant valves is estimated to be $56,000.00.

- **Yolo Street to Sixth Street:** The existing 2½-inch diameter water main located on the westerly extension of Yolo Street between the alley east of the Union Pacific Railroad tracks and Sixth Street is recommended to be replaced with an 8-inch diameter water main. The cost to install a new water main is estimated to be $56,000.00.

See Figure 4 (attached)

Section 6

Cost Estimates

6.0 Basis for Cost Estimates

The cost estimates below are based upon the recommended improvements described in Section 5 and shown on Figure 4. The unit prices are based upon recent experience with similar improvements in northern California for projects constructed in the 2003 construction season. Estimated costs should be adjusted annually to reflect the changes in construction costs, based upon the Engineering News Record Construction Cost Index (ENRCCI). The ENRCCI for January 2004 equals 6824.90.

6.1 Lely Aquatic Park Well Improvements

Item	Description	Quantity	Unit Cost	Amount
1.	Pump testing	Lump Sum	$ 3,000.00	$ 3,000.00
2.	Turbine pump, motor and electric upgrade	Lump Sum	45,000.00	45,000.00
3.	Standby generator	1 Ea.	35,000.00	35,000.00
			Subtotal	$ 83,000.00
		Contingency, Engineering and Administration (20%)		17,000.00
			Total	**$ 100,000.00**

6.2 New Elevated Water Storage Tank

Item	Description	Quantity	Unit Cost	Amount
1.	Site work	Lump Sum	$ 30,000.00	$ 30,000.00
2.	Furnish and install 1MG elevated water storage tank	Lump Sum	1,900,000.00	1,900,000.00
3.	Wireless pump control system	Lump Sum	20,000.00	20,000.00
4.	Remove existing elevated tank	Lump Sum	50,000.00	50,000.00
			Subtotal	$ 2,000,000.00
		Contingency, Engineering and Administration (15%)		300,000.00
			Total	**$ 2,300,000.00**

6.3 Central Street Well Improvements:

Item	Description	Quantity	Unit Cost	Amount
1.	Remove existing building	Lump Sum	$ 5,000.00	$ 5,000.00
2.	Masonry building	Lump Sum	30,000.00	30,000.00
			Subtotal	$ 35,000.00
		Contingency, Engineering and Administration (20%)		7,000.00
			Total	**$ 42,000.00**

6.4 Water Main Replacement (East-Walters Alley):

Item	Description	Quantity	Unit Cost	Amount
1.	Connect to existing water main	2 Ea.	$ 2,500.00	$ 5,000.00
2.	8" diameter PVC water main	520 L.F.	50.00	26,000.00
3.	8" gate valve	2 Ea.	1,000.00	2,000.00
4.	Water service	14 Ea.	800.00	11,200.00
5.	Abandon existing water main	Lump Sum	2,500.00	2,500.00
			Subtotal	$ 46,700.00
		Contingency, Engineering and Administration (20%)		9,300.00
			Total	**$ 56,000.00**

6.5 Water Main Replacement (Yolo Street to Sixth Street):

Item	Description	Quantity	Unit Cost	Amount
1.	Connect to existing water main	2 Ea.	$ 2,500.00	$ 5,000.00
2.	8" diameter PVC water main	390 L.F.	50.00	19,500.00
3.	8" gate valve	2 Ea.	1,000.00	2,000.00
4.	Direction bore railroad crossing	Lump Sum	20,000.00	20,000.00
			Subtotal	$ 46,500.00
		Contingency, Engineering and Administration (20%)		9,500.00
			Total	**$ 56,000.00**

Appendix A

CITY OF ORLAND
2002 CONSUMER CONFIDENCE REPORT
PUBLIC WATER SYSTEM NUMBER 1110001

*******Este informe contiene información muy importante sobre su agua beber. Tradúzcalo ó hable con alguien que lo entienda bien.*******

WATER SUPPLY SOURCES:

The City has seven wells, identified as Central Street Well, Railroad Avenue Well, Woodward Avenue Well, Corporation Yard Well, Eighth Street Well, Suisun Street Well and Roosevelt Avenue Well, that supply water to the system. The wells are distributed throughout the City and range in depth from 150 feet to 400 feet. The wells produce between 600 and 1,200 gallons per minute each, and are automatically regulated by the water level in the elevated storage tank.

A source water assessment has been completed for the seven wells serving the City of Orland public water system. The wells are considered most vulnerable to the following activities not associated with any detected contaminants:

- Sewer Collections Systems
- Housing - High Density (> 1 house/0.5 acres)
- Transportation Corridors - Roads/Streets

A copy of the complete assessment may be viewed at:

DHS Valley District Office 415 Knollcrest Drive, Suite 110 Redding, CA 96002 Attention: Gunther Sturm, 530-224-4866	or at	City of Orland 815 Fourth Street Orland, CA 95963 Attention: Jerry Troxel, 530-865-1610

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water before we treat it include:

- *Microbial contaminants*, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
- *Inorganic contaminants,* such as salts and metals, that can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
- *Pesticides and herbicides,* which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses.
- *Organic chemical contaminants,* including synthetic and volatile organic chemicals, that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems.

- *Radioactive contaminants,* which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, USEPA and the California Department of Health Services (Department) prescribe regulations which limit the amount of certain contaminants in water provided by public water systems. Department regulations also establish limits for contaminants in bottled water that must provide the same protections for public health.

TERMS, ABBREVIATIONS AND SYMBOLS USED IN THIS REPORT:

Maximum Contaminant Level (MCL): The highest level of contaminant allowed in drinking water. Primary MCLs are set as close to the Public Health Goals (PHG) as is technologically and economically feasible. Secondary MCLs are set to protect the odor, taste and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the Federal Environmental Protection Agency (USEPA).

Primary Drinking Water Standards (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and surface water treatment requirements.

Secondary Drinking Water Standards (SDWS): MCLs for contaminants that affect taste, odor, or appearance of the drinking water. Contaminants with SDWSs do not affect the health at the MCL levels.

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Symbols:

ppb = parts per billion (equivalent to micrograms per liter)
µg/l = micrograms per liter (equivalent to parts per billion)
ppm = parts per million (equivalent to milligrams per liter)
mg/l = milligrams per liter (equivalent to parts per million)
< means "less than"
N/A = not applicable
ND = non detectable at testing limit

MICROBIOLOGICAL WATER QUALITY:

Testing for bacteriological contaminants in the water distribution system is required by State regulations. This testing is done regularly to verify that the water system is free of coliform bacteria. Two samples are taken weekly at dedicated locations in the distribution system for bacteriological testing. There were no positive tests for Total Coliform or Fecal Coliform in 2002.

LEAD AND COPPER TESTING RESULTS:

Lead and copper testing of water from individual customer taps throughout the distribution system is required by State regulations. The table below summarizes the most recent monitoring for these constituents in parts per billion (ppb), or micrograms per liter (µg/l).

	Year Tested	Number of Samples Collected	Number of Samples Required	90th Percentile Result (ppb)	Action Level (ppb)	Number of Samples Above Action Level	MCLG (ppb)
Lead	2002	20	20	<5	15	0	2
Copper	2002	20	20	240	1300	0	170

WATER TREATMENT:

Chlorine is added to the water from Railroad Avenue Well, Woodward Avenue Well, Corporation Yard Well, and Suisun Street Well as a preventative measure due to intermittent positive bacteriological tests of the wells. Water from the Central Street Well, Eighth Street Well and Roosevelt Avenue Well are not treated.

DETECTED CONTAMINANTS IN OUR WATER:

The following table provides a list of all detected chemicals in our water during the most recent sampling. Please note that not all sampling is required annually, so in some cases our results are more than one year old.

Chemical Detected	Source	Year Tested	Level Detected	MCL	PHG	Origin
Aluminum (ppb)	Eighth	1991	97	200	None	Erosion of natural deposits.
Barium (ppb)	Central	1992	101	1000	None	Erosion of natural deposits, discharges of oil drilling wastes and from metal refineries.
	Railroad	1992	114			
	Eighth	1991	100			
Boron (ppb)	Railroad	2001	220	None	1000	Erosion of natural deposits.
	Eighth	2001	160			
	Suisun	2001	200			
	Roosevelt	2001	210			
Chromium (ppb)	Corp. Yard	1996	10	50	2.5	Erosion of natural deposits.
	Roosevelt	1996	10			

Chemical Detected	Source	Year Tested	Level Detected	MCL	PHG	Origin
Fluoride (ppm)	Woodward	1991	0.10	2	1	Erosion of natural deposits, water additive which promotes strong teeth; discharge from fertilizer and aluminum factories
	Corp. Yard	1996	0.10			
	Eighth	1991	0.12			
	Roosevelt	1997	0.12			
Nitrate (NO_3) (ppm)	Central	2002	11	45	45	Erosion of natural deposits, runoff and leaching from fertilizer use, leaching from septic tanks and sewage.
	Railroad	2002	13			
	Woodward	2002	8.9			
	Corp. Yard	2002	18			
	Eighth	2002	10			
	Suisun	2002	9.2			
	Roosevelt	2002	3.4			
Chloride (ppm)	Central	2002	25	500	None	Erosion of natural deposits.
	Railroad	2002	18			
	Woodward	2002	21			
	Corp. Yard	1996	33			
	Eighth	1991	18.2			
	Suisun	1996	19			
	Roosevelt	1997	17			
Iron (ppb)	Eighth	1991	148	300	None	Erosion of natural deposits.
Sodium (ppm)	Central	1992	17.4	None	None	Erosion of natural deposits.
	Railroad	1992	18.3			
	Woodward	1991	18.4			
	Corp. Yard	1991	29.0			
	Eighth	1991	17.0			
	Suisun	1992	18.7			
Sulfate (ppm)	Central	2002	21	500	None	Erosion of natural deposits.
	Railroad	2002	24			
	Woodward	2002	23			
	Corp. Yard	1996	29			
	Eighth	1991	22.6			

Chemical Detected	Source	Year Tested	Level Detected	MCL	PHG	Origin
Sulfate (ppm) continued	Suisun	1996	25	500	None	Erosion of natural deposits.
	Roosevelt	1997	19			
Total Dissolved Solids (ppm)	Central	1992	294	1000	None	Erosion of natural deposits.
	Railroad	1992	294			
	Woodward	1991	262			
	Corp. Yard	1996	280			
	Eighth	1991	288			
	Suisun	1992	263			
	Roosevelt	1997	200			
Hardness (ppm)	Central	1992	225	None	None	Erosion of natural deposits.
	Railroad	1992	225			
	Woodward	1991	199			
	Corp. Yard	1991	253			
	Eighth	1991	221			
	Suisun	1992	188			
Vanadium (ppb)	Railroad	2001	6	None	50	Erosion of natural deposits.
	Eighth	2001	7			
	Suisun	2001	6			
	Roosevelt	2001	6			

ADDITIONAL GENERAL INFORMATION ON DRINKING WATER:

All drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly individuals, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. The USEPA Center for Disease Control guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbiological contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

VIOLATION INFORMATION

The regulations require that each active source be sampled for boron, vanadium, and hexavalent chromium if the level of total chrome is over 1 ppb. The regulations also require a second sample to be collected for these constituents if they are detectable. The City of Orland did not submit results for all active sources for boron and vanadium, and failed to collect hexavalent chromium samples at the Corp. Yard and Roosevelt Wells. A second set of boron and vanadium samples have not been collected as required by the regulations.

The Orland City Council meets on the first and third Monday of each month at 7:30 p.m. at the Carnegie Center. Please feel free to participate in these meetings.

For additional water quality data, contact Jerry Troxel of the City Public Works Department at (530) 865-1610.

Appendix B

California Department of Health Services
Drinking Water Field Operations Branch
Annual Inspection Report

Purveyor: City of Orland System No: 1110001
Person(s) Contacted/Position: Jerry Troxel, Director of Public Works (530) 865-1610 and
Jere Schmitke, Public Works Foreman
Date of inspection: May 14, 2003 Reviewing Engineer: Ronnean Lund
Last A.I. Date: March 5, 2002 by DLC District Engineer: Gunther L. Sturm, P.E.

A. INTRODUCTION

1. Permit Status

Full: The original permit was issued in 1959 and reissued on June 4, 1971 for the following:
East and Colusa Street Well (Well-03, source 004)- Destroyed
Railroad Avenue Well (Well-02, source 003)
Corp Yard Well (Well-05, source 006)
Central Street Well (Well-01, source 002)
Woodward Street Well (Well-04, source 005)
Swimming Pool Well - Destroyed
Elevated Tank
There have been two amendments issued as follows:
March 29, 1985 for Suisun Well (Well-07, source 008).
April 29, 1996 for Roosevelt Well (Well-08, source 009); includes the use of the 8th Street Well (Well-06, source 007)(by reference only).

The current permit # is 71-031A2 issued April 29, 1996. See the permit reports and/or well log files for the existing data sheets.

The permit provisions are not being completely complied with. There is a well connected to the system via a valve that is not permitted, and there is a well in use that has never formally been permitted. The first well is located at Lely Aquatic Park. Water samples have been collected from the well and tested for most of the required chemicals. The results have been acceptable. Our records show the well has been capable of producing at least 500-gpm. Its current capacity is unknown. The second well is the 8th Street Well which is currently in use. The City needs to apply for a permit amendment to include these wells in the system or physically disconnect them from the system and apply for a permit for a transient noncommunity system for the Lely Aquatic Park Well.

2. Changes in System

Since the last inspection, they have installed approximately 400-feet of main line to complete the system at Third Street and Roosevelt Avenue. The piping used was 8-inch PVC, schedule C-900. The City Engineer is currently working on a long term master plan for water and sewer services which includes addressing the lack of adequate storage. Once the plan is complete, there will apparently be money set aside for the needed work.

3. Consumer and Production Data – 2002 Data

No. of service connections: 2,563 No. with meters: 2,563
Approx. population served: 6337
Water produced during the 12 month period: (Jan. 2002 to Dec. 2002): 816,287,499 gallons
Maximum month: 109,739,199 gallons (August 2002) Maximum day: Daily records are not kept.

4. Past Data

Table 1
Water Use Data

Year	Max. Month MG	Max. Day 1.3 gpm	Report Max. Day MG	Max. Day gpm	M or D	GPM PDPC	Total Conn.	Meter Conn.	Flat Conn.	Source Capacity	Max. Pop.
1984	97.7	2,840	No data	- - - -	M	1.45	1,957	1,957	--		4,040
1985	78.4	2,280	No data	- - - -	M	1.15	1,978	1,978	--		4,040
1986	104.2	3,030	No data	- - - -	M	1.42	2,136	2,136	--		4,571
1987	97.8	2,850	No data	- - - -	M	1.31	2,172	2,172	--		4,571
1988	93.7	2,730	No data	- - - -	M	1.26	2,172	2,172	--		4,571
1989	92	2,680	No data	- - - -	M	1.21	2,215	2,215	--	6,440	4,715
1990	108	3,140	No data	- - - -	M	1.40	2,248	2,248	--	6,440	5,052
1991	101	2,940	No data	- - - -	M	1.31	2,248	2,248	--	6,440	5,182
1992	129	3,760	No data	- - - -	M	1.61	2,330	2,330	--	5,720	5,394
1993	118	3,440	No data	- - - -	M	1.43	2,405	2,405	--	5,720	5,471
1994	103	3,000	No data	- - - -	M	1.24	2,423	2,423	--	5,720	5,563
1995	114	3,320	No data	- - - -	M	1.37	2,426	2,426	0	6,420	5,763
1996	118.4	3,450	No data	- - - -	M	1.39	2,488	2,488	0	6,420	5,800
1997	115.8	3,370	No data	- - - -	M	1.36	2,476	2,476	0	6,420	7,521
1998	182.2	5,310	No data	- - - -	M	2.11	2,507	2,507	0	6,420	7,521
1999	108.5	3,160	No data	- - - -	M	1.25	2,532	2,532	0	6,430	6,000
2000	112.5	3,385	No data	- - - -	M	1.33	2,544	2,544	0	6,430	6,281
2001	No Data										
2002	109.7	3,302	No data	-------	M	1.29	2,563	2,563	0	6,430	6,337
				Ave.		1.31					

All service connections are metered. The maximum day demand per service connection has been calculated based on the maximum monthly use. It has ranged from 1.15 to 2.11 gpm per service connection over the past eighteen years, with an average of 1.31 gpm.

B. SOURCE DATA

Note: Pressure tanks were measured during the inspection and found to be only half the size reported in previous inspections.

Table 2
Source Data

Sources	Status	Capacity (gpm)	Comments
Groundwater			
8th Street, Well 06, Source 007	Active	620	Sand separator; water lubed, 5,200 gallon pressure tank.
Central Street, Well 01, Source 002	Active	860	5,200 gallon pressure tank, direct drive gasoline engine, water lubed.
Corp. Yard, Well 05, Source 006	Active	1,030	3,350 gallon pressure tank, water lubed, chlorinator.
Railroad Avenue, Well 02, Source 003	Active	1,240	5,200 gallon pressure tank, natural gas generator, water lubed, chlorinator.
Suisun, Well 07, Source 008	Active	1,090	Direct drive natural gas engine, 5,200 gallon pressure tank, chlorinator.
Woodward, Well 04, Source 005	Active	890	Direct drive natural gas engine, 5,200 gallon pressure tank, chlorinator.
Roosevelt, Well 08, Source 009	Active	700	1,050 gallon pressure tank.
Lely Aquatic Park, Source 001	Valved from the system	(500)	5,200 gallon pressure tank.
	Total	**6,430 (6,930)**	

The Waterworks Standards require the use of past records whenever possible for determining source capacity. The City reports the maximum month use each year in its Annual Report to the Department. For the past eighteen years, the average maximum daily use was 1.31 gpm per service connection. Using a peak hour of the maximum day demand factor of 1.5, the needed source capacity is 5,036 gpm (1.5 X 1.31 X 2,563) for 2,563 service connections. Since the current total source capacity is 6,430 gpm, the water system is in compliance with the Waterworks Standards. The City has an industrial/commercial demand, which increases the "per connection" values. These demands, especially the olive producers, are 24 hour per day operations. Reportedly, the City is able to adequately meet peak water demands. All the wells are used in the summer. In the winter, the wells are rotated. The phone system is used to initiate pump rotation. We have well logs and/or well data sheets on file for all of the wells.

C. TREATMENT

1. Surface Water Sources

There are no surface water sources.

2. Groundwater Sources

Continuous disinfection is provided at four of the City's eight wells. The wells that are not continuously disinfected are capable of being chlorinated if needed. Sodium Hypochlorite is used for disinfection at all the wells. LMI Model 171 solution pumps inject a 12.5% solution into the discharge pipes at the wells to obtain a residual of greater than 0.2 mg/l. City customers are very much against chlorination, but the City is maintaining a system residual in hopes to alleviate future bacteriological failures. The solution pumps at the Suisun and 8th Street Wells have a capacity of 10 gpd. All of the other pumps have a capacity of 0.42 gph. The solution pumps are in operation when the wells are in use. The City provides chlorination as a precautionary measure. Prior to chlorination, the City had collected a small number of positive bacteriological samples. Since they started chlorination, positive samples have decreased and the system has been in compliance. The 8th Street well is not chlorinated at this time because the well is not used enough to keep the chlorinator primed. They have not been submitting their chlorination logs to our office. I advised them to start submitting them monthly.

3. **Other Treatment or Blending facilities**
   A sand separator at the 8th Street Well is the only other treatment provided to the system.

4. **Describe Records Maintained of Treatment:**
   Chlorine usage and residual logs are maintained by the City. Residual readings are only being taken once every few days. According to Mr. Troxel, the wells are only checked once a week.

D. STORAGE DATA

Table 3
Storage Reservoir Data

Storage	Type	Capacity	Zone	Comments
Elevated tank	Steel	80,000	One	For pressure regulation
Pressure tanks	Steel	1,050 to 5,200	At each well	For surge control & Cl2 contact

According to the Waterworks Standards, a metered water system with 2563 service connections at a maximum average monthly air temperature of 80 degrees Fahrenheit requires approximately 1.8 million gallons of storage. The City has approximately 0.086 million gallons of storage; therefore, the City does not meet the Waterworks Standards for storage capacity. Based on review of the needed source capacity, the City has adequate source capacity to offset the needed storage. There are sources of emergency power at some of the wells in case of a power outage. The data sheet for the elevated tank is in the permit file. Tanks have appropriate coatings. I did not climb the elevated tank this year. The City's electrician reportedly climbs the tank and inspects it annually. The elevated tank is drained annually. There is only one pressure zone which is regulated by the elevated storage tank.

E. TRANSMISSION FACILITIES

There are no transmission lines. The distribution system is a grid system.

F. DISTRIBUTION SYSTEM

1. **Pressure Zones**

Table 4
Pressure Zones Data

Pressure Zone Name	Pressure Range (psi)	Source Production (wells, pressure. sta. etc.)	Storage Capacity	No. of Connections
One zone	Approx. 50-65 psi	All wells	80,000 gal	All

2. **Mains**

Table 5
Distribution System Data

Material	Amount @ %	Size *	Class/Gage	Condition
Cast Iron	Unknown, (older parts of town)	Varies		Old pipe - good
Steel	Unknown,	Varies		Good
Asbestos Cement	Unknown	Varies		Good
PVC	Unknown	Varies	AWWA C-900	Good

* Sizes range between 4"- 8" with some 10" pipes and one 12" pipe to the storage tank.

3. **Leak History** during past 12 months (mains and connections):
They have had a lot of leaks in the past year. In discussion with them it was concluded that there are several factors contributing to this. They include, but are not limited to, use of chlorine in the distribution system, old shallow hand dug piping, garbage trucks driving in alleys where piping is located. In further discussion it was concluded that most of the leaks occur at the joints. They are using leather seals which can be adversely affected by chlorine. Once weakened by the chlorine, they're more susceptible to truck traffic. I advised them to look into purchasing a different type of seal that is more resistant to chlorine. They acknowledged this.

4. **Distribution Facilities**
Reportedly, the system is constructed in accordance with the requirement of the Waterworks Standards.

5. **Separation Practices**
The City is aware of our main and sewer line separation requirements and reportedly abides by them.

6. **Low Head Lines**
Reportedly, there are no low head lines in the system. System maintains a pressure of 50-55 psi at the service connections.

7. **Leaded Pipes, Joints, Solder, etc.**
The City is up to date on its lead and copper monitoring. They need one set of 20 samples by **December 2003**. No previous lead and copper samples exceeded the action levels.

G. WATER QUALITY AND MONITORING

1. **Bacteriological**

There are eight dedicated sample taps for bacteriological sampling. Two samples are collected weekly by the Foreman, Jere Schmitke, for a total of eight-ten samples per month. The samples are collected and analyzed using the MMO-MUG technique and are delivered to the Monarch laboratory by Mr. Schmitke on the same day. The Bacteriological Sample Siting Plan (BSSP) we have on file, dated 1992, is not current. They will provide us with a current BSSP. In 2002 there was a problem with the Corp Yard Well. When they went to put it back on line, they chlorinated it and got positive results several times before heavily flushing it and getting a negative sample. It was never determined what the problem was with the positive samples. Mr. Troxel said they think it might have had something to do with iron bacteria. They have not had a problem since obtaining a negative sample. All other samples were negative in 2002 and so far in 2003. They are taking quarterly raw water samples which have been fine since the problem with the positive samples from the Corp Yard Well.

2. **Chemicals**

I provided them with a copy of their delinquent monitoring schedule and advised them to have the testing done now. Mr. Jere Schmitke (Foreman) collects samples and delivers them to Monarch Laboratories in Chico, CA. They need to perform MTBE sampling on all permitted sources (including the 8th Street Well) each of the remaining three quarters of this year, and perform MTBE sampling on all permitted sources (including the 8th Street Well) once in 2004. In addition, they need to perform unregulated chemical testing as outlined in Table 6 below.

Table 6
Unregulated Chemicals Monitoring Due

	Chromium	1,2,3-TCP
Lely Aquatic Park, Source 001	Needs Screening	Needs Sample Taken
Central Street, Well 01, Source 002	OK	Needs Sample Taken
Railroad Avenue, Well 02, Source 003	Needs Sample of Hexavalent Chromium (Chrome 6)	OK
Woodward, Well 04, Source 005	OK	Needs Sample Taken
Corp. Yard, Well 05, Source 006	OK	Needs Sample Taken
8th Street, Well 06, Source 007	Needs Sample of Hexavalent Chromium (Chrome 6)	OK
Suisun, Well 07, Source 008	Needs Sample of Hexavalent Chromium (Chrome 6)	OK
Roosevelt, Well 08, Source 009	Needs Sample of Hexavalent Chromium (Chrome 6)	OK

3. **Other**

There are no other chemicals they need to monitor for at this time. They have not submitted their confirmation of distribution of their Consumer Confidence Report (CCR) for 2002. City Engineer, Bruce Nash (895-1422), will be completing this task by July 1, 2003.

H. OPERATION AND MAINTENANCE

1. Personnel and Planning

The City reportedly has up-to-date maps of the water system. I advised them to put all additions/changed to the distribution system on their maps so that the information doesn't get lost.

Table 7
Personnel Data

Name	Title	Grade	Expiration
Jere Schmitke	Public Works Foreman	T1 D1(interim)	5-1-2005 1-1-2004
Mike Schroer	Public Works Employee	T1 D1(interim)	5-1-2005 1-1-2004

The two City personnel listed above are signed up to take the D1 certification exam in August of this year. This system requires a T1 and a D1 certified operator or a D1 certified operator.

2. Cross-Connection Control Program

The City does not have an official cross-connection program. They do, however, send out letters once a year reminding people that their devices need to be tested. The devices are tested each May by a third party.

3. Complaints

Complaints are passed on to the Water Department Foreman, Jere Schmitke, who normally visits the customer within the hour. In 2002 there were numerous complaints, most of which were leaky meter complaints. During the inspection, we discussed this and determined that they have been having more and more problems with leaks mainly due to two factors: the first being the use of chlorine and the second being garbage trucks running through the alleys where piping is old and shallow. It was concluded that they need to look into obtaining gaskets that are more resistant to chlorine. They are using leather gaskets that are apparently deteriorating more quickly with the use of chlorine. I advised them to check with a distributor on which gaskets might be best to use; they acknowledged this.

4. Emergency Response

a) *We went over the Emergency Notification Plan during the inspection. They need to expand on it. I left the most current plan with them to revise and resubmit to our office.*

b) Reviewed and left a copy of the DHS Public Water System Inspection Checklist for Security with Jere Schmitke.

c) Mr. Troxel will verify that their Disaster Response Plan addresses procedures for restoration of water services in the event of an emergency. They will provide our office with a copy of their plan.

5. **Main Disinfection Program**
   Reportedly, HTH tablets are used after maintenance and for new construction. The City is aware of the AWWA Standards for disinfecting mains and reportedly adheres to them.

6. **Valve Maintenance Program**
   Reportedly, the City attempts to exercise the valves twice a year. The City paints the valve covers with a different color every time they exercise the valves so they know which ones have been operated. According to the distribution system maps, there are an adequate number of valves to isolate work areas without shutting off large portions of the system. Reportedly, the location of valves are satisfactory. According to the City's map of the distribution system, there are two unique water line locations. What is unique about these locations is the water lines traverse north and south from the Central Street Well between houses. The water lines are under the yards of these houses. Reportedly, there are valves at both ends of these lines.

7. **Flushing**
   Certain dead ends are flushed quarterly. The City keeps a record of the flushing. Pressure tanks at the wells are flushed two times per year. Reportedly, there are seventeen dead ends less than 200-feet long and six dead ends more than 200-feet long. All dead ends have flushing valves.

8. **Other**
   The Source Water Assessments have been completed for all permitted sources in this system.

Report prepared by:

Ronnean Lund, Sanitary Engineer Date

SYSTEM DEFICIENCY RECORD

Name of System: City of Orland **System No.** 1110001

Date Noted	Description of Defect or Hazard	Order No.*	Correction Required By	Reported Corrected	Confirmed Corrected
5/14/03	Supply our office with a current Bacteriological Sample Siting Plan.	2	June 23, 03		
5/14/03	Perform MTBE sampling on all permitted sources each of the remaining three quarters of this year, and perform MTBE sampling on all sources once in 2004.	3	First one due by June 30, 2003		
5/14/03	Start MTBE sampling of the Lely Aquatic Park Well. Start by taking a sample each of the remaining three quarters of this year and one sample in the first quarter of 2004.	3	First one due by June 30, 2003		
5/14/03	Submit chlorination logs monthly to our office.	3	June 23, 03		
5/14/03	Perform all delinquent routine chemical testing of the sources.	2	June 23, 03		
5/14/03	Perform unregulated chemical testing as outlined in the inspection report.	3	June 23, 03		
5/14/03	Provide a vent on the well at the Corp Yard.	3	Now		
5/14/03	Provide a new screen on the casing vent at the Suisun Well.	2	Now		
5/14/03	Provide an inverted U at the blow off on the pressure tank at the Roosevelt Well.	3	Now		
5/14/03	Submit a copy of the system Disaster Response Plan to our office.	3	June 23, 03		
5/14/03	Complete and submit a revised ENP to our office.	2	June 23, 03		
5/14/03	Submit a permit amendment application for addition of the 8th Street and Lely Aquatic Park wells to the system.	2	June 23, 03		

* Order No.:
1. Serious health hazard; corrective action must be taken immediately.
2. Critical system or operational defect and/or potential health hazard.
3. System or operational defect and/or potential contamination hazards of lesser public health significance.
4. System or operational defect and/or potential health hazard - costly to correct - to be included in any long-range water improvement project.