APPENDIX J

City of Davis
SB 610 Water Supply Assessment
Covell Village Development (Davis, CA)

The purpose of this study is to provide information regarding water supply for the 413.8 acre Covell Village Project ("the Project") located in north-central Davis, California. (Wat. Code, § 10910 et seq., as amended by Stats. 2001, ch. 643 (SB 610), effective January 1, 2002.) A water assessment must be prepared for any "project" subject to the provisions of the California Environmental Quality Act, Public Resources Code, sections 21000 et seq., that also meets the definition of "project" set forth in Water Code section 10912, subdivision (a). (Wat. Code, § 10910, subd. (a).) The City of Davis ("the City"), as the "public water system" that will supply water to the Project, is required to prepare this water assessment. (Wat. Code, §§ 10910, subd. (b), 10912, subd. (c).)

In 2003, the City served a population of approximately 67,740 through nearly 16,000 water service connections in its service area. The City's service area includes areas within the Davis city limits, as well as the Willowbank and El Macero areas. The City currently relies solely on local groundwater resources to serve its customers. The City's right to use this groundwater was established in 1917 upon incorporation as a city, based on the understanding that groundwater rights are an incident of land ownership that allows a land owner to generally withdraw for "reasonable use." (AWWA Manual M50; see Wat. Code, § 10910, subd. (d).)

In 1992, the City began to shift its groundwater extraction from the intermediate aquifer (300-600 feet below ground surface) to the deep aquifer (below 700 feet). The City now produces about 25-30 percent of its water supply from deep wells, with the goal of increasing reliance on the deep aquifer to at least 60 percent of total water production by 2010. (Appendix A: Historical water data; see also slide, NRC Slide Presentation: 10/25/04). In furtherance of this goal, all new wells within the City's water service area are required to be designed and constructed to be screened into the deep aquifer.

The City Council approved the Urban Water Management Plan ("UWMP") in 2001. The City plans to prepare and submit an update in 2005 as required by the Urban Water Management Planning Act for agencies serving more than 3,000 customers and/or supplying more than 3,000 acre-feet of water annually. (Wat. Code, §§ 10617, 10620 et seq.)

The Project site was included in the City's General Plan area from 1987-2001, and therefore was anticipated in water planning efforts during this period. The 2001

General Plan deleted the Project site from the City's land-use planning area. For this reason, the 2001 UWMP did not specifically address water demands associated with the Project. (Wat. Code, § 10910, subds. (c)(1)-(4), (h).) Consequently, the City must include in this water assessment "a discussion with regard to whether the public water system's total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system's existing and planned future uses, including agricultural and manufacturing uses." (Wat. Code, § 10910, subd. (c)(3).) While the City relies in part on data included in the most recent UWMP, this water assessment necessarily includes additional data regarding the water demands associated with this Project. [1] (See Wat. Code, § 10910, subd. (f).)

Water Demand

The Water Code requires that a water supply assessment anticipate water demand for "the proposed project, in addition to the public water system's existing and planned future uses" over the next 20 years. (Wat. Code, § 10910, subd. (c)(3).)

In 2003, existing City water customers used 14,546 acre-feet per year (afy) of water. (Department of Water Resources 2003 Annual Water Report, attached in Appendix A.) While there is no statutory definition for "planned future uses," the Department of Water Resources ("DWR") suggests that "planned future uses are those that would be undertaken within the same time frame as the project under consideration." (Department of Water Resources, Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001 (2003) p. 23 (hereafter Guidebook).)

The City's current General Plan projects a maximum population of 64,000 in 2010, with a corresponding water demand of 15,531 acre-feet per year (afy). (City of Davis, General Plan Update (2001) pp. 85, 200; see also City of Davis, Urban Water Management Plan (2001) p. 15 (hereafter UWMP) [water usage broken down by sector].) To date, no other proposed uses of water meeting the definition of "project" in Water Code section 10912 "are considered to be moving towards construction" in the City's service area for the purposes of inclusion in the demand projections. (Guidebook, *supra*, at p. 23.) Thus, the General Plan projected demand of 15,531 afy reflects the City's 20-year water demands for the purposes of this assessment.

[1] / In addition, the City includes information in this water supply assessment from the 1999 Deep Aquifer Study, the 2002 Joint Water Supply Feasibility Study completed in cooperation with UC Davis, and other relevant studies and reports regarding local and regional groundwater resources. (See Appendix A.) The City also relies on its knowledge and experience in operating its groundwater system.

As part of its General Plan process, the City has not estimated development occurring after 2010. For this reason, the General Plan does not provide a basis for projecting demand 20 years into the future. Although not based on planning documents, there is a basis for estimating projected demand beyond the 2010 planning horizon used in the General Plan. The City has estimated long-range projected water demand based on a 2002 Joint Water Supply Feasibility Study prepared by the City and the University of California at Davis:

2005	2010	2015	2020	2025
14,935 afy	15,826 afy	16,769 afy	17,769 afy	18,829 afy

These projections are based on the assumption that water demand will increase over time, proportional to a population increase of between 0.8 to 1.6 % each year. The projections are not identical to, but generally correspondent with, demand projections in the General Plan and UWMP. [2]

Annual demands during dry and multiple dry years are expected to be the comparable to or less than in normal years, as a reflection of voluntary conservation efforts and, in the event of severe drought conditions, mandatory conservation measures set forth in the UWMP. (UWMP, *supra*, at pp. 11-14, 18-19, 31-39.)

The City plans to meet these anticipated 20-year water demands by completing its pending deep replacement well capacity project and requiring new development projects to obtain adequate additional supply capacity from the deep aquifer to meet their corresponding demands. (See Project Information for Notice of EIR Preparation: Davis Well Capacity Replacement (October 2004); City of Davis, General Plan Update (2001) p. 204 [Policy Water 1.3: City policy to require adequate water supply for all future development].)

The proposed Covell Village Project has two scenarios: the applicant's proposed Project with a population of 3,845 and a higher density alternative being considered in the EIR with a population of 5,125. Within the 20-year projection horizon, the Project will likely be at full buildout, with estimated water demands as follows:

[2] / City of Davis & UC Davis, Joint Water Feasibility Study (2002) pp. 4-1 to 4-6 and Figure 4-1; see also UWMP, *supra*, at p. 15 (includes projections through 2020 broken down by use sector); City of Davis, General Plan Update (2001) p. 200 (2010 water demand).

	Applicant-Proposed Covell Village Project	High Density Alternative Covell Village Project
Population	3,845	5,125
Average Daily Demand (Gallons Per Capita / Day)	205 gpcd	205 gpcd
Average Daily Demand (Million Gallons / Day)	0.788 mgd	1.051 mgd
Total Demand (Acre Feet / Year)	883 afy	1,177 afy
Peak Demand (Avg. Day x 3)	2.37 mgd	3.15 mgd
Fire Protection	0.36 mgd	0.36 mgd
10 Percent Reserve	0.237 mgd	0.315 mgd
Total Peak Demand During Max. Month (Peak+Fire+Reserve)	2.967 mgd or 2,060 gpm (gallons / minute)	3.825 mgd or 2,656 gpm (gallons / minute)

The peak demand for the high density alternative is probably conservative, since the smaller homes and lot sizes associated with that alternative would likely generate less yard watering demand per capita, reducing demand to less than 205 gpcd.

Supporting data for these Project demand projections are summarized in Department of Water Resources 1999-2003 Annual Water Report, attached in Appendix A. As indicated above, demand in dry years is expected to be comparable to or less than in normal years. The methodology used to calculate peak demand capacity requirements for the project is based on observed system requirements and the 1989 Master Water Plan (Page 4-2). Peak demand calculations are necessary to ensure that new capacity developed for the project meets all projected demands without impacting the existing level of service.

In summary, the projected water demands of existing and planned future uses in 2010, in addition to the Project at buildout, will be between 16,414 and 16,708 afy. Projecting out to 2025 yields an estimated demand of 19,712 to 20,006 afy.

Water Supply

The City's existing water supply system consists of 17 intermediate depth wells, 4 deep wells, one elevated water storage tank (200,000 gallon capacity) and one above-ground, pre-stressed concrete water storage tank (4-million gallon capacity). Appendix A contains the 2003 Well Location Map which indicates the layout of the City's existing well water system, and the Well Depth and Screening Intervals graphic which indicates the screening intervals through which water is extracted from each City well.

The City produced 14,546 acre-feet of groundwater to meet water needs during the calendar year 2003. During 2002, the City produced 15,110 acre-feet to meet its entire system demands. (See Appendix A for well production data for the past five years; Wat. Code, § 10910, subd. (f)(3).) The current City water system can provide water supplies for existing customers.

The Project includes the development of one to two additional well(s) to meet all of its peak demands without impacting the City's existing water system or level of service.

During variable hydrologic conditions, the City's water well system is expected to be reliable for meeting recent levels of demand without necessitating the need for demand reductions. The City has reduced per capita water use by approximately 15 percent comparing recent data to the historic average of 230 gpcd. (see Appendix A) During extended dry periods the City would institute further demand reduction measures including implementation of contingency plans set forth in the UWMP as necessary to ensure water levels do not drop below pump set levels . (UWMP, *supra*, at pp. 31-39.)

The City's plans to shift groundwater extraction from the intermediate to the deep wells reduce the probability of impacts resulting from prolonged dry periods. The reduction in the risk of adverse impacts is due to the fact that the deep and intermediate aquifers are separated by a very thick clay layer that prevents interaction between the two aquifers. (City of Davis, Deep Aquifer Study (1999) p. 4-23). The intermediate depth aquifer is more shallow, has faster recharge, and reacts more immediately to changes in hydrologic conditions than the deep aquifer (*Id.* at p. 4-23, 5-5, et al). Therefore diversifying reliance amongst the two aquifers reduces the probability of impacts from prolonged dry periods that most directly impact the shallower aquifers.

Annual Water Supplies
2003 Calendar Year

Source	Normal Year	Single Dry Year	Multiple Dry Year
Deep Wells	3,636 afy	3,636 afy	3,636 afy
Intermediate Wells	10,910 afy	10,910 afy	10,910 afy
Total Production AFY	14,546 afy	14,546 afy	14,546 afy

The City is not projecting reduced water supplies as a result of a short duration dry period (up to four years), based on its experience from recent droughts, including the 1986-1992 drought, and diversification of supplies amongst the intermediate and deep aquifers accomplished since the most recent dry period. (See also UWMP, *supra,* at pp. 18-19.)

The City will continue to replace older intermediate depth wells with new, better constructed and higher quality deep wells as part of its capital improvement program. The City is currently completing a Deep Replacement Well EIR to allow the next 4-6 deep replacement well projects to move forward in a timely fashion to maintain the integrity of the existing water system and improve water quality for both drinking and wastewater discharge purposes. These deep replacement wells will primarily be located in the southern and eastern portions of the City service area, far from the Project. (Project Information for Notice of EIR Preparation: Davis Well Capacity Replacement (October 2004) at pp. 2-3 & Figure 3.)

The City's overall ability to supply water to its customers is not expected to vary significantly as a result of well replacement projects because the purpose is to replace lost well capacity in order to provide existing customers with a reliable level of service. Thus, the City will meet its projected supply requirements by developing necessary additional supply capacity from the deep aquifer. The City plans to locate these additional deep wells primarily in the central, southern and eastern portions of its service area where lost well capacity has occurred or where intermediate-depth well capacity will be phased out as replacement deep well capacity is brought online.

The City will continue to obtain supply for existing and planned future uses from existing intermediate and deep wells in amounts consistent with historical levels and the physical and water quality limitations of each individual well. (See Appendix A for historical well production data; Wat. Code § 10910, subd. (f)(4).) As the City develops deep replacement wells as discussed above, pumping from those new wells will replace declining quality and capacity of existing intermediate-depth wells.

Additional Supply for the Project

The City's existing and replacement well infrastructure cannot meet the additional water pumping demands associated with completion of the Project. Therefore, the Project applicant will cooperate with the City to site and develop one to two additional deep wells to supply water for the Project, which will be connected to the existing City infrastructure. (Wat. Code, § 10911.)

The City has installed four deep aquifer wells, and thus has experience with the reliable yield of wells screened in this aquifer. Based on this experience, available evidence indicates one or two wells will provide adequate pumping capacity to serve the Project's needs and that the deep aquifer will support this additional pumping. The exact location of each well and whether one or two wells will ultimately be necessary to serve the Project will depend on the results of test wells drilled as part of the well development process.

Costs and Financing
The Project applicant will be required to pay for 100 percent of the up-front costs of developing the required water supply capacity to meet Project demands. The costs of developing the necessary water supply improvements will be credited against the required water connection fees the City would normally collect for the Project to finance the MPFP (Major Projects Financing Plan, established to ensure new development pays for required improvements). Therefore, actual costs borne by the Project applicant to bring necessary water supply capacity online will be credited against the water connection fees for the Project.

Permits and Approvals
The City's current water supply permit from the State of California Department of Health Services will be amended to include the water well capacity provided for the Covell Village Project. The California Department of Health Services (DHS) would likely be involved in assessing the suitability of potential well locations as well as design and construction aspects of additional well capacity to be added to the City's water system permit. In addition, development of the Project wells may require consultation with or approval from the California Department of Fish and Game, the Regional Water Quality Control Board, and/or the Yolo-Solano Air Quality Management Board.

Timeline for Completion
The City and the Project applicant will negotiate a schedule for completing the additional deep well capacity for the Project prior to Tentative Map approval. The additional capacity will be brought online concurrently with Project demands, as development is phased. Actual timing of well completion will be tied to

occupancy permits. Ensuring that demands of the Project are met utilizing Project well capacity will eliminate the potential for negatively impacting the existing water system level of service. The actual timeline will be dependent upon future progress of the Project

Groundwater Basin Description

There have been many studies conducted regarding the groundwater resources in Yolo County. The regional groundwater basin is not adjudicated, nor is it covered by any groundwater management plan. (Wat. Code, §§ 10631, subd. (b)(1), 10910, subd. (f)(2).) The California Department of Water Resources has not determined that the groundwater basin in Yolo County is over-drafted. (See DWR Bulletin 118 for Groundwater Basin Number 5-21.67, updated 2/27/04; Wat. Code, § 10910, subd. (f)(2).) Since the construction of Indian Valley Reservoir and conveyance of surface waters through the Cache Creek system to farmers in Yolo County, shallow water well levels seem to have stabilized and in some cases recovered since those improvements have been in place. (DWR, groundwater level data for certain Yolo County wells).

The Davis area is part of the Sacramento Valley groundwater basin. There are no extensive barriers to north-south groundwater flow from the Montezuma Hills to Stony Creek on the west side of the Sacramento Valley. The Plainfield Ridge, an extension of the Dunnigan Hills anticline, creates a minor restriction to east-west groundwater flow just west of the City, but there are no other major restrictions to horizontal groundwater flow in the area. (DWR, 1978; see also, DWR Bulletin 118, 2004.)

The productive aquifers in the Davis area of Yolo County occur in the Plio-Pleistocene and younger deposits discussed above. In some areas of Yolo County, the very productive sands and gravels of the Tehama Formation are wide in extent, but in most areas they are thin, discontinuous layers between silt and clay deposits. The aquifers below 200 feet tend to be confined, having little short-term interaction with the shallow water table. In much of the eastern portion of the county, productive aquifers are found up to 700 feet below ground surface. Few productive aquifers are found in the 700 to 1,000 foot depth range. In the area around Davis (especially to the west), good quality water is also found in the Tehama Formation at depths of approximately 1,200 to 1,500 feet. The base fresh water is between 2,600 and 2,700 feet below surface, near the contact between the Tehama Formation and the underlying Miocene marine sediments according to natural gas well logs from the area and DWR (City of Davis Deep Aquifer Study).

Recharge to the aquifers in the Davis area comes from a number of sources. Deep percolation of irrigation water and rainfall are major components of groundwater recharge. Other significant sources include infiltration in streambeds, channels, and the Yolo Bypass. Relatively coarse-grained deposits line both Putah Creek and Cache Creeks, allowing substantial infiltration. For example, Criss and Davisson (1995) found that water from Putah Creek has infiltrated the intermediate aquifer at a horizontal rate of 60 meters per year since Monticello Dam was built in 1957. The dam is located upstream and to the west of the study area (City of Davis Deep Aquifer Study).

Vertical interaction between aquifers at different depths takes place gradually. In the intermediate zone (200-700 below surface), vertical continuity has been increased by the substantial numbers of wells that have been screened at all productive zones. This causes the well columns to act as open pipes to equalize the water pressure of aquifers at different depths (City of Davis Deep Aquifer Study).

Pumping from confined intermediate depth aquifers in Yolo County has caused approximately two feet of subsidence in the area between the cities of Davis and Woodland, 8 miles to the north of the study area. Four feet of subsidence has occurred near Zamora, 16 miles north of the study area. This subsidence is due to a lowering of water pressures in the aquifers below their historical minimums, and the subsequent one-time extraction of water from the fine-grained inter-layers as they are compressed by differential pressure (City of Davis Deep Aquifer Study).

The deep aquifer has the characteristics of a confined aquifer system based on observed calculated storage coefficient values from the City of Davis Deep Aquifer Study (March, 1999). In the same study, the deep aquifers were found to be very confined and receive little downward vertical leakage. This means that the vertical recharge area for the deep aquifer zone extends well beyond the boundaries of the City and UC Davis area even for moderate amounts of pumping. While no horizontal sources of recharge or constant head boundaries for the deep aquifer zone were identified it is ascertained that some horizontal recharge may come from the areas where the Tehama formation surfaces such as at the Plainfield Ridge and near the foot of the Coast Range (City of Davis Deep Aquifer Study).

The study also recommended future exploration in the deep aquifer should concentrate on the center of the City and areas to the north where the Project is located (City of Davis Deep Aquifer Study). High water quality is expected from the deep aquifer zone in those portions of the City.

In summary, the deep aquifer has the following characteristics:

1. It appears to exist throughout the study area, but may be less predominant toward the east;
2. It conducts water moderately well in the horizontal direction;

3. It is highly confined, meaning that future deep wells in the study area could interfere with each other and draw recharge water from a wide area;
4. Has chemical and isotopic water quality characteristics which are distinct from the intermediate aquifer zone;
5. Has overall better water quality than intermediate depth wells;
6. Has higher arsenic, manganese and temperature than intermediate depth wells, especially in the eastern portion of the study area;
7. The City's west area deep wells and UC Davis deep wells appear to be tapping similar deep aquifer zones. However the geologic connectivity seems to fade going east from the western area of the City based on the 2004 pump test data; and
8. There appears to be annual recharge of the deep aquifer, although at a slower rate than for intermediate depth zones.

Studies have indicated that water from the deep aquifer is generally of higher quality than water from the intermediate aquifer. (UWMP (2001), pp. 7-9; Deep Aquifer Study (1999), p.1-5.) This information indicates that water from the deep aquifer is a suitable water supply. This may be due, in part, to the thick clay layer that separates the deep aquifer from shallower aquifers, which impedes the percolation of trace constituents from the intermediate aquifer to the deep aquifer. Also, the intermediate aquifer is far more susceptible to the influences of surface contamination sources. The City will continue to monitor groundwater quality in both aquifers, to ensure that the City provides its customers with quality drinking water that meets or exceeds all federal and state standards.

Assessment of Project Impacts

Assessing possible impacts of the development of one to two additional wells in on the City's groundwater supply will include consideration of the following:

1. Impact to existing City owned and operated wells;
2. Impact on planned deep replacement wells; and
3. Regional impacts

Proximity to existing City owned and operated wells
The 2003 Well Location Map in Appendix A indicates that the City has no existing deep wells in the vicinity of the Covell Village property where new deep wells would be constructed to meet Project demands. The exhibit indicates, by a circle around each well, the sphere of influence of each existing well. The red circles are around existing City deep wells (#30, #31 and #29) and blue circles around existing intermediate depth wells. Since the Project is required to develop deep wells, only the impact on deep wells is assessed for the purposes of this

analysis. [3] The City is currently considering a plan to develop 4 to 6 deep replacement wells, all of which are planned to be located in the central, south and eastern areas of the existing water system far from the Project. One well could be located near the Project should the other nine sites not prove to be feasible locations. (Project Information for Notice of EIR Preparation: Davis Well Capacity Replacement (October 2004) at pp. 2-3 & Figure 3.)

Impact on planned deep replacement wells

The City is currently preparing a Well Replacement Capacity Project EIR to enable new deep wells to be installed in place of old intermediate depth wells that have already been taken out of service or will be upon development of replacement capacity. (*Ibid.*) The EIR proposes that replacement wells would be primarily located in the eastern and southern areas of the City water service area, although one or more of the replacement wells may be located near the deep wells proposed for the Project should the other locations prove to be infeasible well sites. (*Ibid.*) Nonetheless, it would appear that the resultant deep well network, taking into account the City's existing and planned deep wells and Project wells, will result in a widely dispersed deep well network located throughout the service area. Further study will be necessary to conclude whether this would enable all deep wells to operate without causing excessive impacts from well interference. [4]

Based on current information, it would appear that if there are impacts from the resultant deep well network, impacts would be minimal and not result in depleting the deep aquifer or cause negative interference or drawdown impacts. This conclusion is validated by the long-term drawdown modeling completed in the 1999 Deep Aquifer Study, which assumed a City deep well pumping capacity of 21,000 afy over the next several decades in the analysis along with deep wells in the UC Davis service area. The study concluded that significant drawdown could occur at this rate of deep aquifer extraction. By contrast, current demand projections including full buildout of the Project would result in pumping a maximum of approximately 14,000 afy from a combination of deep and intermediate wells, 1/3 less than the amount the study assumed would be pumped every year from the deep aquifer alone. This suggests a much lower and more acceptable impact level than the 1999 study predicted.

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[3] / Water currently being used on the Project site is being drawn from the intermediate aquifer. Completion of this Project and its accompanying deep wells, then, will have a positive impact on the intermediate aquifer by reducing demand of this property on the intermediate aquifer.

[4] / The City is currently in the process of conducting a deep aquifer study to be completed in late 2004 or early 2005. The results of this study will enhance the City's understanding of the deep aquifer. In addition, the City and UC Davis are jointly pursuing the possibility of obtaining surface water supply to supplement groundwater extraction in the future, should such measures become necessary to maintain water quality levels in the system. (See City of Davis & UC Davis, Joint Water Feasibility Study (2002).)

Regional impacts
The new deep well(s) for the Project would tap the deep aquifer at depths greater than 700 feet below ground surface. Based on existing pump test data from deep aquifer studies to date, it would appear that there would be minimal impacts, if any, on neighboring City deep wells or on existing intermediate wells serving agricultural needs to the north. Also the Project wells would not cause any significant direct or indirect impacts on deep wells at UC Davis because of the distance between the Project wells and UC Davis deep wells.

Historically most of the groundwater pumping has been by agricultural users from the shallow and intermediate depth aquifers. There is more surface water use than groundwater use by farmers in Yolo County except during dry years when surface water is curtailed and groundwater increases. Urban groundwater use has been increasing for many decades. The reliance on the deep aquifers by urban users is a growing trend due to its higher quality. It would appear that if the agricultural water use were equivalent to 3.0 af/acre/year by the farmer of the Project land, existing groundwater demand would be 1,241 afy, which is more than the 883-1,177 afy projected for the base density and higher density alternatives for the proposed Project. This underscores the observation that typically when converting land from agricultural to urban water use, the resultant urban water use is equal to or less than the agricultural use. In addition, the completion of Project wells will result in shifting water use from the intermediate to the deep aquifer, resulting in a beneficial reduction in reliance on the intermediate aquifer.

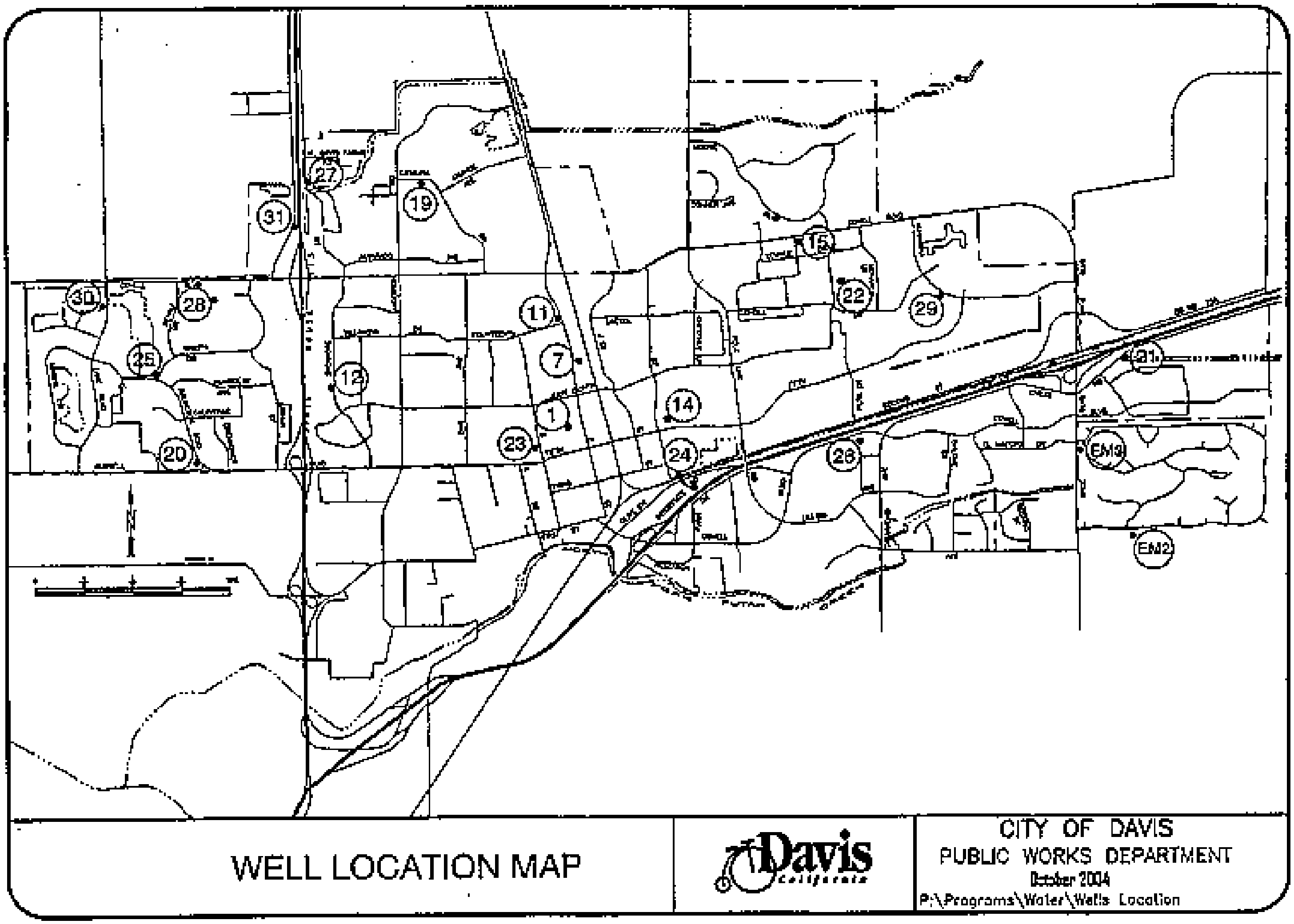
Conclusion
The resultant well network from existing, planned and new development needs will be widely dispersed throughout the service area including the Project property, and will spread the City's water supply reliance over both the deep and intermediate aquifers. Thus, it would appear that no significant impacts would result on deep aquifer users if the Project is approved and necessary deep well capacity is developed for the purposes discussed above. This means that developing a system-wide well capacity of 16,708 afy by 2025, which includes the Project deep well capacity and other intermediate and deep wells in the City system, will not result in any significant impacts on existing or new City water customers.

Sufficiency
Based on available information, the Davis area aquifer system has sufficient source capacity to supply water to existing City customers, new customers anticipated by planned future uses as defined above, and new customers resulting from completion of the Project. (Wat. Code, § 10910, subd. (f)(5).) With regard to pumping capacity, however, the existing infrastructure is inadequate, and

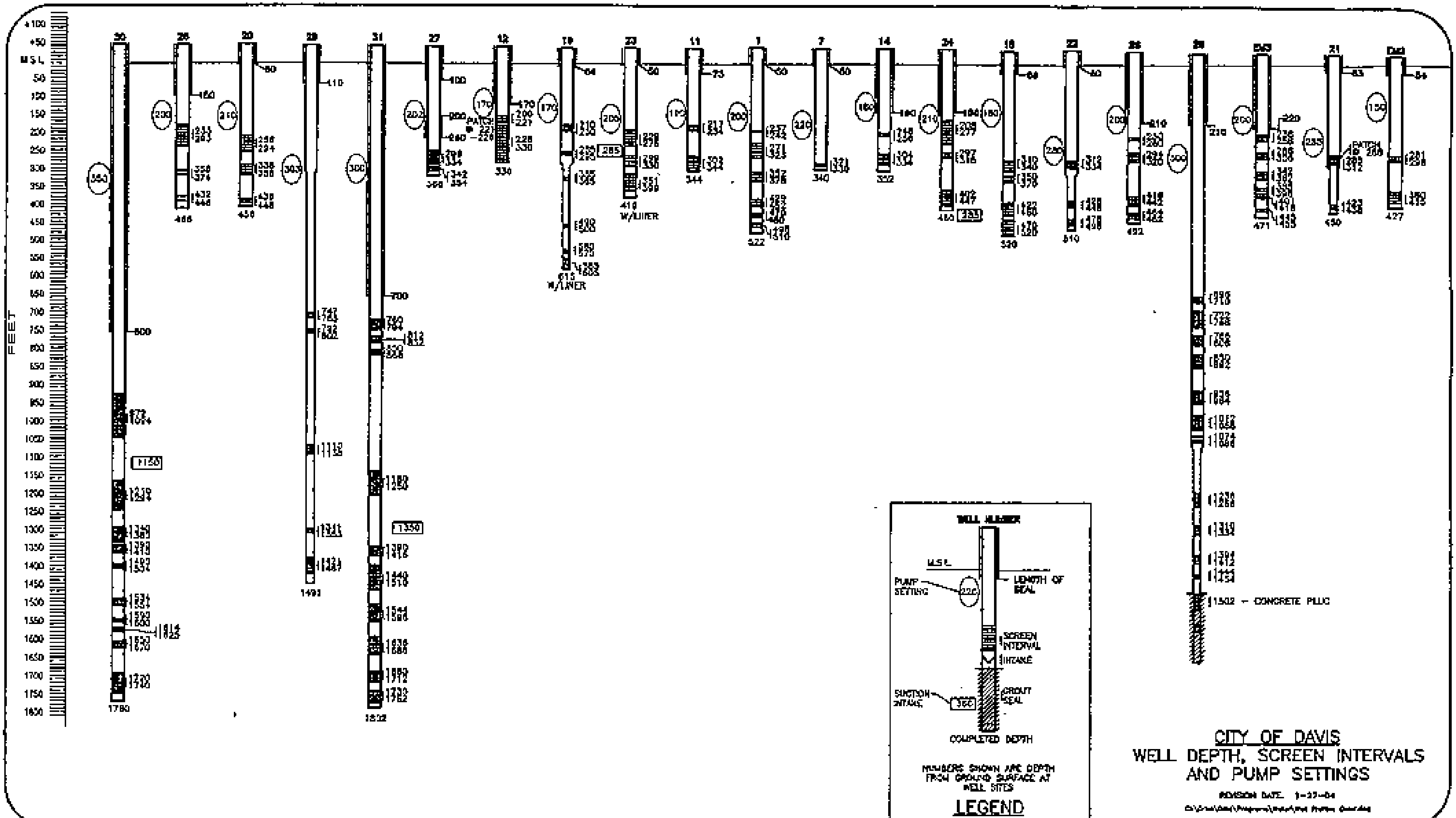
Project demands will be served out of additional capacity added by deep wells developed by the Project applicant in cooperation with the City.

APPENDIX A

City of Davis Well Location Map
City of Davis Depth and Screen Interval Figure
Historical and Projected Annual Water Demands (WS Feasibility Study, 2002)
Last Five Years of Production/Demand Data (DWR Reports)
Graph of Recent Intermediate/Deep Aquifer Production (NRC, 10/25/04)
Deep Aquifer Study (Executive Study)
DWR Bulletin 118 (excerpt for Yolo County Basin)
City of Davis Well Capacity Replacement Project Information
Deep Well Impact Map



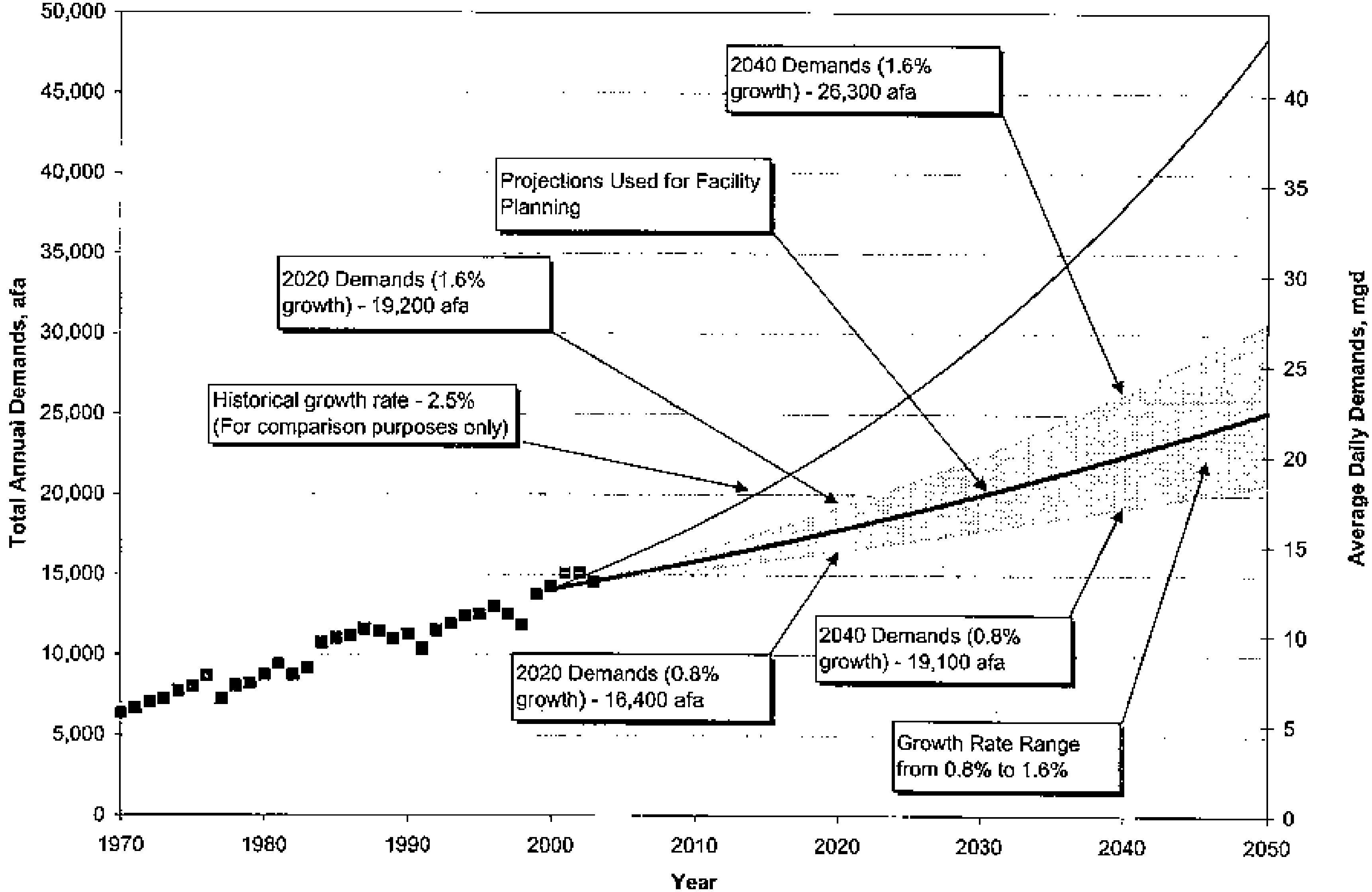
WELL NO.	LOCATION
1	617 E Street
7	800 11th Street
11	1405 F Street
12	921 Sycamore Lane
14	530 L Street
15	1812 Manzanita
19	2857 Catalina Drive
20	2300 Evenstar Lane
21	5050 Chiles Road
22	1414 Tulip Lane
23	527 B Street
24	1600 Olive Drive
25	1188 Arlington Blvd.
26	2850 Cowell Blvd.
27	3000 Sycamore Lane
28	2101 Glacier Drive
29	3535 Alhambra Drive
30	1819 Lake Blvd.
31	2074 John Jones Rd.
EM2	44285 S. El Macero Dr. (Standby)
EM3	800 Mace Blvd.



CITY OF DAVIS
WELL DEPTH, SCREEN INTERVALS AND PUMP SETTINGS

REVISION DATE 1-27-04

Figure 4-1.
CITY OF DAVIS
Historical and Projected Annual Water Demands



Jacques FYI

State of California | Department of Water Resources | The Resources Agency

PUBLIC WATER SYSTEM STATISTICS

Calendar Year 2003

Davis, City of
Bob Schoech
Principal Utility Program Supervisor
1717 Fifth Street
Davis CA 95616

PWS # 5710001 CD

1. General Information

Please follow the guidelines on the back of this form.

Contact: **Bob Schoech**
Title: Principal Utility Program Supervisor
Phone: **(530) 757-5677**
Fax: **(530) 758 4738**
Communities served: **Davis, El Macero, Willowbank**
County: **Yolo**
Population served: **67,740**

2. Active Service Connections

Complete this portion if the system serves all or part of an incorporated city

Customer Class	Recycled Water	Potable Water Metered	Potable Water Unmetered	Inside City Limits Metered	Inside City Limits Unmetered	Outside City Limits Metered	Outside City Limits Unmetered
Single Family Residential	NA	14232		13681		551	
Multi-family Residential	NA	521		521			
Commercial/Institutional	NA	607		607			
Industrial	NA	32		32			
Landscape Irrigation	NA	530		530			
Other (city)	NA						
Agricultural Irrigation	NA						
TOTAL	NA	15922		15371		551	

3. Total Water Into the System - Units of production:

☐ acre-feet ☒ million gallons ☐ hundred cubic feet

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Potable	*Wells*	213.2	205.4	283.6	295.7	414.0	582.3	631.8	631.7	534.0	493.1	252.4	203.2	4,740.5
	Surface													
	Purchased [1/]													
	Total Potable	213.2	205.4	283.6	295.7	414.0	582.3	631.8	631.7	534.0	493.1	252.4	203.2	4,740.5
Recycled [2/]														

1/ Potable Wholesale supplier(s): ______

2/ Recycled wholesale supplier(s): ______

Level of treatment: **Well head chlorination with sodium hypochlorite**

4. Metered Water Deliveries - Units of delivery:

☐ acre-feet ☒ million gallons ☐ hundred cubic feet

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
A. Single Family Residential		162.4		248.5		460.7		626.0		467.1		208.8	2173.6
B. Multi-family Residential		108.1		141.0		160.5		215.6		182.6		120.0	947.8
C. Commercial/Institutional		51.5		68.7		99.1		134.1		108.0		55.3	516.7
D. Industrial													
E. Landscape Irrigation		2.2		10.0		25.0		38.1		25.2		5.5	106.0
F. Other (city facilities, unaccounted)		94.4		111.1		231.0		249.8		244.2		66.0	996.4
Total Urban Retail *(A thru F)*		418.7		579.3		996.4		1263.5		1027.0		455.7	4740.5
Agricultural Irrigation													
Wholesale (to other agencies)													

DWR 38 (Rev. 03/02)
(modified by City of Davis)

Jacquy

State of California — Department of Water Resources — The Resources Agency

PUBLIC WATER SYSTEM STATISTICS

Calendar Year 2002

Davis, City of
Bob Schoech
Principal Utility Program Supervisor
23 Russell Boulevard
Davis CA 95616

PWS # 5710001 CD

1. General Information

Please follow the guidelines on the back of this form.

Contact: **Bob Schoech**
Title: **Principal Utility Program Supervisor**
Phone: **(530) 757-5677**
Fax: **(530) 758 4738**
Communities served: **Davis, El Macero, Willowbank**
County: **Yolo**
Population served: **66,700**

2. Active Service Connections

Complete this portion if the system serves all or part of an incorporated city

Customer Class	Recycled Water	Potable Water Metered	Potable Water Unmetered	Inside City Limits Metered	Inside City Limits Unmetered	Outside City Limits Metered	Outside City Limits Unmetered
Single Family Residential	--			13876		124	427
Multi-family Residential	--			514			
Commercial/Institutional	--			595			
Industrial	--			32			
Landscape Irrigation	--			242			
Other (city)	--			227			
Agricultural Irrigation	--						
TOTAL	--			15486		124	427

3. Total Water Into the System - Units of production:

☐ acre-feet ☒ million gallons ☐ hundred cubic feet

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Potable	*Wells*	204.6	200.5	279.0	387.4	494.3	586.2	634.5	574.4	597.8	479.3	279.8	206.2	4,924.0
	Surface													
	Purchased [1/]													
	Total Potable	204.6	200.5	279.0	387.4	494.3	586.2	634.5	574.4	597.8	479.3	279.8	206.2	4,924.0
Recycled [2/]														

1/ Potable Wholesale supplier(s):

2/ Recycled wholesale supplier(s):

Level of treatment: **Well head chlorination with sodium hypochlorite**

4. Metered Water Deliveries - Units of delivery:

☐ acre-feet ☒ million gallons ☐ hundred cubic feet

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
A. Single Family Residential		184.6		291.9		539.2		622.1		456.4		211.7	2306.0
B. Multi-family Residential		125.5		139.5		197.9		209.9		177.4		132.9	983.1
C. Commercial/Institutional		51.5		72.4		119.3		130.5		99.2		77.8	550.7
D. Industrial													
E. Landscape Irrigation		3.1		11.2		28.1		33.9		22.0		5.5	103.8
F. Other (city facilities, unaccounted)		40.4		151.4		195.9		212.5		322.2		58.1	980.6
Total Urban Retail *(A thru F)*		405.1		666.4		1080.5		1208.9		1077.2		486.0	4924.1
Agricultural Irrigation													
Wholesale *(to other agencies)*													

DWR 38 (Rev. 03/02)
(modified by City of Davis)

State of California — Department of Water Resources — The Resources Agency

PUBLIC WATER SYSTEM STATISTICS

Calendar Year 2001

Davis, City of
Bob Schoech
Principal Utility Program Supervisor
23 Russell Boulevard
Davis CA 95616

5710001

1. General Information

Please follow the guidelines on the back of this form.

Contact. Bob Schoech
Title: Principal Utility Program Supervisor
Phone: (530) 757-5677
Fax: (530) 758 4738
Communities served: Davis, El Macero, Willowbank
County. Yolo
Population served. 65,110

2. Active Service Connections

Complete this portion if the system serves all or part of an incorporated city

Customer Class	Recycled Water	Potable Water Metered	Potable Water Unmetered	Inside City Limits Metered	Inside City Limits Unmetered	Outside City Limits Metered	Outside City Limits Unmetered
Single Family Residential	–			13646		124	427
Multi-family Residential	–			513			
Commercial/Institutional	–			} 618			
Industrial	--						
Landscape Irrigation	–			244			
Other (city)	--			234			
Agricultural Irrigation	--			--			
TOTAL	--			15255		124	427

3. Total Water Into the System - Units of production:

☐ acre-feet ☒ million gallons ☐ hundred cubic feet

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Potable	*Wells*	218 0	190.7	292 7	337.0	560.8	607 6	622 6	621.3	538.1	458 4	272.7	190.9	4910.8
	Surface													
	Purchased [1/]													
	Total Potable	218.0	190 7	292 7	337 0	560 8	607.6	622.6	621.3	538.1	458 4	272.7	190.9	4910 8
Recycled [2/]														

1/ Potable Wholesale supplier(s).

2/ Recycled wholesale supplier(s):

Level of treatment. **Well head chlorination with sodium hypochlorite**

4. Metered Water Deliveries - Units of delivery

☐ acre-feet ☒ million gallons ☐ hundred cubic feet

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
A. Single Family Residential		170.9		282.4		589 2		598 2		433.0		198.7	2272.4
B. Multi-family Residential		117 4		139 2		212 6		204.6		181.1		119.6	974.6
C. Commercial/Institutional		49.4		69 5		131.3		139 5		129.8		55 2	574.7
D Industrial													
E. Landscape Irrigation		3 4		11 3		33 9		37.0		22.8		4.6	113 0
F. Other (city facilities)		11.2		39.7		95 1		99.1		67.4		5.9	318.5
Total Urban Retail *(A thru F)*		352.3		542.2		1062.2		1078.4		834.1		384.1	4253.3
Agricultural Irrigation													
Wholesale *(to other agencies)*													

DWR 38 (Rev 03/02)
(modified by City of Davis)

Public Water System Statistics

Calendar Year 2000

Davis, City of
Bob Schoech
Principal Utility Program Supervisor
23 Russell Boulevard
Davis CA 95616

Public Water System Number: 5710001 CD

1. General Information

Please follow the guidelines on the back of this form

Contact: **Bob Schoech**

Title. **Principal Utility Prgram Supervisor**

Phone: **(530) 757-5677**

Fax: **(530) 758-4738**

Communities served:

Davis, El Macero, Willobank

County: **Yolo**

Population served: **61,665**

2. Active Service Connections

Complete this portion if the system serves all or part of an incorporated city

Customer Class	Recycled Water	Potable Water Metered	Potable Water Unmetered	Inside City Limits Metered	Inside City Limits Unmetered	Outside City Limits Metered	Outside City Limits Unmetered
Single Family Residential				13427		117	440
Multi-family Residential				507			
Commercial/Institutional				} 612			
Industrial							
Landscape Irrigation				235			
Other (city)				234			
Agricultural Irrigation							
TOTAL				15015		117	440

3. *Total Water Into the System* - Units of production:

☐ acre-feet ☒ million gallons ☐ hundred cubic feet

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Potable	*Wells*	216 29	183.43	253.69	387.49	437 66	577.7	605.52	596.55	521.54	364.65	239.7	209.33	4593 55
	Surface													
	Purchased [1/]													
	Total Potable	216 29	183.43	253 69	387.49	437.66	577.7	605 52	596 55	521.54	364.65	239 7	209 33	4593 55
Recycled [2/]														

1/ Potable Wholesale supplier(s) ______________

2/ Recycled wholesale supplier(s): ______________

(Bi-monthly)

Level of treatment: **well head chlorination (sodium hypochlorite)**

4. *Metered Water Deliveries* - Units of delivery:

☐ acre-feet ☒ million gallons ☐ hundred cubic feet

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
A. Single Family Residential		171 9		300.2		498 9		551		386.2		201	2109.2
B. Multi-family Residential		111 3		139 4		188 1		196.4		166.7		112 4	914.3
C. Commercial/Institutional		53 5		77		115 8		128.4		99.4		46 8	522.9
D. Industrial													
E. Landscape Irrigation		3 2		12.1		27.4		32 7		20.6		5	101
F. Other (city facilities)		35.5		54 5		69.1		101.5		51.8		7	319 4
Total Urban Retail *(A thru F)*		375.4		583 2		899.3		1010		724.7		374.2	3966.8
Agricultural Irrigation													
Wholesale *(to other agencies)*													

Public Water System Num 5710001 CD

Davis, City of
Bob Schoech
Principal Utility Program Supervisor
23 Russell Blvd.
Davis CA 95616

Public Water System Statistics

Calendar Year 1999

1. General Information

Please follow the guidelines on the back of this form

Contact: *Bob Schoech*

Title: *Principal Utility Program Supervisor*

Phone: *(530) 757-5677*

Fax: *(530) 758-4738*

Communities Served: *Davis / El Macero*

County: *Yolo*

Population Served: *57,280*

2. Active Service Connections

Complete this portion if the system serves all or part of an incorporated city

Customer Class	Recycled Water	Potable Water Metered	Potable Water Unmetered	Inside City Limits Metered	Inside City Limits Unmetered	Outside City Limits Metered	Outside City Limits Unmetered
Single Family Residential				12,940		4	440
Multi-family Residential				491		1	
Commercial / Institutional				563		1	
Industrial				29			
Landscape Irrigation				266			
Other				238			
Agricultural Irrigation				1		1	
TOTAL				14,528		7	440

3. Total Water Into the System

Units of production: acre-feet X million gallons hundred cubic feet

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Potable	Wells	203 28	170 73	211.72	297 93	480 82	531 35	596 64	551 21	497 17	448 71	256 61	231 23	4,477.40
	Surface													
	Purchased [1/]													
	Total Potable	203 28	170 73	211 72	297 93	480 82	531 35	596 64	551 21	497 17	448.71	256.61	231.23	4,477.40
Recycled [2/]														

1/ Potable wholesale supplier(s)

2/ Recycled wholesale supplier(s)

Level of treatment

(Bi-Monthly)

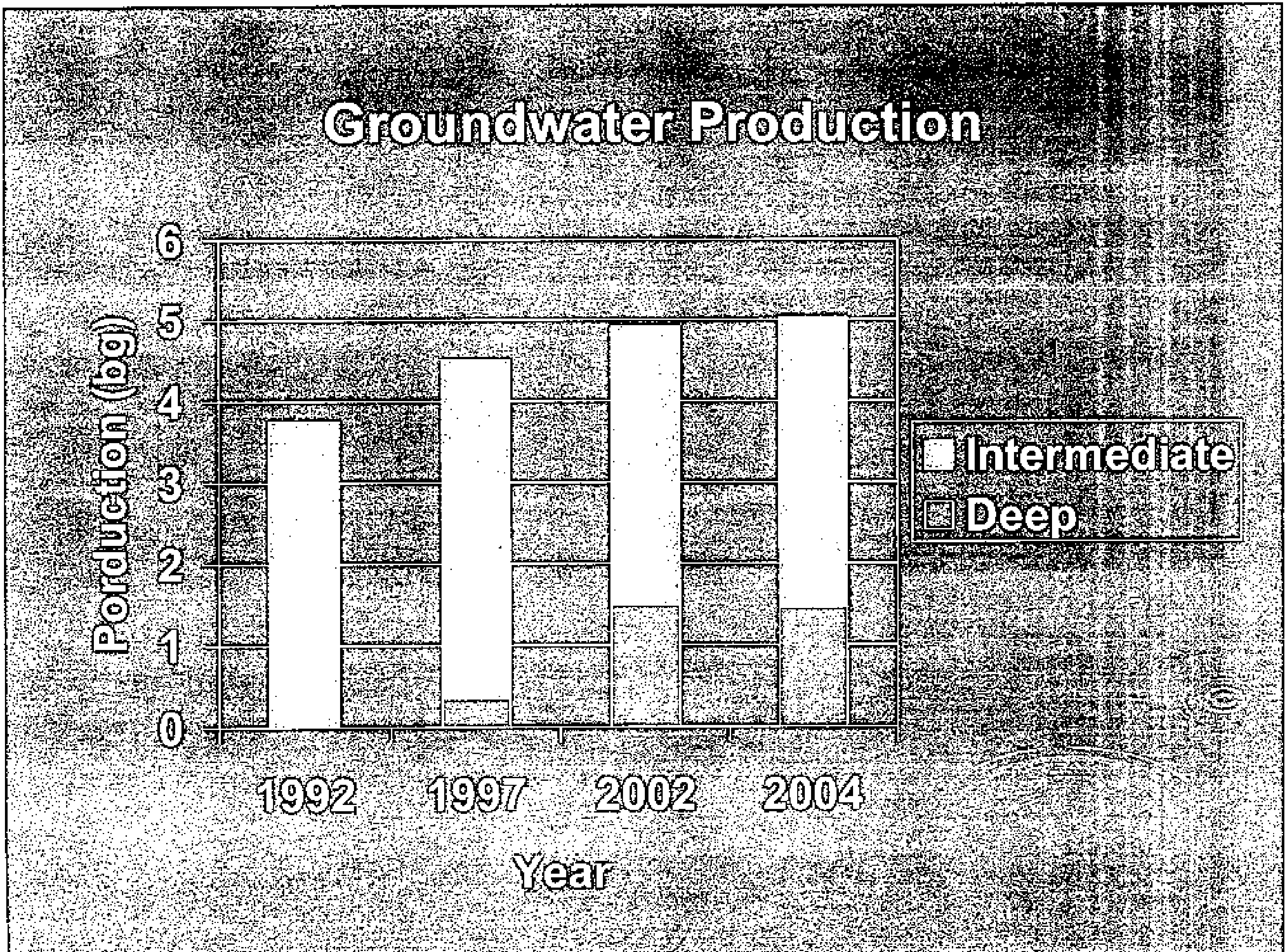
4. Metered Water Deliveries

Units of delivery: acre-feet X million gallons hundred cubic feet

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
A. Single Family Residential		155.57		253 97		495 51		546.44		396.66		226.27	2,074.42
B. Multi-family Residential		101 28		127 64		175.50		182 82		153.40		117 95	858.58
C. Commercial / Institutional		43 56		64 86		111.92		132 19		94 99		60.07	507.59
D. Industrial													
E. Landscape Irrigation		2 30		9 89		28 41		35 22		24.31		7 05	106 98
F. Other *(city facilities)*		0 41		19 18		102.71		139.45		92.77		12 14	366.65
Total Urban Retail (A thru F)		303.11		475 35		914.04		1,036.12		762.13		423.48	3,914.22
Agricultural Irrigation													
Wholesale *(to other agencies)*													

City of Davis
Well Capacity Replacement
EIR

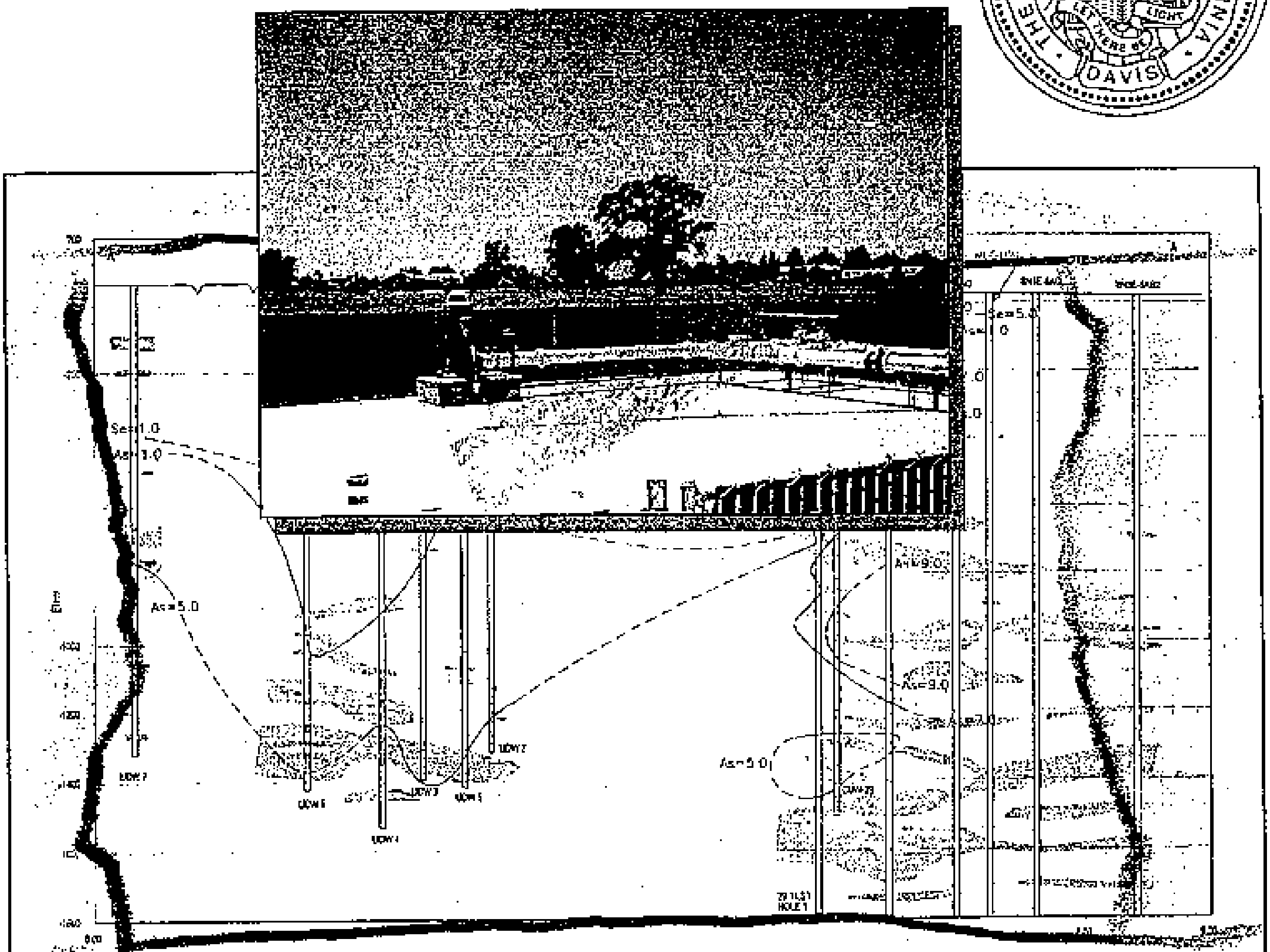
Presentation to
Natural Resources Commission
October 25, 2004



Groundwater Production
Porduction (bg)
6
5
4
3
2
1
0
1992
1997
2002
2004
Year
Intermediate
Deep

CITY OF DAVIS & UNIVERSITY OF CALIFORNIA, DAVIS
HYDROGEOLOGIC INVESTIGATION

Davis
California



FINAL

MONTGOMERY WATSON

WEST YOST & ASSOCIATES

DEEP AQUIFER STUDY

Consulting Engineers
073-97-03

1. EXECUTIVE SUMMARY

The City of Davis (City) currently obtains all its water from groundwater wells, most of them less than 700 feet deep. University of California, Davis (UCD) currently obtains all its domestic water supplies from groundwater wells deeper than 700 feet. UCD obtains water for cooling towers, landscape irrigation, and other utility uses from wells less than 700 feet deep.

Beginning with the City's Water Master Plan in 1989, several studies have recommended that the City use deep wells or treated surface water to supply all its future needs because of water quality problems with intermediate depth wells. The recently completed Draft UCD Water Management Plan contained the recommendation that UCD seek to secure a high quality surface water source to supply new water demands and reduce the use of groundwater. Relevant water resource studies for the City and UCD are listed in Table 1-1.

Table 1-1. Water Resource Studies for the City and UCD

Date	Report	Author
March 1989	City of Davis Water System Management Plan	Brown and Caldwell
March 1990	Supplemental Surface Water Supply Development Program	Borcalli & Associates
May 1992	Yolo-Solano Supplemental Water Supplies: Reconnaissance Level Investigation	Borcalli & Associates
May 1992	Draft, Yolo County Water Plan Update	The Water Task Force of Yolo County
February 1994	SWP Conjunctive Use – Eastern Yolo County	California Department of Water Resources
March 1996	City of Davis, Future Water Supply Study, Phase 2	Montgomery Watson/ West Yost & Associates
October 1997	Draft, UCD Water Management Plan	UC Davis Water Management Task Force

This hydrogeologic investigation was performed as a follow-up to the City of Davis Future Water Supply Study (1996) to obtain more information about the capacity, water quality, and reliability of the deep (greater than 700 ft) groundwater aquifer zone in the vicinity of Davis and UCD. The study area and existing wells are shown in Figure 1-1.

The major questions to be answered by this study included:

- What are the potential impacts of supplying most or all of the City's and UCD's domestic water needs with water from deep wells?

- Should the surface water rights application submitted by the Yolo County Flood Control and Water Conservation District (District) on behalf of the District, Davis, Woodland, and UCD continue to be pursued?

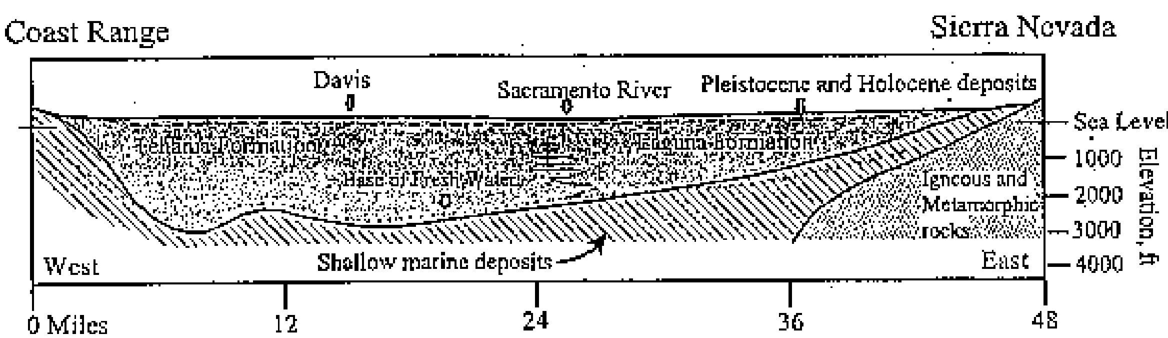
The information needed to answer the above questions was developed through:

1. A review of previous reports and data on hydrogeology for the study area
2. An evaluation of existing and new water quality data from intermediate (200 to 700 feet deep) and deep (greater than 700 feet deep) wells
3. Tests to evaluate how water levels in the deep aquifer responded to pumping
4. A review of longer term pumping versus water level data for UCD deep wells

HYDROGEOLOGY

The generalized geologic cross section for the Sacramento Valley is shown in Figure 1-2. The deep wells in the Davis area are completed into the Tehama Formation, which contains sediments derived from the Coast Range.

Figure 1-2. Sacramento Valley Geologic Cross Section



Source: California Department of Water Resources, 1978

The Davis area is part of the Sacramento Valley groundwater basin. The Plainfield Ridge creates a minor restriction to east-west groundwater flow just west of the City, but there are no other major restrictions to horizontal groundwater flow in the area (California Department of Water Resources, 1978).

The productive aquifers in the Davis area of Yolo County occur in Tehama and younger formations. In most areas of Yolo County, the sands and gravels of the Tehama Formation are thin, discontinuous layers between silt and clay deposits. In much of the eastern portion of the county, productive aquifers are found up to 700 feet below ground surface with few productive aquifers in the 700-foot to 1,000-foot depth range. In the study area (especially to the west), good quality water is also found in the Tehama Formation at depths of approximately 1,200 feet to 1,500 feet. Detailed geologic cross-sections are shown in Section 3 of this report.

Aquifers in the Davis are recharged by a number of sources. Deep percolation of irrigation water and rainfall are major components of groundwater recharge. Other significant sources include infiltration in streambeds, channels, and the Yolo Bypass. Relatively coarse-grained deposits line both Putah and Cache Creeks, allowing substantial infiltration.

Water moves very slowly between aquifers at different depths. In some places, water moves between aquifers through wells which have been screened at a number of different depths. This causes the well columns to act as open pipes to equalize the water pressure of aquifers at different depths.

Pumping from intermediate depth aquifers in Yolo County has caused about two feet of subsidence in the area between the cities of Davis and Woodland. Possible subsidence damage has also been observed in some of the City's intermediate depth wells. This subsidence is due to a lowering of water pressures in the aquifers below their historical minimums, and the subsequent one-time extraction of water from the fine-grained interlayers as they are compressed by differential pressure.

GROUNDWATER PUMPING

Currently the City draws nearly all its water supply from its 20 intermediate depth wells and one deep well (CDW-28). A second deep well (CDW-29) has recently been completed. Water demand for the City is projected to be 15,500 acre-feet per year by the year 2010 and 21,000 acre-feet per year by the year 2035.

UCD currently draws all its domestic water from the deep aquifer zone. The domestic water use by the University was 2,400 acre-feet in 1993. The domestic water use is projected to increase to 2,780 acre-feet per year by the year 2005. If UCD does not obtain surface water or water from other sources, the deep aquifer zone may also be used to supply other UCD water needs in future years.

Hunt-Wesson (Hunts) has a deep well and two intermediate depth wells for its water supply needs. Hunts may add a second deep well in the future. The use of water from the deep aquifer zone in year 2035 by the City, UCD and Hunts could be over seven times as great as at present.

GROUNDWATER QUALITY

Groundwater quality was evaluated for two purposes. The first purpose was to see if there were distinguishing water quality related characteristics between the intermediate and deep aquifer zones. The second purpose was to evaluate the suitability of water from the deep aquifer zone for present and future needs based on water quality considerations.

Chemical Constituents

Chemical water quality parameters between the intermediate and deep aquifer zones are compared in Table 1-2.

Table 1-2. Comparison of Deep and Intermediate Aquifer Water Quality

Parameter	Deep Aquifer, Avg.[a]	Intermediate Aquifer, Avg.[a,b]	Water Quality Limit	Problems at High Levels
Boron, µg/L	780	1080	—	Hurts Sensitive Plants
Nitrate, mg/L	1.4	17.9	45	Blood Oxygen Capacity
Selenium, µg/L	0.8	9.6	50 (drinking) 5 (wastewater)[d]	Chronic Toxicity Waterfowl Health
Electrical Conductivity, µmhos/cm	544	966	900	Taste
Hardness, mg/L	106	353	—	Scale, Deposits
TDS, mg/L	337	577	500	Taste
Arsenic, µg/L	4.4	0.9	50[c]	Cancer Risk
Manganese, µg/L	16	8.2	50	Black Sediment, Stains
Iron, µg/L	40	61	300	Red Sediment, Stains, Taste
pH	8.0	7.9	6.5-8.5	Taste, Scale

(a) Individual wells may have much higher levels of some chemical constituents than the averages shown.
(b) This includes data from all of the DWR, City, and UCD wells used in this study
(c) Arsenic limits may be lowered to 5 µg/L
(d) Wastewater discharge limit

As can be seen in Table 1-2, the average chemical water quality is much better in the deep aquifer than the intermediate aquifer, with the exception of arsenic and manganese. Intermediate depth City wells CDW-16, CDW-10, CDW-17 have all been abandoned because of water quality related problems. Other intermediate depth City wells are used sparingly because of high selenium levels.

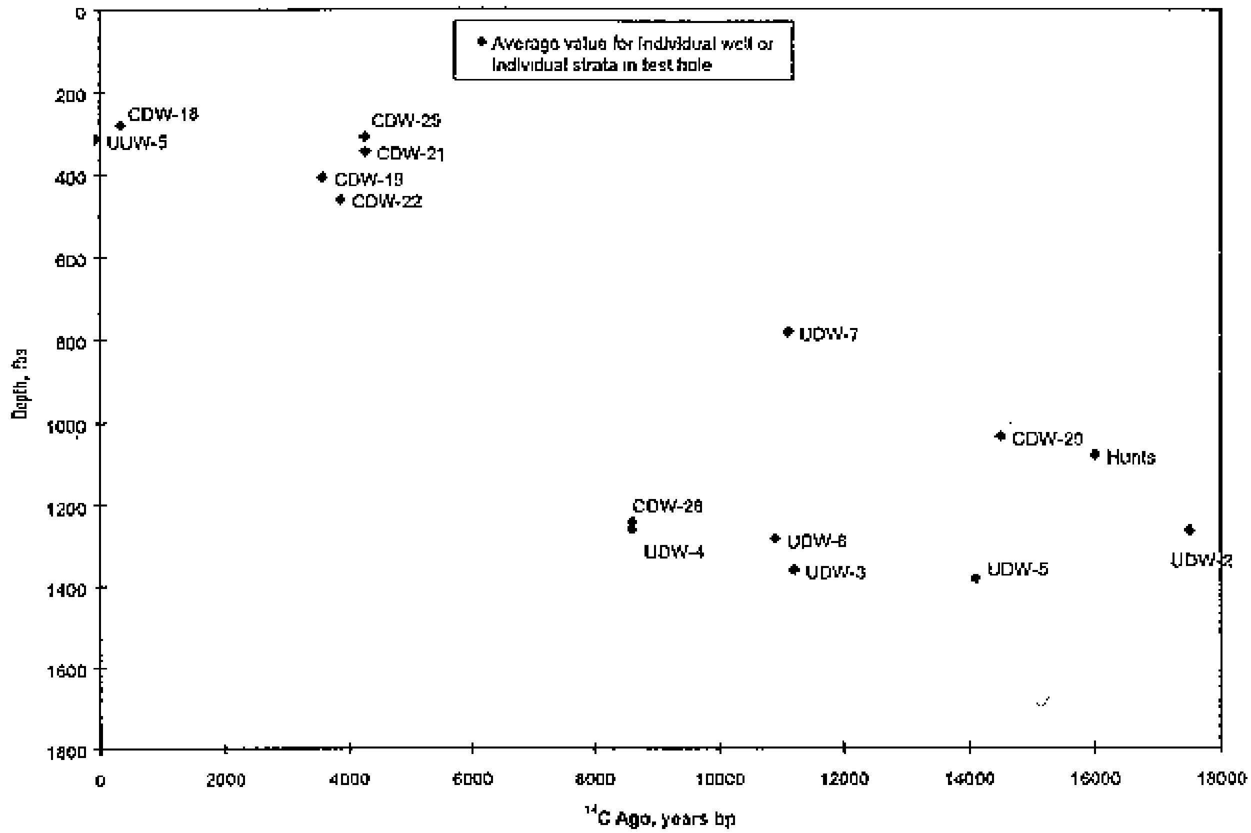
Higher levels of arsenic and manganese occur in samples taken from wells and deep strata in test holes in the eastern portion of the study area relative to the northern and western portions. More data is needed from the eastern portion of the study area to see how widespread this trend is.

Isotopic Characteristics and Age

Concentrations of stable isotopes of oxygen and hydrogen for water from intermediate and deep wells were evaluated to see if there was a distinction based on depth. Water from the deep wells was found to have lower concentrations of oxygen-18 than water from intermediate wells, which indicates that the water in the deep aquifer percolated into the ground during a cooler, wetter climate period.

Carbon-14 dating was also performed on samples from intermediate and deep wells. Water from the deep wells was found to be 8,000 to 17,000 years old, versus water from intermediate wells which is a few hundred to a few thousand years old. Carbon-14 ages versus depth are shown in Figure 1-3.

Figure 1-3. Carbon-14 Age Versus Depth



Potential for Water Quality Deterioration with Time

The intermediate aquifer has become substantially contaminated with nitrate in a period of less than 75 years. The deep aquifer zone is separated from the intermediate zone by substantial clay layers, but some of the UCD deep wells now produce water with small amounts of nitrate. It will probably be at least many decades before deep wells become contaminated with 'substantial amounts of undesirable constituents from the intermediate aquifer zone, but increased pumping from deep wells will accelerate the process.

PUMPING TESTS

Three pumping tests were performed during the 1997 UCD Christmas break. In each of these tests, one well was pumped and the water levels in other wells were monitored for changes. Water levels in the pumping wells were also monitored before, during, and after pumping.

The dates of the pumping tests, wells pumped, and wells monitored are shown in Table 1-3.

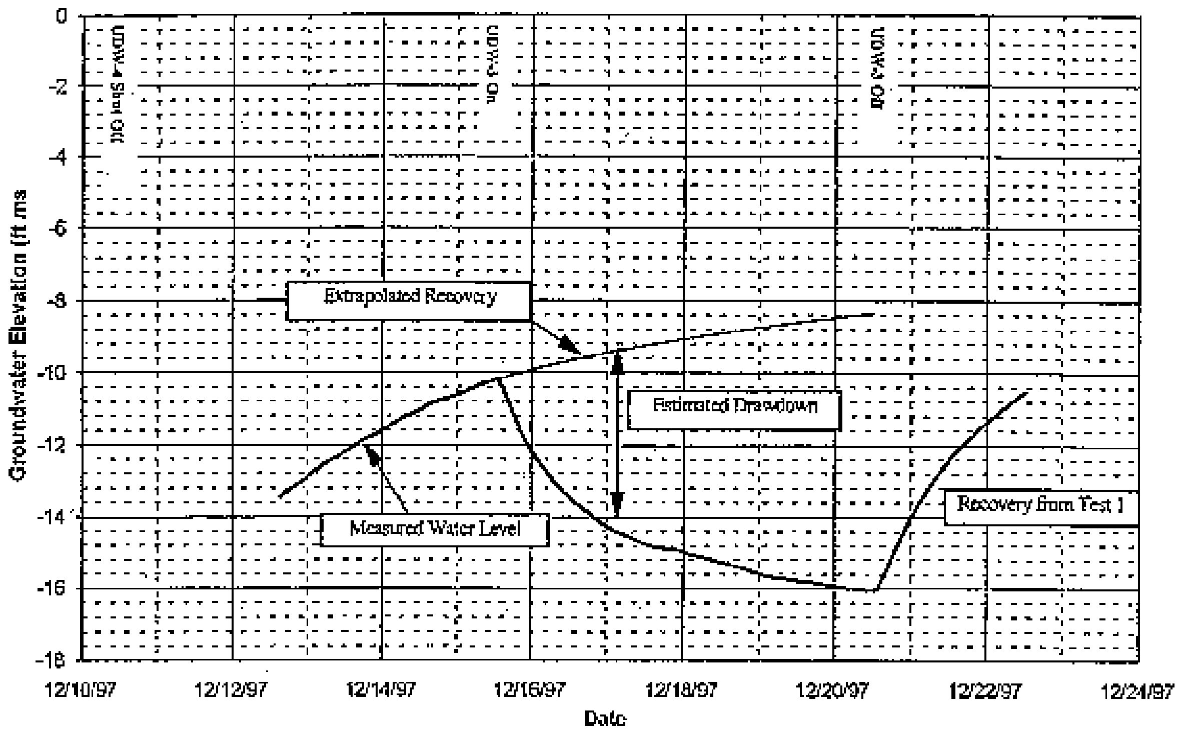
Table 1-3. Deep Well Pumping Tests Performed during Christmas Break

Test	Dates Well Pumped	Pumping Well[a]	Flow, gpm[b]	Intermediate Wells Monitored	Deep Wells Monitored
1	12/15/97 - 12/20/97	UDW - 3	860	UUW-5	UDW-2, UDW-4, UDW-5, UDW-6, UDW-7, CDW-28, CDW-29, Hunts
2	12/22/97 - 12/27/97	CDW - 28	980	CDW-25	UDW-2, UDW-3, UDW-4, UDW-5, UDW-6, UDW-7, Hunts, CDW-29
3	12/30/97 - 1/04/98	CDW - 29	1,850	CDW-15, CDW-22, CDW-25,	UDW-2, UDW-3, UDW-5, UDW-6, Hunts, CDW-28

(a) UDW and UUW are UCD domestic and utility wells, respectively. CDW is a City well.
(b) gpm is gallons per minute.

An example of the data obtained from the pumping tests is shown in Figure 1-4.

Figure 1-4. Pumping Test 1 Monitoring at UDW-4
(UDW-3 Pumping)



Data from the pumping tests were used to derive physical characteristics of the deep aquifer zone in the study area by fitting the water level drawdown or recovery to characteristic curves. A sample of the curve fitting process is shown in Figure 1-5. This process is described in more detail in Section 5 and Appendix B-2.

A summary of average pumping test results is shown in Table 1-4. Transmissivity indicates how well the aquifer conducts water to the well. The values for transmissivity shown in Table 1-4 would be considered moderate, and are significantly lower than what has typically been calculated for the intermediate aquifer zone.

Leakage Factor indicates how tightly confined and separated the aquifer is from shallower aquifers. High Leakage Factors such as those shown in Table 1-4 mean that there is little leakage down into the pumped aquifer from above. Water removed from the deep aquifer zone by pumping therefore must be replaced by horizontal and vertical leakage over a wide area. This conclusion was reinforced by the fact that pumping by the deeper wells had no observable effect on water levels in nearby intermediate depth wells.

The physical characteristics derived from the pumping tests can be used in groundwater models to predict drawdowns under different pumping scenarios.

Figure 1-5. Example of Curve Fitting of Hantush for UDW-5 in Pumping Test 1

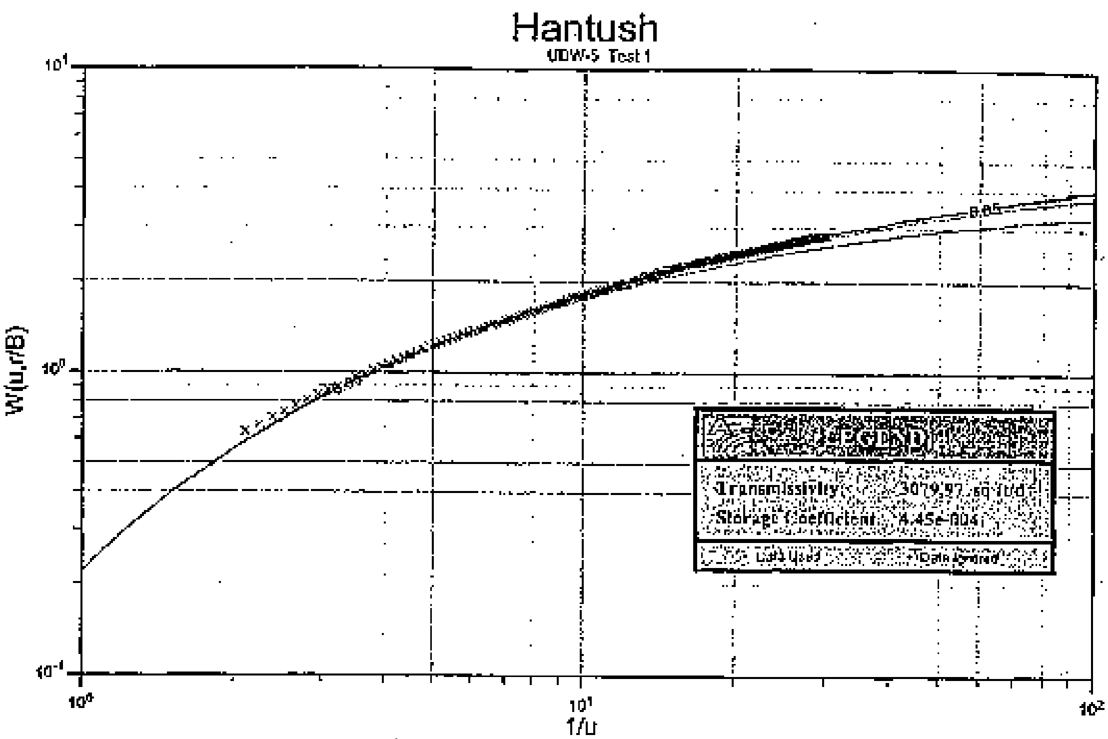


Table 1-4. Summary of Average Pumping Test Results

Area	Transmissivity, sq. ft. per day	Leakage Factor, ft.
UCD	3,900	20,000 to 50,000+
City Well CDW-28 (northwest)	3,600	50,000+
City Well CDW-29 (east)	4,500	50,000+

Note: Transmissivities for the intermediate aquifer zone are typically 4,000 to 10,000 sq. ft. per day.

LONG-TERM DRAWDOWN EFFECTS

Water level decrease versus 2-month pumping was evaluated for the UCD wells for 1995 through 1997. The best correlation was obtained for average water level decrease in all the core area UCD deep wells (UDW-2 through UDW-6A) versus total pumping for the core area deep wells. The ratio obtained was 1,880 gallons per day (gpd) per foot of water level decrease for an estimated no-pumping water level of 30 feet below ground surface. If total pumping in the UCD core area deep wells were doubled to meet future needs, the static water levels (in wells not pumping at a given instant) could drop to more than 150 feet below ground surface. The potential future seven fold increase in total pumping from deep wells by the City, UCD, and Hunts would drop water levels even more.

CONCLUSIONS AND RECOMMENDATIONS

The deep aquifer zone has the following physical characteristics:

- It appears to exist throughout the study area, but may be less predominant toward the north
- It conducts water moderately well in the horizontal direction
- It is highly confined, meaning that future deep wells in the study area will interfere with each other and draw recharge water from a wide area;

If the results of the pumping tests are applied to projected Year 2035 water demands, the total lift for deep wells in the central area of the City could be in excess of 400 feet versus the 100- to 125-foot typical lift for existing intermediate depth wells. This could cause pumping energy costs to more than double. Future City deep wells could seriously impact existing UCD deep wells. Increased drawdown in the deep aquifer zone could also induce ground surface subsidence as deep clay layers become compressed.

The deep aquifer zone has:

- chemical and isotopic water quality characteristics which are distinct from the intermediate aquifer zone
- moderately good water quality in terms of aesthetics, taste, selenium, and nitrate
- moderately elevated levels of arsenic, manganese and temperature, especially in the eastern portion of the study area.

Therefore, while water from the deep aquifer would generally be higher in quality than water from existing intermediate wells, there would still be some short- and long-term water quality issues.

Additional water quality, subsidence, and general aquifer physical data should be gathered for the deep aquifer zone in the eastern portion of the study area. This additional data should be combined with the data from this report so that a regional groundwater data set can be maintained.

The answers to the two questions this study was designed to address are as follows:

1. What are the potential impacts of supplying most or all of the City's and UCD's domestic water needs with water from deep wells?

   Answer: As demands could increase pumping to seven times the current pumping rate, some attendant concerns over subsidence and water quality will arise. Consequently, the deep aquifer zone may not provide an adequate degree of long-term reliability for the total domestic water needs of the City and UCD. The City and UCD will likely have to agree a regional groundwater management plan.

2. Should the surface water rights application submitted by the Yolo County Flood Control and Water Conservation District (District) on behalf of the District, Davis, Woodland, and UCD continue to be pursued?

   Answer: It is likely that the City and UCD will ultimately need an additional water supply. Because of the water quality issues associated with use of the intermediate aquifer, surface water will probably be needed to provide a portion of future supply in combination with the deep aquifer. The surface water rights application and associated issues should continue to be pursued to provide at least a supplemental water supply for the City and UCD.

Sacramento Valley Groundwater Basin
Yolo Subbasin

- Groundwater Basin Number 5-21 67
- County Yolo, Solano
- Surface Area 256,000 acres (400 square miles)

Boundaries & Hydrology

The Yolo Subbasin, located in the sout hern portion of the Sacramento Valley Basin primarily within Yolo County. It is bounded on the east by the Sacramento River, on the west by the Coast Range, on the north by Cache Creek, and on the south by Putah Creek. The basin is roughly bisected by an anticlinal structure, but otherwise is gently sloping from west to east with elevations ranging from approximately 400 feet at the base of the Coast Range to the west to nearly sea level in the eastern areas Major cities within the subbasin include Davis, West Sacramento, Winters, and Woodland

Precipitation averages approximately 20 to 24 inches per year in the western portion of the subbasin, and approximately 18 to 20 inches per year in the eastern portion of the subbasin

Hydrogeologic Information

Water Bearing Formations

The primary water bearing formations comprising the Yolo subbasin are sedimentary continental deposits of Late Tertiary (Pliocene) to Quaternary (Holocene) age Fresh water-bearing units include younger alluvium, older alluvium, and the Tehama Formation (Olmstead, 1961 and DWR, 1978) The cumulative thickness of these units ranges from a few hundred feet near the Coast Range on the west to nearly 3000 feet near the eastern margin of the basin Saline water-bearing sedimentary units underlie the Tehama formation and are generally consid ered the boundary of fresh water (Berkstresser, 1973)

Younger alluvium includes flood ba sin deposits and Recent stream channel deposits Flood basin depos its occur along the eastern margin of the subbasin in the Yolo Flood Basi n They consist primarily of silts and clays, but along the eastern marg in of the subbasin may be locally interbedded with stream channel de posits of the Sacramento River Thickness of the unit ranges from 0 to 150 feet The flood basin deposits have low permeability and generally yield low quantities of water to wells The quality of ground water produced from the basin deposits is often poor

Recent stream channel deposits consis t of unconsolidated silt, fine- to medium-grained sand, gravel and occasionally cobbles deposited in and adjacent to active streams in the subb asin They occur along the Sacramento River, Cache Creek, and Putah Creek. Thickness of the younger alluvium ranges from 0 to 150 feet

The younger alluvium varies from moderately to highly permeable, but often lies above the saturated zone Where saturated, the younger alluvium yields significant quantities of water to wells

Older alluvium consists of loose to moderately compacted silt, silty clay, sand, and gravel deposited in alluvial fans during the Pliocene and Pleistocene Thickness of the unit ranges from 60 to 130 feet, about one-quarter of which is coarse sand and gravel Permeability of the older alluvium is highly variable Wells penetrating sand and gravel lenses of the unit produce between 300 and 1000 gpm Adjacent to the Sacramento River, wells completed in ancestral Sacramento River stream channel deposits yield up to 4000 gpm Wells completed in the finer-grained portions of the older alluvium produce between 50 and 150 gpm

The Tehama Formation is the thickest water-bearing unit underlying the Yolo subbasin, ranging in thickness from 1500 to 2500 feet. Surface exposures of the Tehama Formation are limited mainly to the Coast Range foothills along the western margin of the basin, as well as in the Plainfield Ridge The Tehama consists of moderately compacted silt, clay, and silty fine sand enclosing lenses of sand and gravel, silt and gravel, and cemented conglomerate Permeability of the Tehama Formation is variable, but generally less than the younger units Because of its relatively greater thickness, however, wells completed in the unit can yield up to several thousand gallons per minute

Underlying the Tehama Formation are brackish to saline water-bearing sedimentary units, including the somewhat brackish sedimentary rocks of volcanic origin (Pliocene to Oligocene?) underlain by marine sedimentary rocks (Oligocene? to Paleocene) which are typically of low permeability and contain connate water (Olmstead, 1961) The upper contact of these units generally coincides with the fresh/saline water boundary The contact is found near the Coast Range at depths as shallow as a few hundred feet Near the eastern margin of the basin it reaches depths of nearly 3000 feet

Subsurface Flow Controls

The geologic structure of the groundwater subbasin is dominated by an anticlinal ridge oriented northwest to southeast, which is expressed at the surface as the Dunnigan Hills and Plainfield Ridge The anticlinal structure impedes subsurface flow from west to east. Subsurface groundwater outflow sometimes occurs from the Yolo subbasin into the Solano subbasin to the south Subsurface outflow and inflow may also occur beneath the Sacramento River to the east with the South and North American subbasins Subsurface groundwater inflow may occur from the west out of the Capay Valley Basin

Groundwater Level Trends

Groundwater levels are impacted by periods of drought due to increased groundwater pumping and less surface water recharge (e g in the late 1970's and early 1990's), but recover quickly in "wet" years Long term trends do not indicate any significant decline in water levels, with the exception of localized pumping depressions in the vicinity of the Davis, Woodland and Dunnigan/Zamora areas Past studies (Scott, 1975) have concluded that the

Yolo subbasin is subject to overdraft, however the completion of Indian Valley Reservoir in 1976 provided signifi cant relief in the form of additional available surface water (YCFCWCD, 2000)

Groundwater Storage

Many studies have been conducted to determine the groundwater storage within parts or all of Yolo County Several of these studies refer to calculations completed by Scott and Scalmanini in their 1975 report, Investigations of Groundwater Resources, Yolo County Groundwater storage capacity for the entire county for groundwater aquifer depths between 20 and 420 feet was calculated as 14,038,000 acre-feet based on subtotals from six separate study areas Specific yields were calculated, based on well log information, for thr ee separate depth intervals within six study areas, and ranged from 6 5% to 9 7%

Groundwater Storage Capacity. From the Scott and Scalmanini calculations it can be roughly estimated that the Yolo Subbasin, (defined in this report as a portion of the county) has a total storage capacity of 6,455,940 acre-feet for depths be tween 20 and 420 feet (see below)

Table: Storage capacity was calculated based on Scott (1975) as follows:

Groundwater Basin (Scott, 1975)	Area (acres)	Calculated Gross Storage Capacity (Scott, 1975)	Estimated % area within Yolo Subbasin[1]	Estimated Storage Capacity within Yolo Subbasin[1]
Cache Creek	45,800	1,678,100	20%	335,620
Upper Cache-Putah	70,300	2,017,700	100%	2,017,700
Plainfield Ridge	8,800	240,800	100%	240,800
Lower Cache-Putah	97,300	2,876,900	95%	2,733,055
Colusa	95,700	2,709,800	0%	0
Yolo Bypass	129,100	4,514,700	25%	1,128,765
Totals	447,000	14,038,000		6,455,940

[1]Represents the portion of each Groundwater Basin (as defined by Scott, 1975) that is contained within the Yolo Subbasin (as defined by the DW R) Percentages were estimated by DWR staff

Groundwater in Storage Groundwater storage between the depths of 20 to 420 feet in 1974 for all of Yolo County was calculated to be 13,208,400 acre-feet (Scott, 1975) Based on the Scott report, groundwater storage within the Yolo Subbasin for 1974 is estimated at 6,074,220 acre-feet (see below)

Table: 1974 groundwater storage calculations based on Scott (1975):

Groundwater Basin (Scott, 1975)	Area (acres)	1974 Calculated Storage (Scott, 1975)	Estimated % area within Yolo Subbasin[1]	Estimated 1974 Storage within Yolo Subbasin[1]
Cache Creek	45,800	1,528,700	20%	305,740
Upper Cache-Putah	70,300	1,921,000	100%	1,921,000
Plainfield Ridge	8,800	189,400	100%	189,400
Lower Cache-Putah	97,300	2,677,400	95%	2,543,530
Colusa	95,700	2,433,700	0%	0
Yolo Bypass	129,100	4,458,200	25%	1,114,550
Totals	447,000	13,208,400		6,074,220

[1]Represents the portion of each Groundwater Basin (as defined by Scott, 1975) that is contained within the Yolo Subbasin (as defined by the DWR). Percentages were estimated by DWR staff

Groundwater Budget (Type C)

Currently no groundwater budget has been calculated for the Yolo Subbasin (see comments below)

Groundwater Quality

Groundwater found within the subbasin is characterized as a sodium magnesium, calcium magnesium, or magnesium bicarbonate type. The quality is considered good for both agricultural and municipal uses, even though it is hard to very hard overall (generally over 180 mg/l $CaCO_3$). Selenium and boron are found in higher concentrations locally (Evenson, 1985). Total dissolved solids range from a of 107 ppm to 1300 ppm and average 574 ppm, based on Title 22 data obtained from public supply water well samples (DHS, 2000).

Localized impairments include elevated concentrations of boron (as high as 2 to 4 ppm) in groundwater along Cache Creek and in the Cache Creek Settling Basin area, increased levels of selenium present in the groundwater supplies for the City of Davis, and localized areas of nitrate contamination (YCFCWCD 1992) (Evenson, 1985)

Water Quality in Public Supply Wells

Constituent Group[1]	Number of wells sampled[2]	Number of wells with a concentration above an MCL[3]	
Inorganics – Primary	61	3	
Radiological	53	0	
Nitrates	67		1
Pesticides	59		0
VOCs and SVOCs		59	1
Inorganics – Secondary	61	11	

[1] A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003)
[2] Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000
[3] Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range 150 – 4000+	Average 1500 (estimate)
	Total depths (ft) [1]	
Domestic	Range 40 - 600	Average 230 (estimate)
Municipal/Irrigation	Range 50 - 1500	Average 400 (estimate)

[1]Based on DWR data

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR	Groundwater Levels	10 semi-annually 4 monthly
YCFC&WCD		92 semi-annually 1 monthly
Sacramento County		1 semi-annually
USBR		12 semi-annually 7 monthly
DHS	Water Quality	133 annually
DWR	Ground Subsidence	1 continuously

Basin Management

Groundwater management:	RD 108 adopted AB3030 plan 2/95 RD 2035 adopted AB3030 plan 4/95 RD 2068 adopted AB3030 plan 1/97 Yolo County Flood Control and Water Conservation District are drafting plan but not pursuant to AB3030 RD 900, City of West Sacramento is not drafting AB3030 plan
Water agencies	
Public	Yolo County Flood Control and Water Conservation District City of Woodland, City of Davis, City of West Sacramento
Private	RD 108, 900, 2035, 2068

Comments:

Although groundwater budge ts have been previously calculated for areas overlying the Yolo Subbasin, no groundwater budget has been calculated for the Yolo Subbasin as defined by this report

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Errata

Changes made to the basin description will be noted here.

04-2562-02102

Project Information for Notice of EIR Preparation
Davis Well Capacity Replacement

October 2004

Prepared by:
Winzler & Kelly Consulting Engineers
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Pleasanton, CA 94588
(925) 846-0499

Prepared for:
The City of Davis
Lead Agency under the
California Environmental Quality Act

For Information Contact:
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Public Works Department
City of Davis
1717 Fifth Street
Davis, CA 95616
(530) 757-5686

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FIGURES

I. GENERAL INFORMATION

PROJECT TITLE City of Davis Well Capacity Replacement

LEAD AGENCY City of Davis
Public Works Department
1717 Fifth Street
Davis, CA 95616
(530) 757-5686
Contact: Mr. Jacques DeBra

PROJECT LOCATION
The City of Davis is located north of the Sacramento-San Joaquin Delta in Yolo County, in the Central Valley of Northern California, as shown on Figure 1. Primary access to the Davis area is gained from Interstate Highway 80. The City of Davis is located 13 miles west of the state capitol, Sacramento, and 56 miles northeast of San Francisco. The Davis city limits encompass approximately nine square miles as shown on Figure 2. Figure 3 shows the City's existing wells, priority potential new well locations, and backup potential well locations.

PROJECT SPONSOR City of Davis, Public Works Department

GENERAL PLAN DESIGNATION
Varies, see project description.

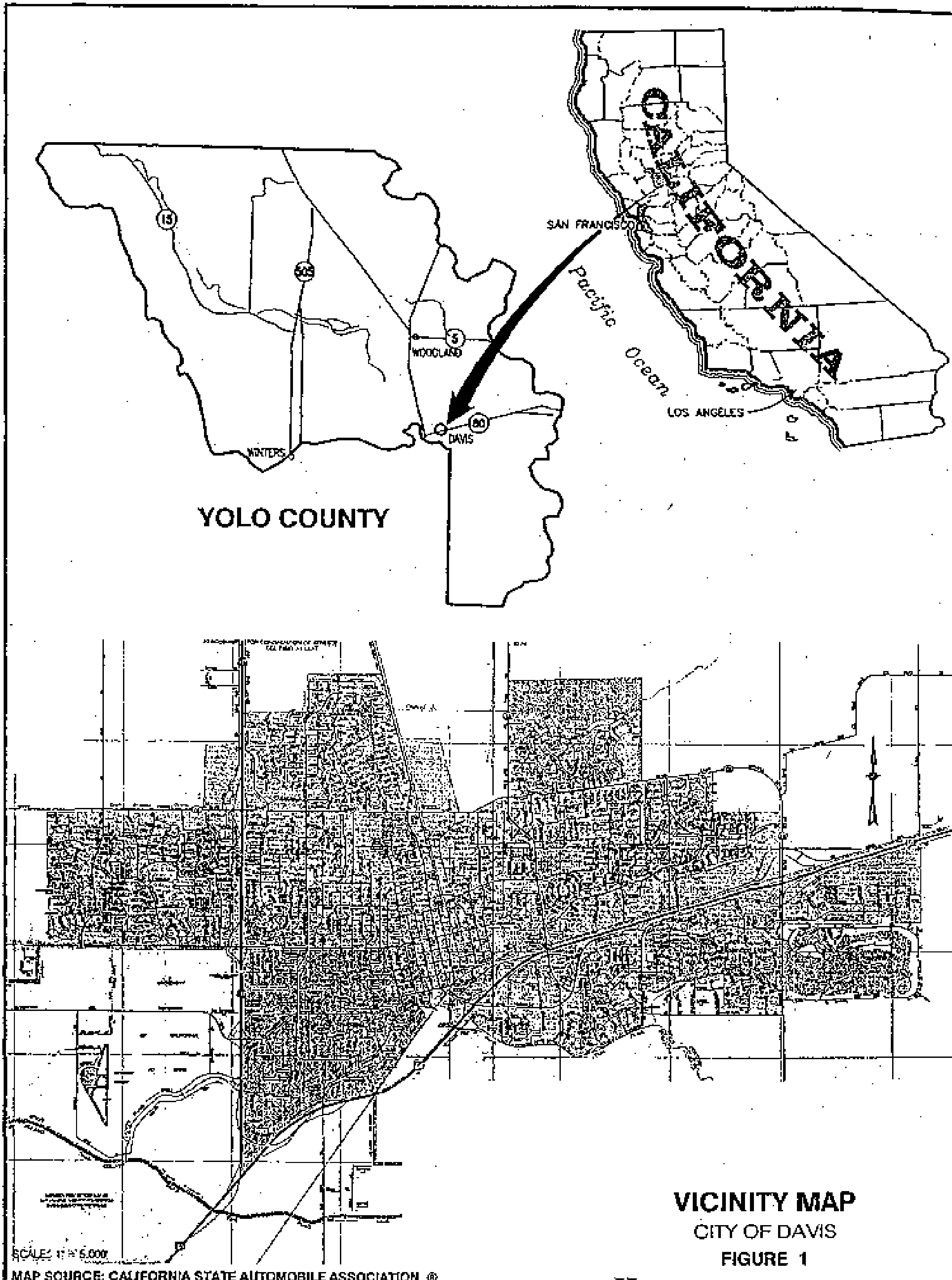
ZONING
Varies, see project description.

CEQA REQUIREMENT
This project is subject to the requirements of the California Environmental Quality Act (CEQA). The lead agency is the City of Davis. The purpose of this Project Information for Notice of EIR Preparation is to supplement the Notice of Preparation (NOP) and provide a basis to better focus the Environmental Impact Report (EIR).

This Project Information for Notice of EIR Preparation is intended to satisfy the requirements of the California Environmental Quality Act, CEQA, (Public Resources Code, Div 13, Sec 21000-21177), the State CEQA Guidelines (California Code of Regulations, Title 14, Sec 15000-15387), and the City of Davis CEQA implementing procedures. CEQA encourages lead agencies and applicants to modify their projects to avoid significant adverse impacts (for example, CEQA Section 20180(c)(2) and State CEQA Guidelines Section 15070(b)(2) and discussion).

Section 15060 of the State CEQA Guidelines requires a preliminary review of projects in order to determine:

(1) whether an activity is subject to CEQA;
(2) if an EIR will be clearly required for a project;
(3) to skip the need for an Initial Study; and
(4) to focus the EIR on the significant effects of a project.



VICINITY MAP

CITY OF DAVIS

FIGURE 1

WINZLER & KELLY

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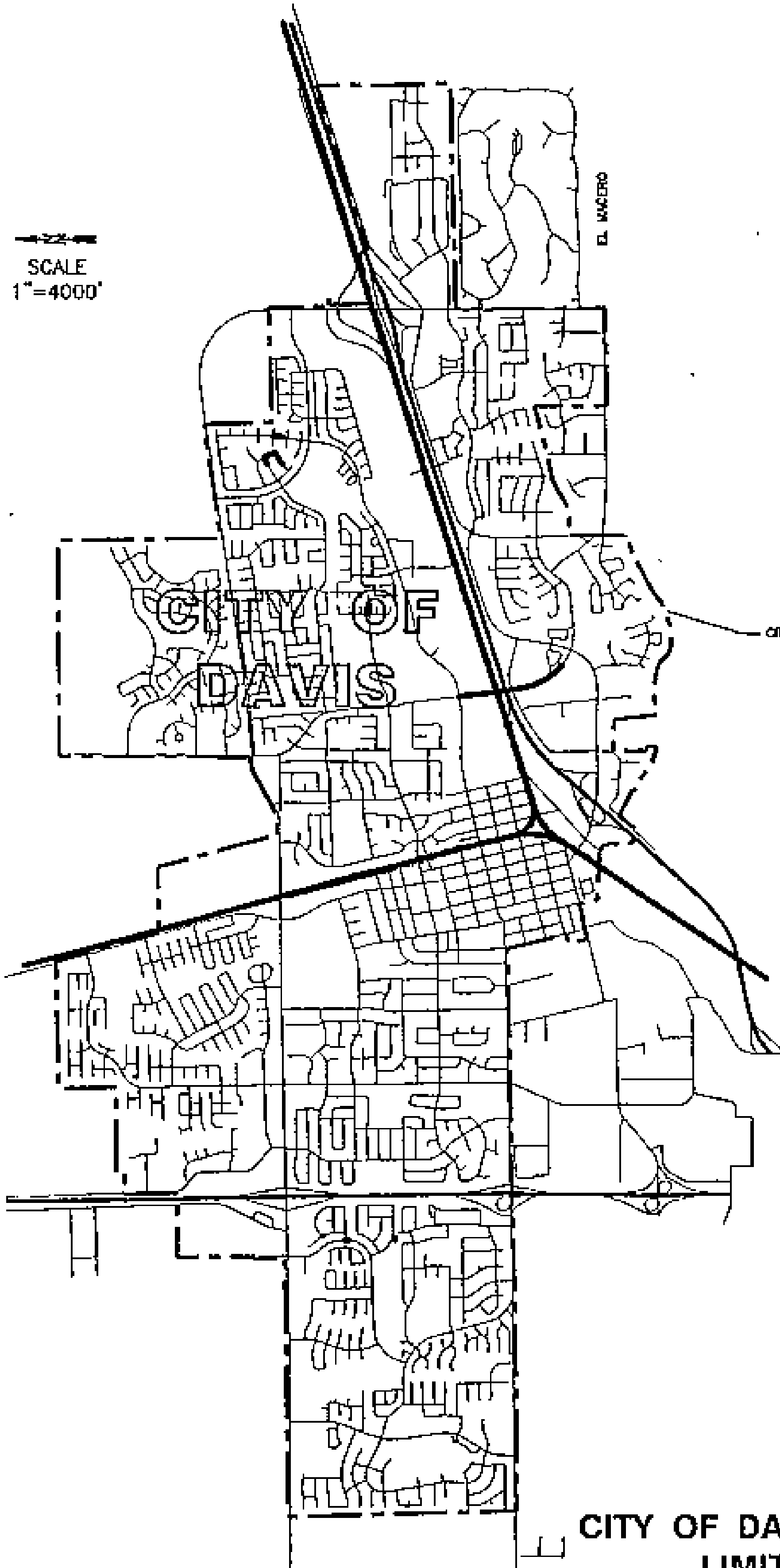

CITY OF DAVIS CITY LIMITS

FIGURE 2

WINZLER & KELLY

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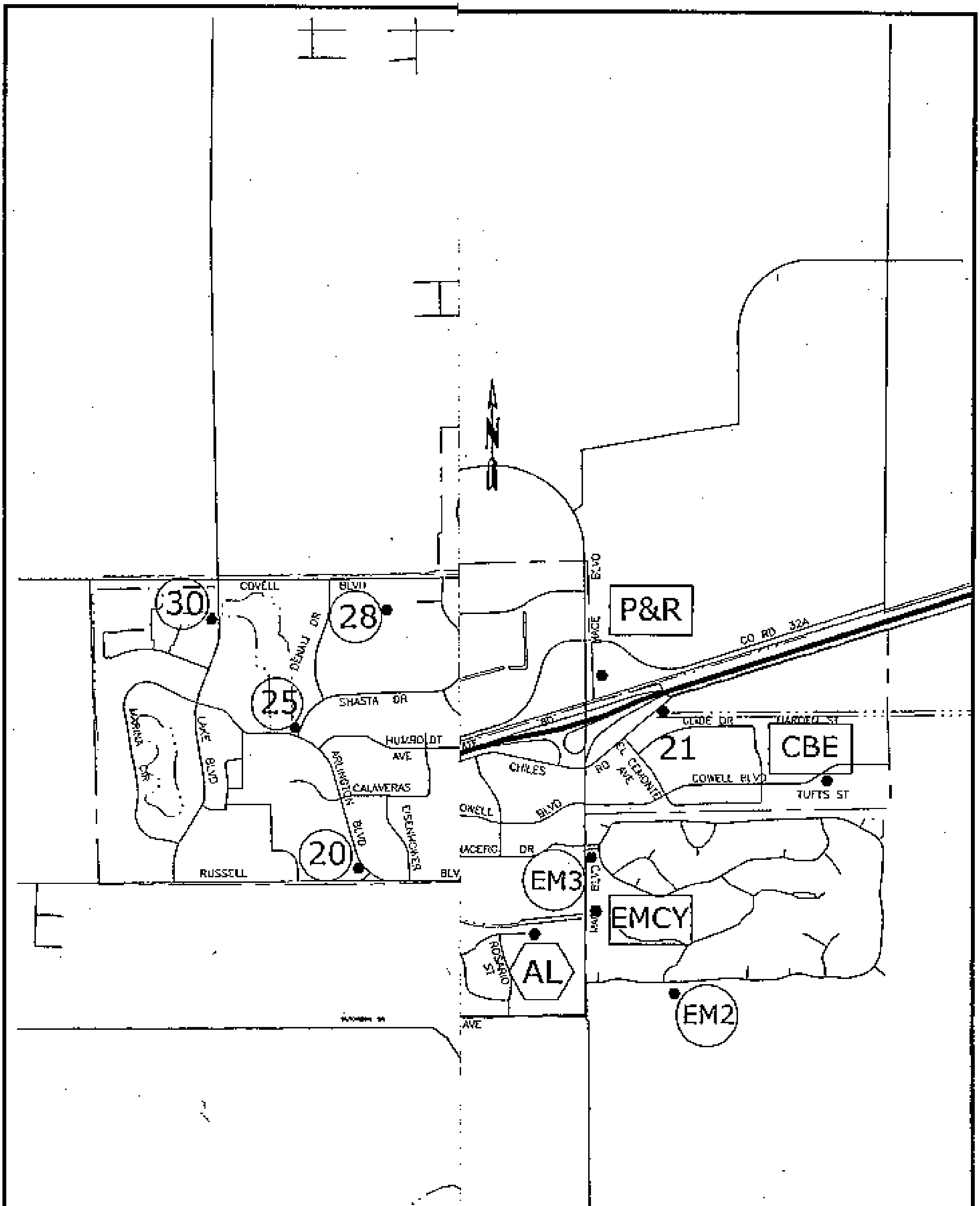

EXISTING AND PROPOSED WELL LOCATIONS

CITY OF DAVIS WATER SYSTEM

FIGURE 3

WINZLER & KELLY

PERMITS AND APPROVALS REQUIRED

- **California Department of Fish and Game**—May require consultation to assure appropriate mitigation during implementation in the event potential special-status species are identified.
- **Regional Water Quality Control Board (Region 5, Central Valley)**—Well start-up purged water (approximately 5,000 gallons) will be discharged partially to the City's sanitary sewer, and the remainder (if any) to the storm-drain system. If development or pump test waters are to be discharged to any surface waters, a National Pollution Discharge Elimination System (NPDES) permit may be necessary.
- **California Department of Health Services, Office of Drinking Water (ODW)**—An amendment to the City of Davis' Operating Permit will be required from the ODW, along with completion of the Source Water Assessment Program (SWAP) conducted for each new well.
- **City of Davis**—Well Permit, Building Permit, and Design Review
- **Yolo-Solano Air Quality Management District**—Requires a permit(s) for emergency generators, if proposed.

II. PROJECT DESCRIPTION

OBJECTIVE

The overall objective of this project is to provide a reliable source of high-quality potable water to the City of Davis that meets all regulatory requirements and results in the lowest overall cost to the consumer. Specific project objectives are to:

- Replace approximately 6,770 gallons per minute (gpm) groundwater capacity lost since 1987.
- Construct the replacement wells into the deep aquifer to obtain better water quality, and to distance the intake of water from potential shallower contamination
- Meet current and anticipated primary and secondary drinking water standards established by the Environmental Protection Agency (EPA) and the California Department of Health Services (DHS).
- Improve aesthetic water quality and reduce consumer-related costs.
- Lower the level of constituents of concern in wastewater supplied to the City's Water Pollution Control Plant (WPCP) to minimize potential for violating current or anticipated National Pollutant Discharge Elimination System (NPDES) permit requirements.

PROJECT SUMMARY

The City seeks to construct well and pumping facilities to obtain approximately 9,250 gpm groundwater supply (from the deep aquifer) to replace lost groundwater capacity from wells removed from service since 1987. Approximately 4 to 6 wells and a storage tank and pump station are required to obtain the necessary capacity to meet current needs. The number depends on site-specific hydrogeologic conditions, hydraulic analysis and geographic location of the specific replacement wells.

The City has identified eight potential well sites as the highest priority locations to investigate for installation of replacement wells. The currently proposed drilling locations to be investigated for their viability as well sites are:

- A parcel located at 3608 Chiles Road at the south end of the Dave Pelz Bicycle Overcrossing
- An area at Sandy Motley Park located at 1903 Moore Boulevard in North Davis
- A parcel located on the northeastern quadrant of the Mace Boulevard/Highway 80 interchange adjacent to the Park 'N Ride lot
- Within the community garden area at 1819 Fifth Street, east of the City Public Works Corporation Yard
- A parcel located at 5448 Cowell Boulevard in a greenbelt on extreme eastern edge of the City
- At the El Macero Golf Course, south of the corporation yard at approximately 1050 Mace Boulevard
- The extreme eastern end of the Cowell Research Park parcel located at 2626 Cowell Boulevard
- The Community Park at 1405 F Street (on the southern edge)

Additionally, two back-up locations have been identified and are outlined below:

- An open-space area located adjacent to 42343 Almond Lane
- At the southwest corner of Slide Hill Park at 1414 Tulip Lane

At each site, a test well will be drilled to determine the potential water-bearing characteristics of the production well. If favorable hydrogeologic conditions are found, a production well will be drilled at the site (or the test hole reused) and pumping facilities installed

In addition to those listed above, the City has identified a number of other potential well sites. It is possible that other sites may be identified and investigated in the near future after completion of the EIR, as it is in the best interest of the City to pursue alternate sites if necessary to install the required well replacement capacity. The EIR will address impacts and suggest mitigation measures for alternative well sites not yet identified but part of this well-capacity replacement project.

Capacity obtained from these wells will offset well capacity removed from service since 1987, and, in addition, other wells expected to be removed from the distribution system. This well capacity replacement will help maintain an adequate water supply to meet current peak demands in the water system, and is not intended for demands that may be caused by future growth of the Cit). Any new growth approved by the City will be required to develop new supplies to meet the projected growth. The City is currently studying alternatives for providing supplemental water supply to meet future water needs, including the pursuit of a treated surface water supply from the Sacramento River, which is not part of this project. This supplemental supply will fulfill future buildout water demands in accordance with the Davis General Plan.

The project also includes construction of a 4 million gallon prestressed concrete water storage tank, booster pump station, and emergency generator in East Davis at the site adjacent to the

Park 'N Ride Lot on Mace Boulevard north of Highway 80. Water will be supplied to the storage tank from the distribution system during off-peak water demand periods or by a newly constructed deep water supply well. Water stored in the tank will be pumped into the distribution system to help meet peak demands, maintain adequate fire reserve capacity, and in emergencies, such as a power outage. The planned operation of the East Davis storage and pumping facilities is identical to the current operation of the West Area Tank facilities in West Davis, west of Highway 113 near Sutter-Davis Hospital.

BACKGROUND

Water Supply

The City of Davis relies solely on groundwater to meet 100 percent of its potable water demand in the service area. Water is pumped primarily from the intermediate depth aquifer (to a depth of approximately 300 - 600 feet below ground surface [bgs]). The four most recently installed wells pump water from the deep aquifer (deeper than 700 feet bgs).

Water from the intermediate depth aquifer is generally very hard (high calcium and magnesium levels) and high in total dissolved solids. Nitrate levels are close to the drinking water limit in some wells, and required the abandonment of Well No. 16 and No. 18. Boron levels are high enough to adversely affect sensitive plants, but not high enough to adversely affect human health. Arsenic levels are relatively low and hexavalent chromium levels are high in most wells, and both may exceed future drinking water limits. Selenium concentrations are below drinking water limits (50 parts per billion [ppb]), but high enough to exceed discharge limits at the City's wastewater treatment plant (5 ppb).

Water from the deep aquifer has moderate levels of hardness and total dissolved solids. Available information indicates that while boron levels are high in the deep aquifer hexavalent chromium, selenium, and nitrates are not problematic constituents. Arsenic levels do not exceed current drinking water limits, but may exceed possible future limits for this constituent. The deep aquifer zone appears to exist throughout most of the Davis area. However, it may be less predominant toward the east.

Water levels in the intermediate depth aquifer vary with hydrogeologic conditions and are impacted by drought conditions. However, the aquifer has historically fully recovered following drought periods with some minor subsidence. Availability of water from the intermediate depth aquifer is not a concern at the present level of withdrawal. However, the intermediate depth aquifer is relied on by agricultural uses and is susceptible to land subsidence. Recent studies of long-term quality and yield of the deep aquifer suggest that the reliability of the aquifer could be at risk of overpumping if both the City of Davis and UC Davis rely on it as their only water supply source. However, data to support this conclusion has not been available.

Table 1: City of Davis Well Data

Well No.	Location	Year Constructed	Elevation (feet, asl)	Depth (feet)	Seal Depth (feet)	Casing Diameter (inches)	Motor (HP)	2004 Avg. Pumping Rates Feb-Mar (gpm)	Feb-Mar (mgd)	Jul-Aug (gpm)	Jul-Aug (mgd)
1	617 E Street	1982	46	522	50	16	75 *	1000	1.4	860	1.2
7	810 11th Street	1952	44	390	50	14	100	1176	1.7	989	1.4
11	1405 F Street	1961	44	344	50	14	100	1515	2.2	1319	1.9
12	921 Sycamore Lane	1961	48	330	170	14	125	850	1.2	816	1.2
14	530 L Street	1970	45	352	190	16	gas	1000	1.4	1004	1.4
15	1812 Manzanita	1965	38	520	50	14, 10	100 *	1212	1.7	1119	1.6
19	2910 Catalina Drive	1973	44	615	50	16, 12, 8	100 *	1400	2.0	1343	1.9
20	2300 Evenstar Lane	1976	55	456	50	18, 12	125	1226	1.8	1127	1.6
21	5050 Chiles Road	1977	33	450	50	16, 12	100	1685	2.4	1165	1.7
22	1414 Tulip Lane	1977	42	510	50	16, 12	125 *	1271	1.8	1017	1.5
23	527 B Street	1980	45	419	50	16	150	1885	2.7	1763	2.5
24	1600 Olive Drive	1982	44	460	186	18	150	1937	2.8	1808	2.6
25	1188 Arlington Blvd	1987	53	466	150	18	75	1229	1.8	1145	1.6
26	2850 Cowell Blvd.	1987	38	492	210	18	125 *	1550	2.2	1432	2.1
27	3000 Sycamore Lane	1989	49	366	100	18	125 *	1180	1.7	990	1.4
28	2101 Glacier Drive	1991	51	1491	110	18	75 *	867	1.2	760	1.1
29	3535 Alhambra Drive	1997	37	1502, (1650)	210	18, 14	150	1300	1.9	1231	1.8
30	1819 Lake Blvd.	2002	55	1780	800	18	300	2521	3.6	2537	3.7
31[1]	2074 John Jones Road	2003	50	1732	700	18	300	2550	3.7	2540	3.7
LIC	Lewis Investing Corp.#4	unknown	unknown	1340	50	14	unknown	800	1.2	775	1.1
EM2	44285 S. El Macero Dr.	1969	27	427	50	14, 12	100	1180	1.7	1007	1.5
EM3	800 Mace Boulevard	1991	33	471	220	18	125 *	1216	1.8	973	1.4
							TOTALS	30,550	44.0	27,720	39.9

[1] Estimated values for 2004 pumping rates

* = submersible pump/motor

asl = above sea level

HP = horse power

Existing Well Facilities
The City of Davis draws water from 22 wells located throughout the city. All but five wells (including LIC well) tap into the intermediate depth aquifer. The water does not pass through a central treatment or distribution facility, but rather is filtered naturally by the sand and gravel in the aquifers. The only treatment administered is the addition of chlorine (sodium hypochlorite) at all wells for disinfection. Pumping rates from each well vary with the seasonal groundwater levels and the distribution system hydraulic conditions. Pertinent data on the active wells is shown in Table 1.

In fall 2004, the City entered into agreement with Lewis Investing Corporation (LIC) to use the existing deep well on the former Hunt-Wesson cannery site to supplement the City's water supply until such time that the City water system has sufficient supply to meet its short-term peak demands. The City performed an inspection of the well casing and rebuilt the pump prior to putting the well in service. Additional rehabilitation or maintenance of the well casing was not performed due to previous rehabilitation work in the upper portion of the casing. The well currently produces approximately 550 gpm. The well is intended for limited usage only, not long-term, and is near the end of its useful life.

The active wells range in age from new to over 50 years old. Since 1987, the City has removed six intermediate depth wells from service due to age, poor water quality, production, and/or operations and maintenance problems. A summary of the wells removed from service since 1987 is provided in Table 2.

Table 2: Wells Removed From Service Since 1987

Well No.	Average Capacity (gpm)	Year Removed From Service	Reason for Removal
EM-Vista	800 (estimated)	1988	Poor water quality, sand
10	875	1988	Poor water quality
17	1100	1994	Poor water quality
16	1045	1998	Poor water quality (NO_3)
13	1460	2001	Poor water quality (Se)
18	764	2002	Poor water quality (NO_3)

NO_3 = Nitrates
Se = Selenium

The total average well capacity for the six wells removed from service since 1988 is approximately 6,050 gpm.

All of the active wells are available to supply water to the system. However, Well No. 14, powered by an internal combustion engine, is primarily available for usage in an emergency such as the loss of electrical power. As discussed below, two wells are not available to meet peak demands.

Since 1988, the City has constructed six wells to replace the wells removed from service and to meet additional water demands that have occurred in the City. A summary of the wells constructed since 1988 is provided in Table 3.

Well No. 31 cannot be used to meet peak demands since it is located in the immediate vicinity of several other deep wells because the booster pump station and the distribution system cannot handle such a large flow rate in the area. Well No. 29 has been unreliable as the City continues to determine the cause of water quality problems at the well. Therefore, the total peak capacity provided by wells constructed since 1988, not including Well Nos. 29 and 31, is approximately 5,650 gpm.

Table 3: Wells Constructed Since 1987

Well No.	Average Capacity (gpm)	Year Constructed	Comments
27	1,105	1989	
EM-3	1,198	1991	
28	792	1991	
29	1,378	1997	Water quality problems, well not fully functional. City currently investigating feasibility of rehabilitating well
30	2,556	2002	
31	Unknown	2004	Full capacity not available during peak demand periods due to proximity to other wells in west Davis.

At the present time, Well No 12 and Well EM-2 are likely candidates to be taken out of service due to their age and other problems associated with their continued use. The seal for Well No. 12 was extended several years ago in an attempt to reduce the nitrate levels that have been steadily increasing for years. Since the seal extension was constructed, the well has pumped significantly more sand, which resulted in lowering the pumping rate from approximately 1,600 gpm to 800 gpm to minimize pumping of sand. The nitrate level has not decreased and the chromium level has increased, although probably not related specifically to the seal work. The well is 43 years old.

Well No. EM-2 is 35 years old and located on a small lot in a residential neighborhood. The water hardness is over 600 ppm and the specific conductance is over 1400 μmhos/cm, which are not desirable levels for drinking water or WPCP discharge standards.

Well No. 7, at over 52 years old, is the oldest active well in the system. The well does not currently exhibit the same kinds of water quality problems as Well No. 12 and Well No. EM-2, yet it has been rehabilitated in recent years and its remaining useful life is questionable. Well No. 7 has lasted much longer than most of the wells removed from service, and it is only a matter of time before increased water quality and physical problems become apparent at the site, causing the well to be taken out of service.

Existing Distribution System

The hydraulic grade line in the system is primarily determined by the water level in the 200,000 gallon elevated storage tank at Eighth Street. The water level typically varies between 95 and 115 feet below ground surface (bgs), maintaining system pressures between 40 and 50 pounds per square inch (psi) under most demand conditions. All of the facilities are monitored by a Supervisory Control and Data Acquisition (SCADA) system, which turns wells and booster pump facilities on and off based on the water level in the elevated storage tank or pressure at selected locations in the distribution system.

In 2002, the City constructed the West Area Water Storage Tank and booster pump station, located along John Jones Road in west Davis. The tank stores water for delivery by the booster pumps to meet system demands. The booster pump station acts essentially similar to the wells, as the timing and number of pumps operated are also governed by the water level in the elevated tank as well as the water level in the ground-level tank. Also, the tank is operated routinely to provide adequate "turnover" of the water.

Current Well Production

A summary of the annual well production for the wells from 1999 through 2003 is shown in Table 4 (following page). The total well production in 2003 was approximately 4,740 million gallons (averaging approximately 13.0 million gallons per day [mgd]). Maximum well production occurs during the hot summer months when irrigation demands are the greatest. Minimum well production occurs during the wet winter months when irrigation demands are drastically reduced.

Required Replacement Well Capacity in the Near Future

Determination of required replacement well capacity must take into account the well capacity taken out of service since 1987, each well capacity constructed since 1987, and the increase in water demands from 1987 to 2003. A summary of the required well capacity is provided in Table 5.

Table 5: Summary Calculation of Well Capacity Required

Well Capacity Removed From Service Since 1987	(-) 6,050 gpm
Well Capacity To Be Removed From Service in Next Two Years	(-) 3,200 gpm
Total Well Capacity Lost Since 1987	**(-) 9,250 gpm**
Additional Well Capacity Constructed Since 1987	(+) 5,650 gpm
Total Well Capacity Deficit Since 1987	**(-) 3,600 gpm**
Peak Demand Increase Due to New Demand Since 1987	(-) 5,670 gpm
Total Peaking Capacity Required	**(-) 9,270 gpm**
Booster Pump Station Firm Capacity	(+) 2,500 gpm
REPLACEMENT WELL CAPACITY PROPOSED IN EIR	**(-) 6,770 gpm**

Since 1987, the City has removed approximately 6,050 gpm capacity from the distribution system as described herein. In addition, approximately 3,200 gpm capacity from Well Nos. 12, EM-2, and 7 is expected to be removed from service, for an overall total of 9,250 gpm capacity removed from service since 1987. During that same time period, six wells have been constructed. Recognizing that Well No. 31 cannot provide peaking capacity in conjunction with other wells in its vicinity due to distribution system hydraulic constraints, and that Well No. 29 capacity cannot be relied upon until final determinations are made regarding rehabilitation alternatives, the additional capacity constructed into the system since 1987 is approximately 5,650 gpm. This results in a deficit of approximately 3,600 gpm.

Table 4: Davis Water System Well Production 1999 through 2003

Well No.	1999		2000		2001		2002		2003	
	Annual Production (gallons)	% of Total (%)	Annual Production (gallons)	% of Total (%)	Annual Production (gallons)	% of Total (%)	Annual Production (gallons)	% of Total (%)	Annual Production (gallons)	% of Total (%)
1	25,506,000	0.6	48,537,800	1.1	42,962,000	0.9	7,789,000	0.2	10,132,000	0.2
7	8,647,628	0.2	31,276,984	0.7	32,433,000	0.7	13,230,536	0.3	7,906,000	0.2
11	132,820,700	3.0	98,566,400	2.2	85,804,300	1.7	74,680,000	1.5	33,650,000	0.7
12	500,465,000	11.2	267,319,000	5.9	196,603,000	4.0	172,893,000	3.5	158,669,000	3.3
13[(1)]	2,293,000	0.1	4,384,000	0.1	7,915,000	0.2	0	0.0	0	0.0
14	10,676,000	0.2	21,171,000	0.5	9,052,000	0.2	6,285,000	0.1	5,333,000	0.1
15	42,866,700	1.0	68,065,706	1.5	37,294,720	0.8	75,075,000	1.5	118,676,000	2.5
18[(1)]	258,044,510	5.8	403,638,920	8.9	299,307,000	6.1	0	0.0	0	0.0
19	278,230,500	6.2	211,928,000	4.7	211,296,224	4.3	76,802,697	1.6	145,710,833	3.1
20	480,852,000	10.7	462,391,000	10.2	546,294,000	11.1	348,737,000	7.1	349,239,000	7.4
21	309,184,500	6.9	345,265,000	7.6	175,504,000	3.6	172,727,000	3.5	193,236,000	4.1
22	57,203,060	1.3	210,518,037	4.6	343,025,000	7.0	628,924,888	12.8	558,237,461	11.8
23	347,777,000	7.8	602,895,000	13.3	559,079,000	11.4	293,830,000	6.0	178,029,000	3.8
24	553,107,000	12.4	151,666,200	3.3	307,526,000	6.3	307,561,000	6.2	221,266,000	4.7
25	311,024,650	6.9	403,049,360	8.9	396,210,000	8.1	79,783,000	1.6	366,365,468	7.7
26	197,396,000	4.4	445,658,000	9.8	318,528,000	6.5	518,508,000	10.5	700,947,000	14.8
27	375,087,000	8.4	369,064,000	8.1	338,206,000	6.9	351,211,000	7.1	431,414,000	9.1
28	363,133,000	8.1	324,693,000	7.1	184,211,000	3.8	328,499,000	6.7	311,084,000	6.6
29[(2)]	24,262,100	0.5	11,474,800	0.3	97,648,300	2.0	583,200	0.0	28,925,600	0.6
30		0.0		0.0	395,589,100	8.1	1,117,119,900	22.7	550,992,000	11.6
31[(4)]		0.0		0.0		0.0		0.0	0	0.0
H-W[(3)]		0.0		0.0	49,116,687	1.0	52,368,668	1.1	0	0.0
EM-2	1,076,000	0.0	10,725,000	0.2	6,379,800	0.1	7,801,170	0.2	53,447,881	1.1
EM-3	197,748,000	4.4	51,181,000	1.1	270,883,000	5.5	289,658,000	5.9	317,263,000	6.7
Totals	**4,477,400,348**	**100**	**4,543,468,207**	**100**	**4,910,867,131**	**100**	**4,924,067,059**	**100**	**4,740,523,243**	**100**

Notes:
(1) Abandoned in 2002; destroyed in 2003.
(2) Annual production low due to water aesthetics problems.
(3) Well removed from service in 2003. Well rehabilitated in 2004, renamed LIC well, and put back in service in August 2004.
(4) Well placed in service in 2004.

Since 1987, average water demands have increased by approximately 1,890 gpm due to new developments within the service area consistent with the City's General Plan. The resulting peak pumping capacity required for this new demand is approximately 5,670 gpm (utilizing a 3.0 peaking multiplier of average day demand per City standards). Assuming that the new wells constructed since 1987 (5,650 gpm peak capacity) essentially have provided the peak demand for the demand growth since that time, the water system has a deficit of approximately 9,270 gpm to meet peak demands.

It is proposed that approximately 9,270 gpm peaking replacement capacity (peak hour demand) be constructed as soon as possible to replace wells taken out of service and lost capacity since 1987. This replacement capacity can be a combination of new wells and the booster pump station constructed in east Davis (2,500 gpm of firm peak capacity that can offset well capacity). Depending on the actual yield from the individual wells, approximately 6,770 gpm capacity may be obtained from replacement wells, with the remaining 2,500 gpm capacity provided by the booster pump station and water storage tank. At an average well capacity of approximately 1,200 to 1,800 gpm, the required capacity can be provided by 4 to 6 wells.

Water Quality Goals

The City monitors water quality to meet all federal, state and local water quality requirements and closely monitors water produced by the wells. The latest water quality data is contained in the 2003 Annual Water Quality Report, published by the City of Davis.

The City strives to provide the best water quality possible to its customers. Recent studies have indicated that better water quality exists in the deep aquifer. In addition, the City is evaluating the feasibility of obtaining a surface water supply to augment its reliance on groundwater supply. Regardless of the actual source, the City continues to seek better water quality for its customers, to improve the overall system reliability, and improve discharge quality to the wastewater system.

One of the main benefits of constructing wells into the deep aquifer is to obtain water with higher overall quality compared to lower quality water within the intermediate depth aquifer. Water from the deep aquifer is much lower in hardness, selenium, total salinity, and nitrates. Lowering these parameters would be very favorable for negotiating NPDES permit discharge requirements. Over half of Davis homes and businesses are using water softeners, resulting in significant salt loading into the sewer system. A water source with low hardness would negate the need for softeners (that are expensive to the consumer) and improve the reclamation possibilities for wetlands and agricultural irrigation purposes. Hard water also damages customer appliances and fixtures, shortening their useful life and increasing water-related expenses for ratepayers. In addition, hard water reduces the life of the City's water system, including meters, valves, and hydrants. Lowering selenium levels would enable the city to negotiate for greatly reduced NPDES permit monitoring requirements for wildlife protection that are in effect because of the higher selenium levels generated from the intermediate depth wells.

Based on previous studies, it appears that the concentrations of some objectionable trace constituents in the deep aquifer are likely to be higher for wells in the far eastern portion of the service area. Parameters of greatest concern in the deep aquifer are arsenic, manganese and

temperature. Manganese levels in some deep strata exceed secondary drinking water standards designed to prevent nuisance manganese deposit conditions. Arsenic levels are within current drinking water standards, but could be problematic if the limit is substantially reduced as may be promulgated by the EPA and the State of California. Wellhead treatment could be installed to remove arsenic and manganese or adjust the temperature at the wellhead. However, wellhead treatment is very expensive and would add capital and operating costs to the well. Wellhead treatment removing hardness and calcium concentrates would be most expensive and would pose a brine discharge disposal challenge.
Table 6 compares recent water quality data for the intermediate aquifer and the deep aquifer. It appears that better water quality is available in the deep aquifer.

Table 6: Comparison of Water Quality in Aquifers

Parameter	Intermediate Aquifer		Deep Aquifer		Maximum Contaminant Level
	Max.	Avg.	Max.	Avg.	
Boron (µg/L)	1,900	800	1,200	920	None
Selenium (µg/L)	67	12	30	4	50
Total Chromium (µg/L)	50	22	14	<10	Cal 50
Arsenic (µg/L)	6.4	3.0	12.0	5.6	50
Nitrate (mg/l)	45	19.8	12.0	2.9	45
Manganese (µg/L)	67	15	81	42	50
Iron (µg/L)	260	<100	480	120	300
Electrical Conductivity (µg/L)	1,900	1,053	930	577	900 to 1,600
Total Dissolved Solids (mg/L)	1,300	683	570	376	500 to 1,000
Hardness (mg/L)	680	465	410	129	150 to 300
pH	8.1	7.9	8.4	8.2	6.5 to 8.5

Note Wastewater selenium limit < 5 ppb (µg/L).

Water Well Construction

Typical Well Installation

The active water wells throughout the City range in age from newly constructed to over 50 years old, and vary widely in their physical characteristics, construction methods and operation. However, in recent years the City has attempted to standardize its well design criteria to provide for a more uniform system. The proposed well construction by the City will generally adhere to the current design practices as described below.

The water well consists of a steel casing (generally 16 to 18 inches in diameter) surrounded by a filter pack in the annular space between the inside edge of the bore hole and the casing. The lower portions of the casing are screened to allow groundwater to flow into the casing. At the top of the well, there is a concrete sanitary seal to prevent contamination of the well from shallow aquifer water. Either a submersible motor, placed inside the casing approximately 300 feet deep, or a vertical turbine pump, with pump bowls located approximately 300 feet deep and connected to the motor by a shaft, is used to pump the water from the well. If needed, a suction pipe is attached to the lowest pump bowl to obtain water from deeper in the casing. The water is pumped through the casing in the well and into the distribution system.

Electrical motors power the pumps with electricity supplied by the motor control center located in an enclosure on the well site. Disinfection facilities to treat the water before entering the distribution system are installed. The well and pumping facilities are preferably constructed outdoors. If necessary to mitigate noise, safety, or aesthetic concerns, the facilities will be enclosed in a building.

Well Construction Procedures

Test hole investigation and municipal well development is essentially composed of three phases:

1) Phase 1 – Drill Test Hole;
2) Phase 2 – Drill Production Well; and
3) Phase 3 – Construct Site Improvements.

The proposed project would undergo development through these three discrete phases, as described in Table 7.

Table 7: Typical Municipal Water Well Components

Phase	Component	Purpose/Task
1	Site Access	Site access improvements are installed including drilling pad
	Drilling	A 2,000-foot deep test hole is drilled and a resistivity meter is used to measure the difference in potentials at various strata levels The driller's log and cutting samples reflect the geology Measured potentials from electronic logs are compared to collected geologic information to determine the presence of possible water bearing features/aquifers
	Water Sampling	Water samples are collected from suspected water bearing zones and analyzed for inorganic constituents and overall quality.
2	Drilling	A 28-inch diameter hole is drilled to the depth indicated by the data gathered during the test hole construction Frequently the test hole is enlarged Sometimes a new adjacent site is drilled.
	Casing	The well casing is a large diameter (approximately 14 to 19 inches in diameter) steel pipe with screened sections at locations equivalent to prior identified water bearing zones. The casing maintains drill hole integrity and prevents the hole from collapsing.
	Sanitary Seal	A concrete sanitary seal eight inches wide around the casing will extend from ground surface to a minimum depth of approximately 500 feet for a deep well, where a bentonite clay seal will extend to a depth equivalent to approximately 20 feet above the first well casing screen The sanitary seal prevents infiltration of surface and near-surface water into the bore hole shaft.
	Gravel Pack	The gravel pack is placed between the casing and the earth, beneath the sanitary seal The gravel pack transmits water to the casing while preventing the soil from entering the casing during pumping

(Table 7–CONTINUED NEXT PAGE)

Phase	Component	Purpose/Task
3	Submersible Motor/Pump	Submersible motor and pump placed in the well lifts water to the surface and into the City's main distribution system at a pressure required to maintain/augment distribution system pressure. The pump is usually placed about 300 feet below ground. An alternative to the submersible pump is a vertical turbine pump and motor placed above grade with a long pump shaft and pump bowls located approximately 300 feet deep.
	Final Site Development	Access driveways, site pads, and equipment pads are finalized. Access driveways and pads are to be concrete.
	Control System	Installation of on-site electrical monitoring and control devices.
	Communication System	Installation of radio telemetry connection to the City's master control center.
	Connection to City Water Distribution System	New well is connected to the City's water distribution system via a piping loop.
	Connection to City's Storm Drain System	Well start-up purge water (approximately 5,000 gallons) is discharged to the City's storm drain system Similarly, on-site drainage is directed to storm drain inlets for ultimate disposal to the Yolo Bypass.
	Liquid Sodium Hypochlorite Chlorination Facility	Site development will include installation of a pad and structure to eventually contain liquid sodium hypochlorite (bleach) chlorination facilities, including storage tank and delivery pump and piping.
	Fencing and Landscaping	The fencing and landscaping will be designed to be compatible with the neighborhood
	Site size	Normally 50 feet by 50 feet minimum area required to accommodate wellhead treatment, if necessary in the future.

Phase 1 of proposed deep well development includes the drilling of a test hole and measuring of the geophysical properties at each location. During this phase, a reverse rotary drill rig would be brought on site to drill the approximately 2,000-foot deep test hole. Drilling operations may be nearly continuous for several days to several weeks, depending on individual site characteristics.

Use of the reverse rotary drilling method requires temporary use of mud/cuttings tanks. The "drilling mud" is directed down the borehole shaft to the drilling bit. Drill cuttings are removed from the borehole as they are forced up the shaft by the drilling mud. Drilling mud and cuttings exiting the borehole are circulated through the mud/cuttings tanks where cuttings are removed and drilling mud recycled

During Phase 1, the acceptability of the test hole is determined based on collected geophysical and groundwater quality data. The test hole is then used to collect water samples from the desired strata. If the test hole data and water quality data prove sufficient for development, then Phase 2 is initiated.

To be considered sufficient for development, the site must meet the following:

- The electronic log records an electrical resistivity on strata in the formation material indicating the possibility of water;
- The geophysical logs indicate those strata that are sands, gravels, clays, etc.;
- The water samples from each stratum meet drinking water, turbidity, color and odor standards; and
- Soil samples and electronic logs of the completed test hole include sufficient data to predict if the water bearing intervals will produce a minimum of 800 gpm.

If properties of the test hole and the water quality from the monitoring well do not meet the City's well development criteria (e.g., the water quality meets health and safety standards and water production capability equal to or greater than 800 gpm), the project will be concluded at the site. If the site is abandoned after construction of the test hole, the test hole will be abandoned and destroyed per the state specifications ending at approximately five feet below ground. If a monitoring well is constructed, then a 4-foot by 4-foot pedestal will be constructed that extends 3 inches above ground level.

During Phase 2, the drill rig may be relocated approximately 30-50 feet from the test hole, and the production hole is constructed or the test hole is converted into the production hole. The well construction/development phase includes installation of a permanent metal casing with appropriately screened sections, and a filter pack which is inserted between the metal casing and the soil of the bore hole to prevent sand and soil from entering the casing through the screened sections. The production well is developed next and test pumped to determine the final pump design.

During Phase 3, the site improvements are constructed, including installation of underground piping connecting the production well to the City's main distribution system and storm drain system, pump and motor (either submersible or vertical turbine pump), electrical equipment, building enclosure (if necessary), radio telemetry and monitoring systems, surface paving, security fencing, and disinfection equipment.

TANK AND PUMP STATION

Tank and Pump Station Construction

The tank will be constructed of prestressed concrete similar to the West Area Tank. The height will be no more than three stories tall to minimize aesthetic impacts. The capacity of the tank will be approximately four million gallons. The booster pump station will be sized to provide approximately 2,500 gpm firm capacity with a total of three pumps. An emergency generator will be installed on-site. The pumps and electrical equipment will be housed in a concrete block building.

To achieve the tank foundation elevation, the existing ground at the site will be excavated approximately 5 to 8 feet under the footprint of the tank. The reinforced concrete floor is then poured. The cast-in-place concrete walls will be constructed next, after which a high-strength wire strand is wrapped around the tank walls from bottom to top. The wire is stressed to carry the tanks water load. The wire strands are covered with shotcrete to protect them from corrosion.

Once the walls have been constructed and stressed, the columns and concrete roof are placed. The exterior wall facing can be painted or other architectural treatment administered as desired.

The booster pump station will be constructed in stages. The piping into and out of the pump station building, the pump pedestals, and other piping appurtenances will be constructed first. The pumps and motors are then installed (or possibly installed later if long procurement lead time is necessary). After the piping is installed, the building floor slab is poured. The walls and roof structure are then constructed on the footing. The electrical equipment and the remaining ancillary equipment are installed in the building through access doors and man-ways. A portable emergency generator will be located at the site, similar to the West Area Tank (WAT) site,

Required construction equipment includes graders, backhoes, small cranes, concrete trucks, haul trucks for disposal of excavated material, and flatbed trucks for delivery of heavy equipment and construction materials.

It is estimated that tank and pump station construction will be completed within 8 to 12 months from the start of construction.

Tank and Pump Station Operation

The 1989 Water Management Plan identified a plan for constructing additional wells and approximately 8 million gallons water storage capacity in ground-level tanks to offset a portion of the needed groundwater well pumping capacity. The storage tank(s) would be filled from the distribution system at periods of low demand (or from a dedicated deep aquifer well) and delivered to the distribution system through the booster pump station during periods of high demand or in an emergency.

The City has already constructed the West Area Tank and booster pump station in west Davis in 2002. Plans are currently in place to enable use of a City-owned property to locate a second 4 million gallon tank and pump station facility in east Davis to geographically balance the storage capacity locations. The preferred site at the present time is a site adjacent to the Park 'N Ride lot on Mace Boulevard north of Highway 80 (see description below). This location is large enough to site the tank, pump station, and a replacement deep well.

The tank stores groundwater pumped from the existing wells. The booster pump station is currently scheduled to operate similar to a well, with the pumps staggered to operate based on declining water levels in the elevated water tank. Presently, the storage tank fills primarily at night, and the pump station operates during the morning peak demand period through the evening peak demand period. The planned operation of the East Area facilities would be similar to the existing facility.

SELECTION OF POTENTIAL REPLACEMENT WELL SITES

The City's water supply system is the typical well-based system, consisting of wells scattered throughout the distribution system to primarily supply water to a localized area in the vicinity of the well. The distribution system piping has been configured to move the water from the wells to meet the demands in the immediate vicinity of the wells. The distribution system does not have large diameter transmission mains to move large volumes of water from one geographic area to another.

Therefore, it is important to locate replacement well capacity as close to the center of the geographic area where the water is most needed or where well capacity has been removed. However, it is not always possible to locate a well at the most advantageous location. The well sites will require an area of approximately 1 acre for construction/grading/staging purposes and approximately 1/10 of an acre for the final well and pumping facilities. Above ground facilities will be designed to blend into the surroundings. Potential well sites under private land ownership may be very costly to purchase.

Based on a review of the wells removed from service and the current location of the wells, it is possible to target geographic areas for the proposed replacement well capacity. The most strategic locations for replacement wells are east Davis, the El Macero area, central Davis and north central Davis. All of these locations have lost well capacity since 1988 or have wells that are expected to be removed from service very soon. Wells located within these areas would provide the most optimal replacement of lost capacity. However, if other sites are found to be more cost-effective, they can be evaluated, based on hydraulic impacts to the water system using the City's water system hydraulic model.

Selection of a potential well site is a very difficult undertaking. Many factors influence the location, sizing and ultimate operation of a well. Water produced from a well must meet all state and federal drinking water standards as well as attempting to assist the City of Davis WPCP meet more stringent discharge requirements for certain constituents of concern. In siting a new well, a site must meet specific criteria by regulatory statute as well as other criteria developed by the City (zoning, parcel size, water system benefits, etc.) Regulatory statutes include the following well location requirements:

- The well should be located out of the 100-year flood plain.
- The well must be located at least 50 feet from any sewer structures (private or public).
- The well must be located at least 50 feet from any drainage structures (private or public).
- The well must be located outside the established influence zone of a toxic site.
- The well casing must be 18 inches above the pad elevation.
- The California Department of Health Services must approve the well plans.
- The well must be located to minimize adverse impacts on the environment.

Even if the well cannot meet all of these criteria on first evaluation, it may be possible to make localized evaluation of conditions and some of these criteria may be mitigated by relocation of conflicting utilities, additional design considerations or investigation of site-specific problems.

Additionally, the City has adopted several guidelines predicated on good engineering design and systems operation practice when locating a new well:

- The well should be within 200 feet of a looping water main.
- The well should be near a single 10-inch pipeline or a networked 8-inch pipeline or larger.
- The well should be at least ½-mile from any well tapping the same aquifer.
- The minimum area for construction staging and development of the well site and all applicable structures is approximately one acre.
- Locate wells on City-owned property to avoid third-party land acquisition challenges,. which are time-consuming and expensive.
- New or replacement well sites should be at least 50 feet by 50 feet in size to accommodate wellhead treatment if required in the future.

These guidelines are primarily planning tools and may be mitigated by more site-specific investigations to determine the potential for adverse affects and methods to mitigate any potential problems.

Actual yield from the well or pumping capacity cannot be accurately determined without drilling the well and conducting pumping tests. Therefore, it is not possible to predict with certainty the well yield during the planning process. Based on historical data and recent well drilling experience, it is possible to assign an average capacity of approximately 1,500 gpm for new deep wells for planning purposes only. The actual well capacity and yield will be determined only after the test hole is drilled, casing and gravel pack installed, well developed, and pump tests and water quality evaluation performed.

Because of the nature of the distribution system piping, a larger flow rate from a new well may not provide the full benefit to the distribution system. On the other hand, high-yielding wells are not easy to find and it may be necessary to maximize the yield from a particular well, and consider upgrading the distribution system to handle the increased flows. The final capacity decision is done on a case-by-case basis.

Proposed Well Locations

The City has developed a list of potential well sites obtained from a review of vacant parcels, City-owned land, existing and abandoned well sites, parks and greenbelts and other sources. City staff initially identified over 25 potential sites, although not every site meets the requirements outlined above. The City has identified eight potential well sites as the highest priority locations to investigate for installation of replacement wells. The currently proposed drilling locations to be investigated for their viability as well sites are:

- A parcel located at 3608 Chiles Road at the south end of the Dave Pelz Bicycle Overcrossing
- An area at Sandy Motley Park located at 1903 Moore Boulevard in North Davis
- A parcel located on the northeastern quadrant of the Mace Boulevard/Highway 80 interchange adjacent to the Park 'N Ride lot
- Within the community garden area at 1819 Fifth Street, east of the City Public Works Corporation Yard

- A parcel located at 5448 Cowell Boulevard in a greenbelt on extreme eastern edge of the City
- At the El Macero Golf Course, south of the corporation yard at approximately 1050 Mace Boulevard
- The extreme eastern end of the Cowell Research Park parcel located at 2626 Cowell Boulevard
- The Community Park at 1405 F Street (on the southern edge)

Additionally, two back-up locations have been identified and are outlined below:

- An open-space area located adjacent to 42343 Almond Lane
- At the southwest corner of Slide Hill Park at 1414 Tulip Lane

At each drilling site, a test well will be drilled to determine the potential water-bearing characteristics of the production well. If favorable hydrogeologic conditions are found, a production well will be drilled at the site (or the test hole reused) and pumping facilities installed. If any of the sites prove inadequate as a well site, then it shall be converted into a monitoring well with a small pedestal and a short riser.

The City continues to identify and pursue potential well site locations. It is possible that other site(s) may be deemed to be more suitable for a well. It may be in the best interest of the City to pursue the alternate site(s) rather than one of the currently higher priority sites, as deemed necessary to gain the required well replacement capacity. It is prudent to not limit the potential sites as circumstances change and as development of well sites is not an easy undertaking. Also, by selecting a particular well site to develop, nearby locations are inherently eliminated as possible future well locations. The priority sites are identified on Figure 3 and a brief description of each location is provided below.

<u>Pelz Bike Overcrossing</u>
This 26.91-acre parcel (APN #69-020-831) is located at 3608 Chiles Road, just south of Highway 80. Single-family residences abut the parcel to the east and the south. The parcel is undeveloped with open fields to the west. Ground cover, grasses, and small bushes exist on the site. The parcel is owned by the City and is zoned as Office/PD. The proposed well would be located in the small section of the parcel directly beneath and east of the bicycle bridge. This site is to be shared with the Friends of the Davis Library storage facility.

<u>Sandy Motley Park</u>
Sandy Motley Park is approximately 5.23-acres (APN #71-140-18) and located at 1903 Moore Boulevard just east of Pole Line Road in north Davis. Single-family residences exist across the street from the parcel. The park is mostly grass and athletic fields. The park is a city-owned facility and is zoned Park/PD. The proposed well would be located in a small area adjacent to Moore Boulevard and will include the installation of a restroom at the park.

Mace Blvd Park 'N Ride

This 3.44-acre parcel (APN #33-630-06) is located adjacent to the Park 'N Ride lot on the east side of Mace Boulevard just north of Highway 80. The Mace Boulevard overcrossing is immediately to the west of the site. A railroad right-of-way parallels the southern boundary of the parcel. The area to the east and north of the parking lot is undeveloped. Although the parcel is just outside the City limits in Yolo County, it is City owned. It is zoned as Agriculture/Agriculture (outside City limits). In addition to the proposed well, the 4 million gallon water tank and booster pump would be located on the same site.

Community Gardens at the City Public Works Corporation Yard

This 4.82-acre parcel (APN #70-560-01) is located at 1819 Fifth Street, just east of the City Public Works Corporation Yard. Residences are located to the north with commercial development to the south and east. The site is partly weeded and partly planted/garden plots. The parcel is owned by the City and used by the public for the community gardens. It is zoned as Industrial/Commercial Service. The proposed well would be located within an area adjacent to the gardens now used for spoils area and access. Access for the well facility would be gained through the Corporation Yard parcel.

Cowell Boulevard

This 0.58-acre parcel (APN #68-284-15) is located at 5448 Cowell Boulevard on the extreme eastern edge of the City of Davis in a greenbelt area. A sewer lift station is located to the east of the site, with single-family residences surrounding the parcel. Ground cover and small trees exist on the parcel. The parcel is owned by the City and is zoned Greenbelt/PD. The proposed well would be located in a corner of the parcel adjacent to Cowell Boulevard.

El Macero Golf Course Corporation Yard

This 166.81-acre site is part of the El Macero Golf Course (APN #68-130-01 and #68-130-02), located along Mace Boulevard, south of I-80. The area is partially paved and partially turf. The site is outside the City limits and is zoned Park/Recreation. The well would be located just south of the corporation yard adjacent to Mace Boulevard at approximately 1050 Mace Boulevard.

Cowell Research Park

This 12.37-acre parcel (APN #69-020-81) is located at 2626 Cowell Boulevard, south of I-80. Single-family residences exist to the south and an area identified as greenbelt exists on portions of the parcel. The site is gravel with broken pavement and other debris and is overgrown with weeds. The parcel is zoned General Commercial/PD. The proposed well would be located on the extreme eastern end of the triangular-shaped parcel adjacent to Cowell Boulevard.

Community Park

This site is in Community Park (APN #70-010-02), a 30.4-acre public park, located west of F Street in central Davis. The large park completely surrounds the well site, with multi-family dwellings nearby across F and 14th Streets (approximately 100 feet away). Turf and small trees exist on the site along with the access road for Well No. 11. The parcel is owned by the City and is zoned Park/R. The proposed well would be located at the extreme southerly end of the park at the northwest quadrant of the intersection of F Street and East Fourteenth Street at 1405 F Street.

The two backup sites are identified on Figure 3 and a brief description these alternate locations is provided below.

Almond Lane

This 3.82-acre parcel (APN #69-490-22) is located adjacent to 42343 Almond Lane, on the eastern end of the street. Single-family residences are located to the south and west of the parcel. Open space is located to the east, with the remnant north fork of Putah Creek running on the northern boundary of the parcel. The site is covered with native grasses and small brush. A row of oak trees (to remain) runs along Putah Creek. The site is owned by the City and is zoned Greenbelt/PD. The proposed well would be located south of the creek and east of the end of Almond Lane.

Slide Hill Park

This 12.01-acre site (APN #32-061-14) is located at 1400 Tulip Lane in north Davis. Single-family residences are located to the south and across Tulip Lane to the west. Turf and small trees exist on the parcel along with a paved driveway to Well No. 22 (which exists on the same parcel to the east of the proposed new well site). The park is owned by the City and is zoned Park/R. The proposed well would be located on the southwest corner of the park adjacent to Tulip Lane, across from Belmont Drive.

INFEASIBLE PROJECT ALTERNATIVES

Other project alternatives to obtain additional capacity have been analyzed and have been determined to be infeasible, as noted below:

- Continued Construction of Intermediate Depth Wells
- Treatment of Intermediate Depth Wells
- Water Conservation
- Non-potable Irrigation Systems

Continued Construction of Intermediate Depth Wells

The City could continue to drill new water supply wells into the intermediate depth aquifer to replace the lost capacity from the wells recently taken out of service. However, it has already been proven that the intermediate depth aquifer water quality is poorer than other feasible alternative supplies, and the overall water quality characteristics of the intermediate depth aquifer are only likely to continue to deteriorate as time passes and as water quality regulations become stricter.

Use of the intermediate depth aquifer cannot continue without dealing with the poor water quality of the aquifer. Some form of treatment would be required. Therefore, it is not feasible to continue to pump from the intermediate aquifer without addressing the water quality aspects.

This alternative does not meet the project objectives, due to the poor water quality and inability to meet wastewater discharge standards.

Treatment of Intermediate Depth Aquifer Wells

It is clear that the only viable option for extracting water from the intermediate depth aquifer is to treat the water to remove or reduce unwanted constituents. Wellhead treatment facilities such as iron and manganese or arsenic removal would be required. Wellhead treatment is costly and requires additional space on-site for the treatment facilities, which would likely limit the availability of some sites that might otherwise be suitable. Depending on the treatment technology utilized, it is likely that boron concentrations would continue to be high. The use of reverse osmosis wellhead treatment would produce a brine stream that would make disposal difficult and costly. Intermediate depth aquifer is also susceptible to land subsidence and impacts from overuse.

While this alternative may meet some of the project objectives, it is very costly and is not considered cost-effective and practical compared to the proposed project.

Water Conservation

The City has actively promoted water conservation throughout the water system for a number of years. Water savings from an aggressive conservation program can reduce water demands by up to 15 to 20 percent utilizing standard techniques such as installation of water meters, low-flow fixtures and appliances, minimizing wasted water in everyday usage, proper irrigation of lawns and plants, and repairing leaks.

The City of Davis adopted a long-term system-wide annualized demand reduction target of approximately 20 percent, as identified in the 2000 Urban Water Management Plan. Achieving this target would result in the majority of water savings coming from residential users, which comprise 89 percent of all service connections and about 60 percent of metered demands. Before water conservation efforts were implemented, average water use was 230 gallons per capita per day (GPCD). The 20% reduction goal is 185 GPCD, which water use for calendar year 2003 was 192 GPCD.

Commercial and industrial users are expected to have made minor reductions in usage primarily related to irrigation efficiency and retrofitting with low water use fixtures and appliances. A portion of the system's unaccounted-for-water has been reduced through metering construction water and from regular surveying and repairing of water system leaks. Meters have recently been installed in the El Macero area, meaning all services are now metered.

The City expects to meet the 20% water conservation goal now that all water services are metered. Further demand reductions could be much more difficult and expensive to achieve and maintain overtime.

While the water conservation and demand reduction program has been successful to date, it is likely that significant additional demand reduction cannot be expected. Conservation should continue to be encouraged, and any additional savings will directly result in less pumping of the groundwater. However, it is not feasible to expect any significant additional water demand savings through conservation alone to offset the need to replace the lost well capacity.

Non-Potable Irrigation Systems

The City has investigated the possibility of constructing a dual reclaimed water system to take treated effluent from the City's wastewater treatment plant and serve irrigation demands at parks, greenbelts, open spaces, athletic fields and other high-water users throughout the service area. The demand that can be met through reclaimed water directly reduces potable water consumption and may offset the need to construct replacement well capacity. Improved drinking water quality enhances ability to re-use wastewater flows.

The study investigated the feasibility of constructing a separate water distribution system within the City of Davis that would be used for irrigation purposes only. Two irrigation options were investigated: 1) irrigation of parks and open spaces only; and 2) irrigation of parks, open spaces, and all residential/commercial areas within Davis. Two water supply sources for irrigation were investigated: 1) existing intermediate depth wells and new intermediate depth wells strategically located within the parks and open spaces; and 2) reclaimed water from the Davis WPCP located northwest of the City.

For all demand or source options, a separate irrigation distribution system will be required. The non-potable water source will come from the intermediate wells, and this will remove them from meeting potable water demands. Therefore, potable demands will be met either from new deep aquifer wells or a new surface water supply, or both. Use of reclaimed water would require significant process and treatment modifications to the existing WPCP to meet Title 22 standards and other regulatory requirements.

The study concluded that meeting landscaping demands in Davis with reclaimed wastewater would be very costly. In addition, there are a number of concerns regarding health risks, potential plant damage and negative public perceptions that could make it difficult to implement. The study also concluded that irrigation demands could be met by converting existing intermediate depth wells to irrigation use only, but the project would be very costly and would require a complete irrigation distribution system throughout the city. The cost could be reduced significantly if the scope of the irrigation demands were reduced to only parks and open space.

According to the study, the potential peak day irrigation demand that could be associated with parks and open space only is approximately 1.4 mgd. The potential peak day irrigation demand associated with all the residential and commercial areas is approximately 12.3 mgd. Irrigation of only parks and open space does not significantly reduce potable demands. However, if all irrigation demands are included, then significant reduction of potable demands can be achieved. However, the high cost of developing the system most likely will not justify the water savings.

Therefore, non-potable irrigation systems are not considered a viable alternative.

TREATED SURFACE WATER SUPPLY STUDIES
The City of Davis is a party to a water rights application for surface water from the Sacramento River under area of origin water rights protection, filed in conjunction with UC Davis and the City of Woodland in 1994. The City and UC Davis completed a feasibility study in September 2002 that evaluated feasible alternatives for improving water supply quality and reliability. Alternatives included use of treated surface water in conjunction with existing or new deep groundwater wells, use of the groundwater supply only, and use of surface water only to meet current and projected future demands. Options involving treated surface water with peaking from deep wells were most favorable in the analysis in meeting the City and UC Davis objectives.

The City continues to pursue a 20,000 acre-feet per year supplemental increment of treated surface water from the Sacramento River in conjunction with UC Davis and the City of West Sacramento. The City and UC Davis would purchase high quality treated surface water through the West Sacramento water treatment plant. The water would be conveyed into east Davis. Additional water storage capacity and a new transmission piping system would be required to store and deliver the water to the existing distribution system. Depending on the final alternative selected, peak demands may be augmented with groundwater wells tapping only the deep aquifer.

Currently, the City and UC Davis are preparing to begin work on the project EIR as recommended by the Feasibility Study. Additional deep aquifer investigation and water quality monitoring is being conducted by the City and UC Davis. The agencies are preparing the necessary environmental documentation and continuing to pursue approval by the State Water Resources Control Board for their pending water rights applications.

III. ENVIRONMENTAL SETTING

Following is a brief overview of existing conditions. Additional information about the setting is presented in the environmental checklist, as necessary for discussion of each item. Additionally, the above project description includes location information for the currently proposed drilling sites.

The City of Davis is located in California's Central Valley, north of the Sacramento-San Joaquin Delta in Yolo County. The Sierra Nevada Mountain range lies to the east as well as the Sacramento and American Rivers. To the west lie the Coastal Range, San Francisco Bay, the coastal redwood forest, and the beaches and rugged shores of the Pacific Ocean. No active earthquake faults run through the city of Davis and no recent damage to the City has been noted as a result of earthquakes occurring on the San Andres fault system to the west or the Eastern Sierra fault system to the east. As with all locations in the seismically active state of California, there is always the potential for strong seismic ground shaking activities to occur and affect a site. The State Office of Planning and Research has placed the Davis area in Seismic Activity Intensity Zone II.

Regional access to the City of Davis is provided from Interstate Highway 80, approximately thirteen miles west of the state capitol Sacramento, and approximately fifty-six miles northeast of San Francisco (Figure 1). The population of Davis was estimated by the Department of Finance (DOF) to be approximately 65,000 residents in 2004 with an annual projected growth rate of 1.1 percent. The Davis city limits encompass approximately 10 square miles (Figure 2). Figure 3 shows the proposed locations of the existing wells and potential new well sites. The City of Davis General Plan governs land use and planning in the project area. The area surrounding Davis has some of the most productive agricultural land in California, sustaining hundreds of different crops. Conservation of prime agricultural land through limited urban growth is a priority as part of the City's General Plan. Other directives include resource conservation and the efficient use of energy, open space, and water resources. The Davis water service area includes the City of Davis, Willowbank County Service Area (CSA), El Macero (a CSA situated to the southeast of the City), and limited additional areas along the perimeter of the City limits, which have been identified in the Davis General Plan to be within the urban sphere of influence. In 2003, the Davis water service area had approximately 15,900 service connections.

Davis sits in the Pacific Flyway, a major migration route for waterfowl and other North American birds. Several wildlife preserves exist in the surrounding area, the largest being the Yolo Bypass Wildlife Area, which provides habitat for thousands of resident and migratory waterfowl on more than 2,500 acres of seasonal and semi-permanent wetlands. Davis sits in the eastern portion of the Putah Creek Plain, a major feature of the southwestern Sacramento River Valley. The land slopes at generally less than one percent Elevations range from 60 feet in western parts of the city to 25 feet in some eastern parts, with an official elevation level of 51 feet. Flood hazards in Davis generally consist of shallow sheet flooding from surface water runoff in large rainstorms. To mitigate this impact, the Public Works Department maintains three main channels and three detention ponds, which provide for drainage and storm water detention. Portions of Davis, primarily in the northern section of town, are subject to flooding in a 100-year flood.

The Central Valley climate can be described as Mediterranean. During the hot, dry, sunny summers, temperatures can exceed 100 degrees Fahrenheit on some days; however, more often summer temperatures are in the low 90s. The Sacramento River Delta breeze usually cools overnight temperatures into the 60s. Spring and fall has some of the most pleasant weather in the state. Winters in Davis are usually mild Temperatures drop below freezing on only a few days. The rainy season typically runs from late fall through early spring and fog season lasts from November through March. Average annual rainfall is about 17 inches.

Davis is within the Yolo–Solano Air Quality Management District (AQMD). With respect to state air quality attainment designations for "criteria pollutants," Yolo County is designated as a non-attainment area for ozone and PM_{10} (particulate matter less than ten micrometers in diameter). The national designation for ozone is also non-attainment. All other criteria pollutants are classified as attainment.

IV. ENVIRONMENTAL EFFECTS

An environmental checklist follows, which evaluates potential adverse effects known at this time based on preliminary review of the proposed project. There is the potential for significant impacts to occur as a result of the proposed project, even with the use of mitigation measures; therefore, an Environmental Impact Report will be prepared to evaluate potential environmental effects as a result of the proposed project in greater depth. The EIR will recommend mitigation measures, as feasible, to lessen the significance of any impacts identified as potentially significant.

V. ENVIRONMENTAL CHECKLIST AND EXPLANATORY NOTES

City of Davis
Davis Well Installation

NOTE ABOUT CHECKLIST: This checklist is essentially the checklist portion of Appendix G of the State CEQA Guidelines, as amended on December 1, 2003. This checklist is modified somewhat for clarity. Explanations of the findings noted in each of the seventeen issue categories (I through XVII) follow each tabular issue section. Where appropriate and where noted, an explanation addresses more than one specific issue question.

I. AESTHETICS - Would the project:	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Have an adverse effect on a scenic vista?				X
b) Damage scenic resources, such as trees, rock outcroppings, and historic buildings, within a scenic highway?				X
c) Degrade the existing visual character or quality of the site and its surroundings?		X		
d) Create a new source of light or glare that would adversely affect day or nighttime views in the area?		X		

I.a,b) The well drilling activities will occur within the developed area of the City of Davis and is unlikely to effect a scenic vista. There are no state designated scenic highways in the vicinity of the proposed project.

I.c) Temporary changes to the existing visual character of the sites will occur due to the presence of drilling and construction equipment and other project-related activities. Upon completion of the project, all site disturbances from construction will be returned to pre-construction conditions. This will be a temporary, minor effect. After construction, the visible changes at the sites will be essentially the new well facility, which will visually vary from site to site. Site developments may include, depending on the site, the wellhead and pump, piping, a pad and structure (to eventually contain liquid sodium hypochlorite [bleach] chlorination facilities, including storage tank, delivery pump, and piping), electrical equipment, building enclosure (if necessary), radio telemetry and monitoring systems, surface paving, security fencing, and landscaping. As part of the project description, the fencing and landscaping will be designed to be compatible with the neighborhood Depending on the site, these changes are expected to be minor in the context of the overall views of the facility from the offsite The City design review process will evaluate impacts of the new well sites on a site-by-site basis and any visual impacts will be mitigated during this process. Mitigations will be developed and proposed in the EIR to ensure protection of the existing visual character and quality of each site.

I.d) The proposed project does not include any permanent new light sources, although a night-time emergency light will be available in the case a site needs to be visited. All exterior lights will utilize cut-off optics and be mounted in a way to minimize light spilling offsite. A mitigation measure will be proposed in the EIR that will ensure compliance with night-time lighting ordinances and minimize offsite impacts.

II. AGRICULTURE RESOURCES - In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model prepared by the California Dept of Conservation as an optional model to use in assessing impacts on agriculture and farmland Would the project:	**Potentially Significant**	**Less Than Significant With Mitigation**	**Less Than Significant**	**No Impact**
a) Convert Prime Farmland; Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program in the California Resources Agency, to non-agricultural use?			X	
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				X
c) Involve other changes in the existing environment that, due to their location or nature, could individually or cumulatively result in loss of Farmland, to non-agricultural use?			X	

II a-c) The proposed project could potentially utilize agricultural land or agricultural zoning areas The Mace Boulevard Park 'N Ride site is zoned Agriculture The project sites will be small (approximately one acre necessary for equipment staging and site development at each site, and only 1/10 of an acre for actual footprint upon implementation completion) The proposed project will not significantly impact agricultural lands, or cause agricultural lands to be taken out of production Overall impacts to agricultural resources will be explored in greater detail in the EIR with impacts expected to be less than significant

III. AIR QUALITY - Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations Would the project.	**Potentially Significant**	**Less Than Significant With Mitigation**	**Less Than Significant**	**No Impact**
a) Conflict with or obstruct implementation of the applicable air quality plan?			X	
b) Violate any air quality standard or contribute to an existing or projected air quality violation, including in relation to asbestos in construction materials or earth?		X		
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?			X	
d) Expose sensitive receptors to substantial pollutant concentrations?			X	
e) Create objectionable odors affecting a substantial number of people?			X	
f) Otherwise degrade the atmospheric environment?				X
g) Substantially alter air movement, moisture, temperature or other aspects of climate?				X

III.a-e) The Yolo-Solano area is currently in attainment of all state and federal ambient air quality standards, with the exceptions of ozone (federal and state) and the state standard for particulate matter less than ten micrometers in diameter (PM_{10}) Nearly all areas of the state are classified as non-attainment for PM_{10} Construction activities will result in temporary emissions of diesel and gasoline engine combustion products and earthen dust from site development Operation of the well facilities will be similar to the current site conditions in regards to air quality.

The EIR will provide mitigation measures to minimize dust emissions, and the net increase of PM_{10} will be minor and brief, and not a significant cumulatively considerable increase.

An emergency generator will exist at the pump station, to be exercised for 30 to 60 minutes once every week/or month, depending on site permit, for maintenance purposes, and otherwise used only during power outages. The necessity of a permit from the Yolo-Solano Air Quality Management District for the generator at the tank site will be researched, and no separate mitigation is likely necessary.

The impacts are inherently limited to minor and temporary levels and are not a cumulatively considerable increase in any air pollutant. Thus, these ordinary construction emissions will be less than significant (III.f), and there will be no violations or attainment plan conflicts (III.a,b,c).

III.f-g) No atmospheric effects other than noted above are expected

IV. BIOLOGICAL RESOURCES - Would the project:	**Potentially Significant**	**Less Than Significant With Mitigation**	**Less Than Significant**	**No Impact**
a) Have an adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game, the U.S. Fish and Wildlife Service, or the National Marine Fisheries Service?		X		
b) Have an adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations; or by the California Department of Fish and Game, the US Fish and Wildlife Service, or the National Marine Fisheries Service?		X		
c) Have an adverse effect on wetlands, either individually or in combination, with the known or probable effects of other activities through direct removal, filling, hydrological interruption, or other means?		X		
d) Interfere with the movement of any resident or migratory fish or wildlife species or with established resident or migratory wildlife corridors, or impede the use of wildlife nursery sites?			X	
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?			X	
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan?			X	
g) Otherwise degrade the biotic environment?			X	

IV.a-c) Review of the U.S. Fish and Wildlife Service's (FWS) list of species that have been recorded or may occur in the Davis and Merritt Quads identified nine federally threatened species (2-invertebrates, 4-fish, 3-amphibians, and 1-bird); two candidate species, one proposed species and 42 species of concern. Threatened, candidate and proposed species, as well as critical habitats, identified by the FWS list are presented below. One listed species, the long-horned elderberry beetle (*Desmocerus californicus dimorphus*) may occur in the Putah Creek riparian and the California tiger salamander (*Ambystoma californiense)*, proposed threatened state-wide, has been recorded once within the Davis city limits. The FWS list is constantly updated, and will be consulted during the EIR process to include any changes to species designations

Consultation with California Department of Fish and Game's Natural Diversity Database (CNDDB) in September 2004 identified one state listed threatened species known to occur within the Davis city limits (Swainson's Hawk [Buteo *swainsoni*]), the California tiger salamander record and seven sensitive plant and animal species (see below). Site-specific plant lists will be generated through biological surveys of proposed well sites as part of the EIR preparation process. Sensitive plant species that were identified by the CNDDB as occurring within the Davis city limits include San Joaquin saltbush (*Atriplex joaquiniana*, found in seasonal alkali wetlands), brittlescale (*Atriplex depressa*, found in alkali grasslands and vernal pools), and alkali milk-vetch (*Astraglaus tener* var. *tener*, found in alkali grasslands). The EIR will verify whether habitats exist in the project area to support any of these plant species (i.e., wetlands, alkali grasslands, or vernal pools). Sensitive animal species that were identified by the DFG CNDDB as occurring within the Davis city limits include Swainson's Hawk (nesting in riparian or oak savannah or suitable trees, foraging in suitable adjacent alfalfa or grain fields), Burrowing Owl (*Athena cunicularia*, burrow sites in open grasslands, dependent on ground squirrel colonies), White-tailed kite (*Elanus leucurus*, nesting in riparian, oak savannah, foraging in adjacent open fields). Possibly occurring in Putah Creek is the colonial nesting Tricolor Blackbird (*Agelaius tricolor*), the locations of which are suppressed by the CNDDB. All currently proposed well sites will be evaluated during the EIR process as to the potential for these sensitive species to occur. **Mitigation measures will be developed in the event any sensitive species or habitats are identified. Mitigation measures will** also be developed to avoid any impacts on future potential sites that have not yet been identified.

SCIENTIFIC NAME	COMMON NAME	STATUS	Potential to Occur in the City of Davis
Branchinecta lynchi	Vernal Pool fairy shrimp	Threatened	Not recorded in City, no habitat.
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	Threatened, Critical Habitat	Likely to occur in Putah Creek riparian but not recorded by the CNDDB
Hypomesus transpacificus	Delta smelt	Threatened	Not recorded in City
Oncorhynchus mykiss	Central Valley steelhead	Threatened (NMFS)	Not recorded in City
Oncorhynchus tshawytscha	Central Valley spring-run chinook salmon	Threatened (NMFS)	Not recorded in City
Oncorhynchus tshawytscha	Winter-run chinook salmon	Endangered (NMFS)	Not recorded in City
Ambystoma californiense	California tiger salamander	Proposed threatened	Recorded within City limits
Rana aurora draytonii	California red-legged frog	Threatened	Not recorded in City, no habitat.
Thamnophis gigas	Giant garter snake	Threatened	Habitat does exist but not recorded as occurring in City limits
Haliaeetus leucocephalus	Bald eagle	Threatened	Nesting not recorded in City
Vernal Pool Plants	Various	Critical habitat	
Tuctoria mucronata	Solano grass (= Crampton's tuctoria)	Critical habitat	
Acipenser medirostris	Green sturgeon	Candidate	Not recorded in City
Oncorhynchus tshawytscha	Central Valley fall/late fall-run chinook salmon	Candidate (NMFS)	Not recorded in City
Buteo swainsoni	Swainson's Hawk	State Threatened	Scattered nest sites in City
Agelaius tricolor	Tricolor Blackbird	Species of Concern*	Nesting not recorded in City
Athena cunicularia	Burrowing Owl	Species of Concern*	Scattered nests sites in City
Elanus leucurus	White-tailed Kite	Species of Concern*	Scattered nest sites in City

(NMFS) = Jurisdiction means consultation should occur directly with the National Marine Fisheries Service in regards to this species
* = Listed by the California Department of Fish and Game as a Species of Concern
Source FWS, 2004.

Known wildlife use within the City of Davis consists of common occurring migratory and resident land birds, including the State threatened Swainson's Hawk, and species of concern, the Burrowing Owl and White-tailed Kite. The fore-mention species of raptors are known to occupy suitable sites within the Davis city limits in proximity to developed surroundings. **Mitigation measure(s) will be developed** to protect any nesting raptors during breeding cycle in the event any tree removal is proposed. All proposed well sites will be evaluated on a site-by-site basis during the EIR process as to the potential for the identified listed species and critical habitats to occur. **Mitigation measures will be developed** to ensure protection of these species on and adjacent to all current proposed well sites as well as any unidentified potential sites that become available to the City for use in the future

Well start-up, development, and pump test water will be discharged to a combination of the City's sanitary sewer and storm drain systems. All site work will comply with the City's Stormwater Management Plan and will follow associated Best Management Practices (BMPs) Mitigation measures may be developed during the EIR process to ensure proper protection in the event any adjacent riparian, wetland, or vernal pool areas exist. The proposed well installations will not adversely affect, destroy, or modify habitat in streams or surrounding riparian habitats. With mitigation, no significant effects are expected

IV.d) The project will not interfere with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. The remnant north fork of Putah Creek, which meanders through the City of Davis, acts as a resident and migratory wildlife corridor and wildlife nursery. Setbacks from property lines, wetlands/creeks, and flood areas will provide an adequate setback between the well facilities and any potential adjacent creek wildlife corridors. The subject sites are small in size and do not solely support fish and wildlife species, nor do they act to connect habitat areas. Therefore, the project will have a less than significant impact on the above referenced biological resource.

IV.e,f) There are no known Habitat Conservation Plans, Natural Conservation Community Plans, tree preservation, or habitat protection policies known for the project area with which the proposed project would conflict. The project will abide by all local policies and ordinances and no significant impacts are expected. Grading permits will be obtained for all locations where site-development is proposed.

IV.g) The project site selection and design will minimize impacts to the biotic community to the greatest extent possible. Impacts in this category will more than likely not be significant.

V. CULTURAL RESOURCES – Would the project	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Cause an adverse change in the significance of a historical resource, as defined in Section 15064.5?				X
b) Cause an adverse change in the significance of an archaeological resource, pursuant to Section 15064.5?		X		
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?			X	
d) Disturb any human remains, including those interred outside of formal cemeteries?		X		

V.a,b,d) A cultural resources records search will be conducted of all sites where ground disturbing activities will occur (for drilling and/or site development). If it is determined that there is a high priority of discovering buried cultural resources at any site, a complete field survey of the site will be conducted and the results/recommendations of this survey incorporated into mitigation measures in the EIR. A mitigation measure will be included in the EIR to avoid impacts on future unknown potential well sites, by requiring the above procedures for all future potential well sites.

V.c) No unique paleontological resource or unique geological feature is known or expected to exist in the project impact area.

VI. GEOLOGY AND SOILS - Would the project:	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving.				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Publication 42				X
ii) Strong seismic ground shaking?				X
iii) Seismic-related ground failure, including liquefaction?				X
iv) Landslides?				X
b) Result in soil erosion or the loss of topsoil?		X		
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?		X		
d) Be located on expansive soil, as defined in Table 18-1B of the Uniform Building Code (1994), creating risks to life or property?		X		
e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?				X

VI a) The state of California in general is at risk of strong ground shaking due to earthquakes Based upon review of the Alquist-Priolo Earthquake Fault Zoning Maps, the City of Davis is not in an area where fault rupture is known or expected and potential impacts resulting from the proposed project and fault rupture are less than significant There have been no recorded instances of damage to the City of Davis as a result of earthquakes occurring from the San Andreas Fault system to the west or the Eastern Sierra fault system to the east.

VI.b) In addition to the drilling activities, there will be relatively minimal surface excavation or ground clearing disturbance. If surplus soils are stockpiled from site excavation and utility trench construction, care will be taken to cover the piles if rains are pending or other factors affecting erosion potential are encountered Erosion control requirements will be included in the construction plans and specifications. The construction contractor will comply with these requirements for protecting exposed soils from runoff-producing rain and for the proper disposal of excess soils An erosion control plan will be adopted if the total area of soil disturbance is greater than one acre. The project will include best management practices and feasible mitigation measures, if necessary, to reduce soil erosion.

VI.c) Landslides are not expected to be an issue due to the low topographic relief of the Davis area. Each site will be analyzed for stability and potential for lateral spreading, subsidence, liquefaction, and/or collapse as a result of the proposed well drilling project. Mitigation measures will be proposed, as necessary, to ensure a reduction in significance of any of these mentioned impacts.

VI d) The soils in the Davis area predominantly alluvial sands and sedimentary materials Expansive soils are usually associated with specific clay minerals, which can potentially occur in localized regions in the Davis area (Andrews, W F., 1968). Expansive soils would have no bearing on the well drilling activities, but could be problematic for building construction. Due to the scale and nature of the proposed project, there will be no increase in risk to life or property as a result of any expansive soils within the area of drilling or site development Further evaluation of the nature of the proposed sites and review of the hydrogeologic technical memorandum will determine potential impacts, and mitigation will be developed, as necessary.

VI e) The project does not involve the construction of septic systems

VII. HAZARDS AND HAZARDOUS MATERIALS - Would the project:	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Create a hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?			X	
b) Create a hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?			X	
c) Have hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?			X	
d) Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?			X	
e) Be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, and consequently result in a safety hazard for people residing or working in the project area?				X
f) Be located within the vicinity of a private airstrip, and consequently result in a safety hazard for people residing or working in the project area?				X
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
h) Expose people or structures to the risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				X

VII.a-c) The use of ordinary equipment fuels and fluids during construction could create a minor hazard. The chance of a spill is small, and if a spill were to occur, it would be controlled and cleaned-up as needed in accordance with county and state regulations, with minimal environmental impact. Any impact would be temporary and not significant, and mitigation is not necessary. It has not yet been determined if the emergency generator(s) will be diesel or propane. Any on-site storage tank for diesel will meet current double-containment requirements. If the fuel tank capacity were to exceed 1,320 gallons for one site, a Spill Prevention, Control, and Counter Measure Plan will be required. If diesel generator is to be used, a Hazardous Material Business Plan will need to be developed/modified that covers the project site(s) and includes the presence of diesel fuel, as applicable. No separate mitigation is necessary to preclude a significant impact.

Liquid sodium hypochlorite will be stored and injected at all well locations for treatment prior to water entering the distribution system. At each well site, there will be a small storage tank (30 gallons) that the liquid is pumped from into the discharge line The liquid state of this chemical is safely contained in the storage tank. All necessary safety procedures will be implemented during installation of the facility and for operation.

VII d) Well-siting requirements must meet specific criteria by regulatory statute, which mandates wells to be located outside established influence zones of toxic sites During the EIR process, each site will be reviewed to ensure preclusion from any listing of hazardous materials sites compiled pursuant to Government Code Section 65962 5, and that each potential well site is located away form zone of influence of any known contaminated sites in the vicinity.

VII.e,f) The proposed well sites are not known to be within an airport land use plan. The Yolo County Airport is located five miles northwest of Davis. The U C. Davis Airport is within 1 mile to the southwest of downtown Davis, and is open to the public with general utility services for light aircraft. The proposed project does not include any new housing or changes to the UC Davis airport operation and therefore does not increase safety hazard for those residing within two miles of the UC Davis airport. The proposed project will employ people temporarily at each site during project construction; after completion one employee will visit each site daily for up to several hours for routine maintenance checks There will not likely be an increased safety hazard for people working in the project area as a result of the proposed well drilling.

VII.g) By its nature as a small-scale project with temporary implementation, the project will have no bearing on emergency plans. Mobile generators will be available to provide backup power to the well pumps in the event of an emergency (loss of power).

VII. h) The urbanized area of Davis is not considered to be a wildfire hazard area and there are no extraordinary or unusual fire risks at the currently proposed sites. The project sites may vary slightly in this regard-based on variations in vegetation and level of urbanization Each site will need to be evaluated individually for fire risk Operation of vehicles and equipment could create a small increase in the potential for fire The contractor will be required to use appropriate fire safety methods. Normal precautions, such as possessing appropriate fire-suppression tools, will be sufficient No specific mitigation is necessary to preclude a significant impact.

VIII. HYDROLOGY AND WATER QUALITY - Would the project:	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Violate any applicable water quality standards or waste discharge requirements?		X		
b) Deplete groundwater supplies or interfere with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?	SIGNIFICANCE OF IMPACT TO BE DETERMINED			
c) Alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in erosion or siltation on- or off-site?			X	
d) Alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?			X	
e) Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide additional sources of polluted runoff?				X
f) Place housing within a 100-year floodplain, as mapped on a Federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
g) Place within a 100-year floodplain structures that would impede or redirect flood flows?				X
h) Expose people or structures to a significant risk of loss, injury, or death involving: 1) flooding, including flooding as a result of the failure of a levee or dam or 2) inundation by seiche, tsunami, or mudflow?				X
i) Otherwise degrade water quality?	SIGNIFICANCE OF IMPACT TO BE DETERMINED			
j) Change the amount of surface water in a water body?				X
k) Change currents or the course or direction of water movements?			X	

VIII a) One of the objectives of the proposed project, as stated in the project description, is to "lower the level of constituents in wastewater...to minimize potential for violating current and anticipated NPDES requirement." As more deep aquifer water is added to the balance of the drinking water system it is anticipated that a positive water quality result will occur with regard to the City's ability to discharge wastewater.

VIII b) A technical analysis of the potential impacts to the deep aquifer will be prepared for submittal as an appendix to the EIR. A Technical Memorandum will be developed from existing published or available unpublished data. Both UC Davis and the City of Davis have produced a number of technical reports.

The EIR will focus on whether or not the proposed new wells will result in depleting groundwater quantity such that there would be a lowering of the groundwater table (deep aquifer). The impact assessment will address at a conceptual level the potential effects on water quantity (yield), water quality, sustainability, subsidence and the effects on existing deep aquifer wells. It is expected that the existing data will not be sufficient to numerically quantify all of the potential effects. If the potential effects are expected to be significant, recommendations will be provided for monitoring for potential effects, if appropriate, and mitigation measures incorporated as necessary and feasible

The Technical Memorandum will specifically attempt to address the following:

- Provide a narrative and map of the current understanding of the hydrogeologic environment
- Discuss the potential for hydraulic connection between local surface water and the deep aquifer.
- Discuss potential for additional subsidence.
- Discuss long term aquifer depletion.
- Discuss effect on long-term recharge and storage.
- Evaluate well interference with existing City wells.
- Evaluate well interference with non-City (i.e., UCD) wells.
- Discuss interaction between new deep wells and upper/intermediate aquifer wells.
- Discuss water quality from the new wells and how this may change over time.

VIII.c-g) It is not anticipated that the project will alter existing drainage patterns nor create or contribute substantial runoff. The project is small in scale and includes minimal addition to impervious surfaces. Minor site drainage will be provided for by connection to City stormwater system or by on site percolation. The project will not place structures within a 100-year floodplain The project does not involve new housing.

VIII h) As stated above, a Technical Memorandum will discuss impact on groundwater quality.

VIII j,k) The project will not change the amount of surface water in a water body nor change the currents or course of direction of water movement

IX. LAND USE AND PLANNING - Would the project	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Physically divide an established community?				X
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	**SIGNIFICANCE OF IMPACT TO BE DETERMINED**			
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?				X

IX a,c) By its nature and scale, the proposed project will not physically divide the community. The project has no bearing on any conservation plans in the area

IX.b) Several of the currently proposed sites have zoning designations that are different from the proposed use. Most of the sites are all owned by the City of Davis. The proposed project will utilize only a small area of each site, as described in the project description, and will not change or affect the land use or zoning designation for the remaining portion of each parcel Based on the scale of the project, no significant impacts are expected Sites that are identified in the future as potential well locations will need to be evaluated in regards to land use plans and policies on a site-by-site basis.

The proposed project provides infrastructure and services as planned for in the City of Davis General Plan Update (City of Davis, 2001). The proposed project is compatible with City policies relative to build-out.

City of Davis General Plan Update (City of Davis, 2001) states in "Policy WATER 2.1 and 2.2" commits the City to actions that preserve quantity and quality of groundwater resources within the Davis Planning Area. In the event that potential significant impacts are identified in the Hydrogeologic Technical Memorandum, mitigation measures if applicable will be developed to reduce the significance of this issue. In the event that this issue is non-mitigatable, then a significant impact may occur in the category of Land Use and Planning due to proposed project conflicting with the General Plan for the area.

X. MINERAL AND ENERGY RESOURCES - Would the project:	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Result in the loss of availability of a known mineral that would be of value to the region and the residents of the state?				X
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X
c) Result in the use of energy or non-renewable resources in a wasteful or inefficient manner?			X	

X a-c) No mineral resources are known at the proposed well sites. The use of energy and other resources for the construction and operation of this project is not considered a wasteful or inefficient use of energy. Mitigation is not necessary.

XI. NOISE - Would the project:	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Generate or expose persons to noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?		X		
b) Generate or expose persons to excessive ground-borne vibration or ground-borne noise levels?		X		
c) Result in a permanent increase in ambient noise levels in the project vicinity above levels existing without the project?		X		
d) A temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?		X		
e) Be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, and consequently expose people residing or working in the project area to excessive noise levels?			X	
f) Be within the vicinity of a private airstrip, and consequently expose people residing or working in the project area to excessive noise levels?			X	

XI.a-d) There will be a temporary increase in sound and vibration levels at the site during the construction period. Construction-related equipment will include a drill rig, bulldozer, excavators, dump trucks, and light-duty equipment and vehicles. Chainsaws may be used if any tree removal is proposed. A crane and other specialized tank-construction equipment will be used to install the tank at the tank site. The increase in ambient noise levels and ground vibration will last only as long as construction, which is expected to require 8 to 12 months at the tank site and approximately 6 months at each well location to complete, with varying levels of activities during that time. Site development and construction will occur between the hours of 7 a.m. and 6 p.m. There is the potential that drilling will occur on a 24-hour basis for up to a period of several weeks. The driller is equipped with sound muffling techniques/supplies and will implement (and include with project specs) all necessary procedures to ensure protection of area receptors during sensitive nighttime hours.

A vertical turbine or submersible pump will be installed at each site, depending on noise constraints and well capacity. The vertical turbine pump type has the potential to create a noise disturbance if installed in a residential neighborhood, in which case it would be completely enclosed in a cinderblock building. These options will be considered on a site-by-site basis during project planning and in the EIR. The project will abide by all City noise ordinances, compliance to which will be fully evaluated in the EIR The EIR will identify residences, significant buildings, and other sensitive noise receptors in the vicinity of the tank and at each of the proposed well locations. Mitigation is recommended to ensure the implementation of these procedures and prevent a significant impact in that regard. Otherwise, the temporary and brief elevation of ambient sound levels is not considered significant.

The placement of an emergency generator at the tank site for use during power outages will increase noise levels on a temporary, periodic basis during emergencies and during normal engine exercise periods (approximately once a week for up to one hour). The project will abide by all City noise ordinances, compliance to which will be fully evaluated in the EIR. It is recommended that exercising the generator be limited to daytime hours between 7 a m. and 6 p m., and mitigation will be developed to mandate this precaution. To ensure that the generator does not exceed the City's noise standard and does not result in a significant noise impact, a mitigation measure shall be recommended in the EIR. Backup power at the well sites will be available using several portable generators, as available and as necessary. The backup generators may increase noise levels and will be acute in duration and low frequency.

XI.e,f) The Yolo County Airport is located five miles northwest of Davis The U.C. Davis Airport is within one mile to the southeast of downtown Davis. The proposed project does not include any new housing or changes to the UC Davis airport operation and therefore does not increase noise exposure of people residing in the area The proposed project will employ people temporarily at each proposed well site during project construction; after completion one employee will visit each site briefly for routine maintenance checks. There will not likely be a significant increase in noise exposure to people working in the project area as a result of the proposed well drilling.

XII. POPULATION AND HOUSING - Would the project:	**Potentially Significant**	**Less Than Significant With Mitigation**	**Less Than Significant**	**No Impact**
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?				X
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X

XII a) The project is a well replacement project and will replenish lost pumping capacity Approximately 6,770 gpm pumping capacity has already been lost and it is anticipated that an additional 3,200 gpm will be removed from the Davis water supply system in the near future. Once the proposed 4 to 6 new deep aquifer wells have been installed, lost capacity as well as a past increase in demand will be satisfied. As described earlier in this document, a surface water supply alternative (not part of this project or document) is being pursued by the City and if secured will meet the projected future demands Although the current project will replace lost capacity as well as accommodate the slight increase in demand (1988 to present), the project is judged not to be growth inducing.

The proposed replacement capacity will not accommodate increases in demand due to new development projects, changes in population density due to zoning designation adjustments, or projects that are currently in the proposal stage. All these mentioned projects would need to be accommodated for through consistency with General Plan policies and necessary City approvals.

b,c) The project will not result in displacement of existing housing or people nor necessitate construction of replacement housing

XIII. PUBLIC SERVICES - Would the project result in 1) adverse physical impacts associated with the provision of new or physically altered governmental facilities, or 2) the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Fire protection?				X
b) Police protection?				X
c) Schools?				X
d) Parks?			X	
e) Roads?			X	
f) Other public facilities?				X

XIII a-d,f) Except in an emergency, the project will place no material demand on fire and police services. The project will not place additional demands on schools, or other services. Although several of the proposed well sites are located in areas identified as parks and greenbelts, the proposed project has temporary implementation procedures and small-scale site development (approximately 1/10 of an acre per site) Therefore, the proposed project will not place additional demand on parks.

XIII e) The truck traffic associated with construction of this project will result in ordinary wear and tear on the roads traversed. Operational traffic will not change. This potential impact is not considered significant and mitigation is not necessary.

XIV. RECREATION	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?			X	
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?				X

XIV.a,b) By its nature, the project will have essentially no adverse effect on recreational facilities. For most currently proposed sites, equipment staging and materials storage will be contained on site and will be temporary during the construction phase. For other sites not yet identified, equipment staging and material storage will be considered during the site selection process It is expected that there will continue to be parking for the public as currently exists and that there will be no adverse impact.

Although several of the proposed well sites are located in areas identified as parks and greenbelts, the proposed project has temporary implementation procedures and small-scale site development; therefore, the proposed project will not place additional demand on parks It is expected that due to the scale of the project, impacts to parks and recreation will be temporary during project construction Upon completion of construction, the site would be similar to pre-implementation conditions, with a small footprint (approximately 1/10 of an acre per site) converted from current use to the proposed use. The proposed project is not expected to place additional demand on parks.

XV. TRANSPORTATION - Would the project	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?			X	
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?			X	
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?				X
d) Substantially increase hazards to a design feature (e g , sharp curves or dangerous intersections) or incompatible uses (e.g , farm equipment)?			X	
e) Result in inadequate emergency access?			X	
f) Result in inadequate parking capacity?			X	
g) Conflict with adopted policies supporting alternative transportation (e g , bus turnouts, bicycle racks)?				X
h) Adversely affect rail, waterborne, or airborne transportation?				X

XV.a,d,e,f) The level of intensity of construction traffic and activity around the site will be relatively light because the project site is small, so the effect of the increased traffic on the flow of traffic will be minor and brief, lasting only the duration of construction Depending on vicinity characteristics of each site, the presence of construction vehicles and equipment could increase the normal traffic hazard if the streets are narrow and on-street parking is used Although the traffic hazard associated with this project is inherently limited by its small extent and brief duration, a formal traffic control plan may be advisable for each proposed drilling site to keep impacts in the public right-of-way to a practical minimum; thus preventing any significant impact on traffic flow, parking, and pedestrian safety from occurring inadvertently This will be further explored in the EIR, and mitigation measures adopted if necessary The proposed projects will ensure and allow emergency vehicle access and passage at all times

XV b,c,g,h) By its nature, the project will have no adverse effects on other aspects of transportation.

XVI. UTILITIES AND SERVICE SYSTEMS - Would the project.	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?				X
b) Require or result in the construction of new facilities or expansion of existing facilities, the construction of which could cause significant environmental effects, for any of the following utilities?				
i) Water treatment or distribution facilities?	**SIGNIFICANCE OF IMPACT TO BE DETERMINED**			
ii) Wastewater collection, treatment, or disposal facilities?				X
iii) Storm water drainage facilities?				X
iv) Electric power or natural gas?				X
v) Communications systems?				X
c) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?				X
d) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				X
e) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?				X
f) Comply with federal, state, and local statutes and regulations related to solid waste?				X

XVI a) No adverse impacts are expected in regards to treatment requirements It is a goal of the proposed project to improve water quality and thus ensure compliance to these and other requirements.

XVI b,d) By project definition, the proposed project includes water treatment (disinfection) and distribution facilities. The significance of environmental impacts in regards to the well installation(s) is summarized in this report and will be analyzed in greater depth in the EIR. Significance of impacts will be determined during the EIR process.

The proposed project replaces previously existing water supply By improving drinking water quality, the proposed project will improve treatment and compliance at the wastewater treatment plant The proposed project will not result in the need for expanded wastewater facilities.

The well sites are small in scale will include a minute addition to impervious surfaces. Drainage for the project developments will be directed towards existing City drainage facilities. It is not anticipated that the project will alter existing drainage patterns nor create or contribute substantial runoff. The project has no appreciable bearing on storm water, wastewater treatment, or solid waste facilities or disposal needs.

This project will not place additional demands on public utilities or services. The necessary utilities are already within feasible distance to the proposed well sites. City guidelines for well locations requests each new well be near a single 10-inch pipeline or a networked 8-inch pipeline or larger.

XVI c) The proposed project has not bearing on water demand. Short-term water use during the construction phase could include such things as equipment rinse water and other drilling requirements. Water requirements of the proposed project for the long-term will be negligible and would include such things as water for landscaping Water related impacts to site hydrology and water quality are addressed in the appropriate previous impact area of this report.

XVI.e-f) There will be minimal construction debris generated during construction.

XVII. MANDATORY FINDINGS OF SIGNIFICANCE	Potentially Significant	Less Than Significant With Mitigation	Less Than Significant	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	**SIGNIFICANCE OF IMPACT TO BE DETERMINED**			
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects, as defined in Section 15130)	**SIGNIFICANCE OF IMPACT TO BE DETERMINED**			
c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?		X		

XVII.a,c) Impact categories judged to have less than significant or no impacts without mitigation include agricultural resources, hazards and hazardous materials, mineral and energy resources, population and housing, public services, recreation, and transportation. Impact categories judged, in one or more sub category, to be less than significant with mitigation include aesthetics, air quality, biological resources, cultural resources, geology and soils, and noise. The hydrology and water quality category has two sub categories where impacts are undetermined. The land use category has one sub category where impacts are undetermined These undetermined categories will be analyzed further in the EIR.

XVII b) The project's impacts will not add appreciably to any existing or foreseeable future significant cumulative impact, except for potential cumulative impacts on water quality and quantity in the deep aquifer. This project will not be growth inducing nor growth inhibitive. This project is not contingent on or otherwise related to the development of an additional water source or any other project.

VI. REFERENCES

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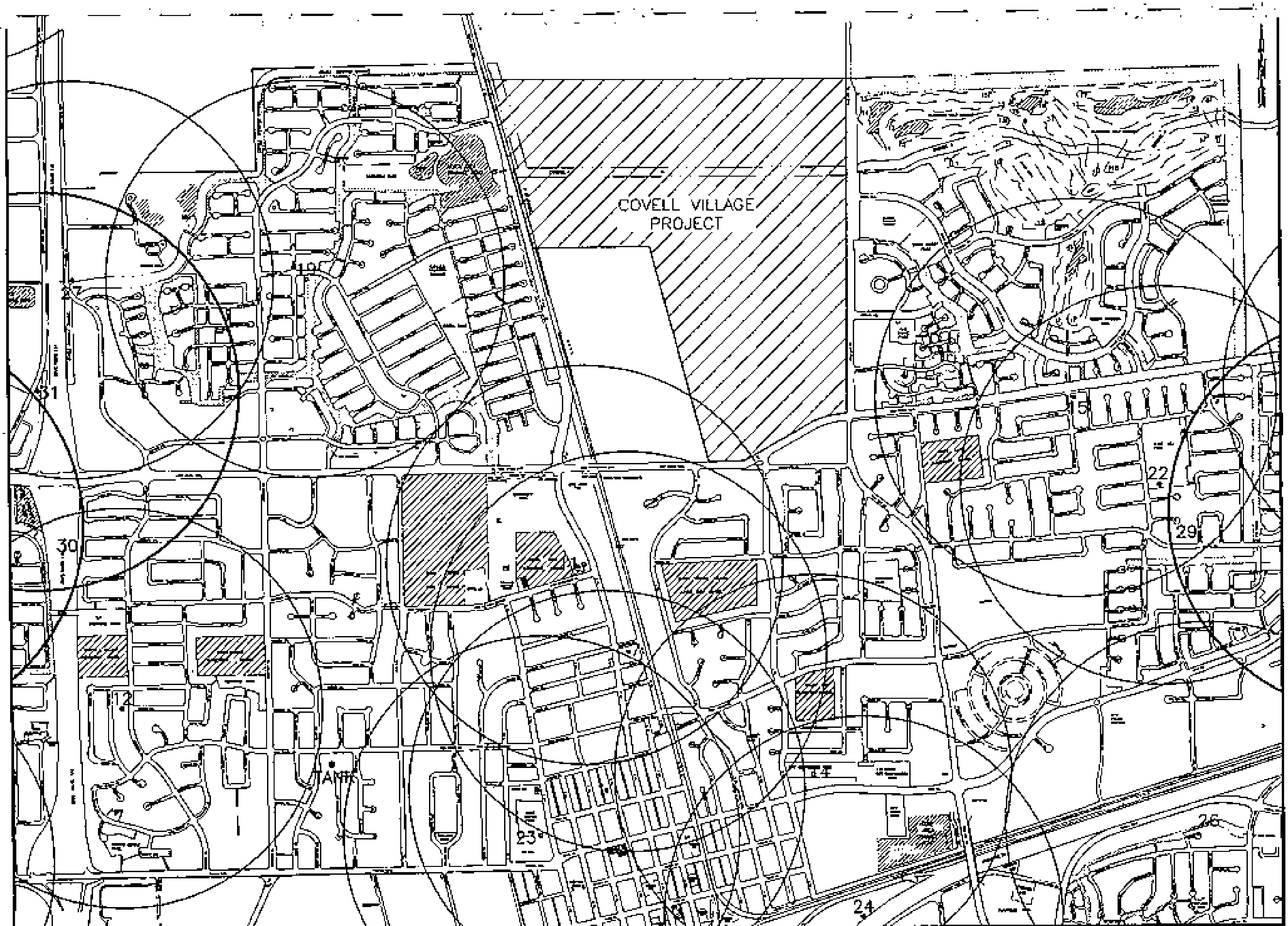

<u>CITY OF DAVIS – COVELL VILLAGE PROJECT –</u>
<u>WATER SUPPLY ASSESSMENT MAP</u>
OCTOBER 2004
SCALE: NONE