

**State of California
The Resources Agency
Department of Water Resources
Northern District**

**M&T CHICO RANCH
CONJUNCTIVE USE INVESTIGATION
PHASE III**



Memorandum Report

December 1996

Memorandum

Date: December 31, 1996

To: Robert Meyer, Chief
State Water Project Planning Branch

From: William Bennett, Chief
Northern District

Subject: M&T Chico Ranch Conjunctive Use Investigation; Phase III

This report summarizes findings to date from Phase III of the Department's M&T Chico Ranch Conjunctive Use Investigation. M&T conjunctive use investigations Phase I and Phase II examined the geology, hydrology, hydrogeology, land and water use, and outlined a conceptual design and potential impacts from a conjunctive use program at M&T Chico Ranch. Based on the recommendations from the Phase II Investigation, the Phase III Investigation reassesses the potential water supply available through conjunctive use and estimates program costs, impact mitigation, institutional constraints, and environmental compliance requirements. In addition, this report documents and presents the findings from previous aquifer testing and well development within the lower-confined Tuscan Formation aquifer.

This investigation was undertaken as a part of the Groundwater Development element of the State Water Project Future Supply Program. This report was prepared under the direction of Glen Pearson, Supervising Engineering Geologist and Koll Buer, Senior Engineering Geologist, and written by Dan McManus, Associate Engineering Geologist. Special services for this report were provided by: Sandy Irving, Water Resources Technician II; David Bogener, Environmental Specialist IV; Joanne Wright, Office Assistant, Bill Lane, Scientific Aid; Kelly Staton, Graduate Student Assistant; Jason Jurrens, Student Assistant; Bryton Johnson, Student Assistant; Denise Jennings, Student Assistant; Jason Spatz, Student Assistant; and Joy Holt, Student Assistant.

Attachment

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INTRODUCTION

In August 1993, the Department of Water Resources presented the findings from the *M&T Chico Ranch Groundwater Investigation, Phase I*. The reconnaissance level Phase I investigation identified the occurrence, movement and distribution of groundwater resources, and evaluated the potential for a conjunctive use program at the M&T Chico Ranch. Findings from the prefeasibility Phase I investigation indicated that a conjunctive use program with the M&T Chico Ranch was highly feasible. Recommendations from the Phase I investigation were to proceed with a Phase II feasibility study of the M&T conjunctive use program.

In June 1995, the Department of Water Resources presented the findings from the *M&T Chico Ranch Ground Water Investigation, Phase II*. The Phase II investigation analyzed the hydrogeology of southern M&T Chico Ranch, identified water availability for conjunctive use, developed proposed feasibility-stage guidelines for a conjunctive use program, estimated operations and maintenance cost, identified environmental compliance and permitting requirements, listed potential impacts of the proposed conjunctive use program, and provided recommendations for future work. Phase II recommendations were to proceed with a Phase III program to better determine the viability of a M&T based conjunctive use program.

Based on the recommendations from the Phase II investigation, the specific work program for the Phase III investigation includes the following tasks:

- ▶ Conduct aquifer performance testing using the test wells drilled during the Phase II investigation.
- ▶ Update/refine M&T Chico Ranch's water rights, water use, and amount of water available for conjunctive use groundwater exchange.
- ▶ Based on aquifer performance test data and the amount of surface water available for conjunctive use, design a well field capable of providing groundwater in substitution for existing surface water requirements.
- ▶ Evaluate current institutional relationships and/or possible constraints resulting from a conjunctive use program.
- ▶ Identify environmental compliance and permitting requirements.
- ▶ Define conjunctive use program operations for the M&T Chico Ranch conjunctive use program.
- ▶ Estimate design, operations and maintenance, and mitigation costs for the conjunctive use program.

M&T CONJUNCTIVE USE PROGRAM

M&T Chico Ranch is in western Butte County and overlies part of the Sacramento Valley Groundwater Basin (Figure 1). The Ranch consists of about 8,300 acres, bordered by the Sacramento River to the west, Big Chico Creek to the north and Ord Ferry Road to the south (Figure 2). M&T annually flood irrigates about 4,000 acres of the proposed conjunctive use area with approximately 16,000 acre-feet of surface water diverted from the Sacramento River and/or Butte Creek. The proposed conjunctive use area at M&T Chico Ranch would focus on the southern and western Ranch, which is currently flood irrigated with surface water.

The M&T program would facilitate conjunctive use by developing the groundwater resources in the southern and western Ranch, thereby allowing the Ranch to use surface water during wet years and make greater use of groundwater resources in the dry years. By using groundwater in lieu of surface water during dry years, M&T Chico Ranch's normal surface water entitlement could be left in the Sacramento River -- providing additional water supply to the State Water Project.

It is intended that conjunctive use activities would not affect existing water rights of the Ranch, change historic farming practices, reduce crop acreage, result in uncompensated injury to overlying groundwater users or other water users, exceed the safe yield of the basin, cause overdraft in the basin, cause subsidence, and/or conflict with existing Butte County groundwater ordinances. Groundwater extracted for this program would be used on the overlying Ranch land; all facilities used in this project would be owned by the Ranch.

The M&T based program would have two operational components: the surface water component and the groundwater component. A contractual agreement would determine when each component is activated. During years when runoff is greater than normal, surface water would, as usual, be used to irrigate the south Ranch, providing direct and in-lieu groundwater recharge. Surface water diverted from the Sacramento River would directly recharge the groundwater through conveyance losses from the Parrott Phelan Canal. The water diverted from Butte Creek would also provide groundwater recharge via conveyance losses in Edgar Slough.

Groundwater extractions under the proposed conjunctive use program would be determined by State Water Project needs in any particular year. The State Water Project need is estimated by using the Sacramento Valley Water Type Year Index (40-30-30 Index).

Because of the problems associated with shepherding Butte Creek/West Branch Feather River water through the Butte Basin and also because of the new M&T/Parrott Investment Company pumping plant (relocated to the Sacramento River), the M&T based program would utilize M&T's Sacramento River water instead of their Butte Creek/West Branch Feather River water for the conjunctive use program.

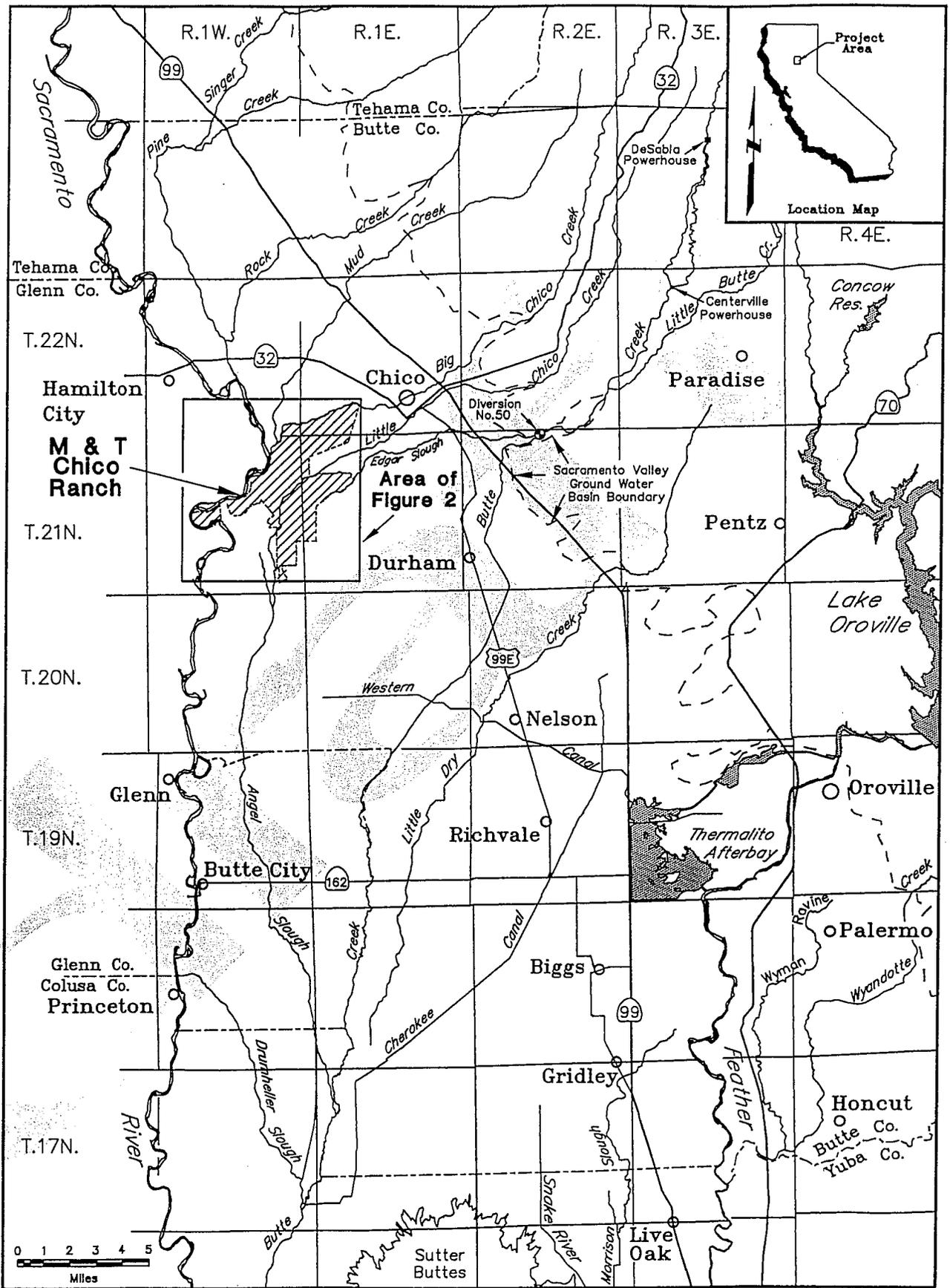
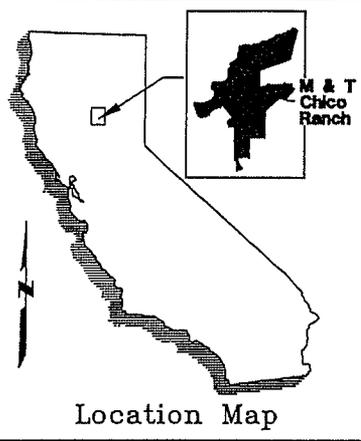
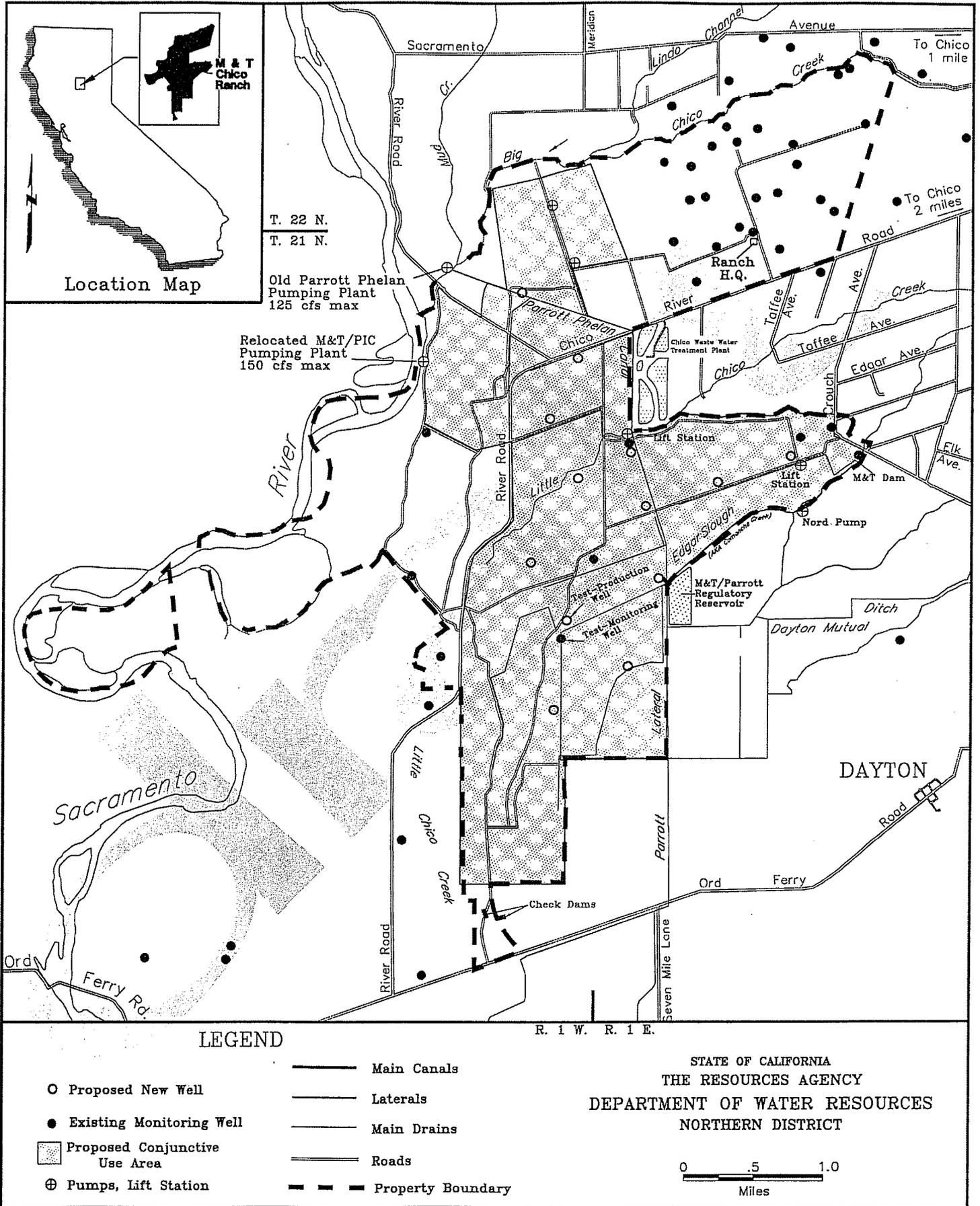


Figure 1. Location Map, M&T Chico Ranch.



T. 22 N.
 T. 21 N.

Old Parrott Phelan Pumping Plant
 125 cfs max

Relocated M&T/PIC Pumping Plant
 150 cfs max

LEGEND

- Proposed New Well
- Existing Monitoring Well
- ▨ Proposed Conjunctive Use Area
- ⊕ Pumps, Lift Station
- Main Canals
- Laterals
- Main Drains
- Roads
- - - Property Boundary

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 NORTHERN DISTRICT

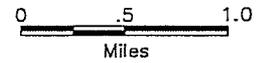


Figure 2. M&T Chico Ranch Conjunctive Use Area

It is estimated that a M&T based conjunctive use program utilizing M&T's Sacramento River entitlement could provide a reliable supply of up to 14,000 acre-feet of in-lieu Sacramento River water during periods of State Water Project need. The actual size of the conjunctive use program will be based on M&T's current land use, M&T's ability to deliver Sacramento River water to all areas of the Ranch which are currently irrigated with surface water, and M&T's ability to exchange *Butte Creek Bypass Water* for an equivalent quantity of water from the Sacramento River during the October-June bypass period (as per "Agreement for Relocation of M&T/Parrott Pumping Plant Providing for Bypass of Flows in Butte Creek").

Costs were developed and analyzed based on the program operating every other year (best case), and every third year (worst case). Detailed analysis of aquifer performance, well field design, operations, maintenance, mitigation and permit costs are discussed later in the report.

The total construction cost for a M&T conjunctive use program is estimated at about \$3 million. Total construction costs include a one-time well maintenance mitigation allowance of \$56,500 for maintenance to third-party wells within the impact area having a drawdown greater than 15 feet. Estimated annual operations, maintenance, power and replacement cost range from \$166,700 for biennial operation to \$119,000 for triennial operation (about \$24 per acre-foot). Annual energy mitigation allowance associated with groundwater drawdown to surrounding domestic and agricultural wells are estimated at about \$16,200 for biennial operations and \$10,800 for triennial operations (about \$2.30 per acre-foot). Annual cost for county permits to operate the conjunctive use program are estimated to range from about \$42,000 for biennial operation to \$28,000 for triennial operations (about \$6 per acre-foot). Total project costs (present value) is estimated to range between \$6.4 million for biennial operations, to about \$5.4 million for triennial operations. Assuming that the project operates biannually over a forty year period, economic analysis indicates that 280,000 acre-feet of water could be pumped at a unit cost of about \$61 per acre-foot. A triennial program operated over the same period would yield about 190,000 acre-feet at \$77 per acre-foot.

FINDINGS

- ▶ Testing of the lower-confined Tuscan Formation aquifer shows that aquifer transmissivity is approximately 75,000 gallons per day per foot, and aquifer storativity is between 1×10^{-4} and 1×10^{-5} .
- ▶ Specific capacity of the test-production well, constructed within the lower-confined Tuscan aquifer, was calculated at about 23 gallons per minute per foot of drawdown (total drawdown of 135 feet at a discharge of 3,000 gallons per minute). Well efficiency of the test-production well is estimated at 63 percent.
- ▶ The deep-aquifer well design was originally selected as the design of choice for maximizing well production and minimizing drawdown related impacts to surrounding groundwater users. However, aquifer testing of the deep aquifer design revealed lower than expected aquifer productivity and greater than expected pumping lifts and associated pumping costs. Further analysis of the proposed production well designs shows that a composite well design will be more effective at maximizing well/aquifer productivity, and minimizing pumping costs and drawdown related impacts to third party groundwater users. Construction of the composite designed well is similar to the deep-aquifer well design, however, in addition to the deep perforations (760 to 920 feet), the composite design is constructed with a second set of perforations between 300 and 350 foot. Specific capacity associated with the composite well design is estimated at about 30 gallons per minute per foot (about 30 percent greater than that of the deep-aquifer design).
- ▶ The M&T conjunctive use program could provide a reliable supply of up to 14,000 acre-feet of in-lieu Sacramento River water during periods of SWP need. The M&T program would require the installation of 13 wells of composite design with production capabilities of about 3,000 gallons per minute. The total construction costs, which include a one-time well maintenance mitigation allowance of \$77,500 is estimated at about \$3 million. Estimated annual operations, maintenance, power and replacement cost range from \$166,700 for biennial operation to \$119,000 for triennial operation (about \$24 per acre-foot). Annual energy mitigation allowance associated with groundwater drawdown to surrounding domestic and agricultural wells are estimated at about \$16,200 for biennial operations and \$10,800 for triennial operations (about \$2.30 per acre-foot). Annual cost for County permits to operate the conjunctive use program is estimated at about \$42,000 for biennial operation to \$28,000 for triennial operations (about \$6 per acre-foot). Total project costs (present value) is estimated to range between \$6.4 million for biennial operations, to about \$5.4 million for triennial operations. Assuming that the project operates biannually over a forty year period, economic analysis indicates that 280,000 acre-feet of water could be pumped at a unit cost of about \$61 per acre-foot. A triennial program operated over the same period would yield about 190,000 acre-feet at \$77 per acre-foot.

▶ Butte County currently has enacted two ordinances designed to regulate the capacity and spacing of groundwater wells and govern groundwater substitute pumping. The most recent ordinance, Measure G, was just recently passed during the November 5, 1996 election, and has yet to be tested. Thus, the potential constraints to the Butte County conjunctive use programs, as a result of Measure G, are difficult to fully identify. However, preliminary review indicates that the cost for groundwater extraction permits under Measure G are estimated to range between \$2.00 and \$8.00 per acre-foot of extracted groundwater. The time-lag between application and approval of groundwater extraction permits, under Measure G, is estimated to take between 8 to 12 weeks but is not considered a project deterrent. Because the Butte County Board of Supervisors, the local water purveyors, and potential conjunctive use participants all supported Measure G, legal challenges over the constitutionality of the ordinance is not expected. However, potential battles over EIR requirements should be expected. Measure G requires that the BBWUA, through the use of the BBWUA/HCI groundwater model, analyze and report the safe yield of each groundwater subbasin to the County Health Department by January 15th of each year. It appears that a significant amount of the permitting decisions, under Measure G, will be based on the safe yield data reported by the BBWUA. To date, the BBWUA/HCI model has not been used to determine the safe yield at a Basin-wide scale, let alone at a subbasin scale. The ability of the model to accurately calculate safe yield at the subbasin level remains unknown and could lead to program delays. Under Measure G, the Commission will include one member from each Board of Supervisor's district, two members which are landowners of property served by a water district, and two members which are landowners served by private wells. A significant unknown under Measure G, is the expertise and general ability of the future Butte County Water Commission to make permitting decisions based on scientific evidence, and not public or political opinion. Under Measure G, the County will not have funding for in-house hydrogeologic expertise and will most likely contract-out to evaluate groundwater extraction permit applications. In absence of in-house expertise, the permitting recommendations made by the consultant could ultimately drive the Butte County Health Department's and Butte County Water Commission's final permit determination. The consultant's ability to make accurate permit determinations and the county Commissions ability to interpret these determinations is unknown.

▶ Based on preliminary environmental review of the M&T based conjunctive use program, all foreseeable significant impacts should be able to be clearly identified and mitigated. Thus, a negative declaration should be able to successfully address any environmental impacts under CEQA -- alleviating a full EIR. However, even though a negative declaration would most likely satisfy all CEQA requirements, public and political perspectives towards conjunctive use and substitute groundwater pumping programs in Butte County may make preparation of an full Environmental Impact Report warranted and prudent.

RECOMMENDATIONS

Recommendations at this time are to:

- If the costs associated with the proposed M&T program are acceptable, recommendations are to proceed with small scale pilot program to test and confirm calculated assumptions of well design, aquifer productivity, aquifer recovery, recharge areas, subsidence potential and drawdown related impacts. The pilot program would consist of drilling up to three production wells and six monitoring wells to test previously calculated assumptions.
- Under Measure G (Ordinance to Protect Groundwater Resources in Butte County), a significant portion of the groundwater extraction permit review process is based on safe yield data generated by the BBWUA/HCI groundwater model. To date, the BBWUA/HCI model has not been used to determine the safe yield at a Basin-wide scale, let alone at a subbasin scale. The ability of the model to accurately calculate safe yield at the subbasin level remains unknown and inaccurate analysis could lead to program delays. If the costs associated with the M&T based alternative are acceptable, work should begin to develop a groundwater model of the West Butte Subbasin. The groundwater model would be used to analyze various M&T program operational scenarios and to help determine if the proposed program operations will fall within the safe yield of the West Butte Subbasin. Use of the proposed model would be limited to analysis of conjunctive use program operations and would not interfere with modeling analysis conducted by BBWUA/HCI in association with Measure G. This work should be conducted in conjunction with the pilot test program discussed above.
- If the costs associated with the proposed M&T program are acceptable, recommendations at this time are to proceed with a formal initial study/environmental review during the well permitting/construction phase of the pilot conjunctive use program. Even though Phase III findings show that a negative declaration should be able to successfully address any environmental impacts under CEQA, due to public impressions and political concerns towards conjunctive use programs in Butte County, it is also recommended that full consideration be given to the current advantages of preparing of an complete Environmental Impact Report at the time of initiating the pilot conjunctive use program.

AQUIFER PERFORMANCE TESTING OF THE LOWER-CONFINED TUSCAN FORMATION AQUIFER

Previous M&T investigations and substitute groundwater pumping programs have shown the need to minimize drawdown impacts to surrounding groundwater users. To minimize impacts from project related groundwater drawdown, conjunctive use wells should ideally withdraw groundwater from a production zone separate from that of surrounding groundwater pumpers.

The M&T Phase II investigation identified a laterally extensive and potentially productive water-bearing zone beneath the M&T Chico Ranch and within the lower-confined Tuscan Formation aquifer. Initial data indicates that this lower-confined portion of the Tuscan Formation aquifer may be sufficiently separate from shallower systems to minimize project related impacts to groundwater levels in surrounding wells drawing from the upper aquifer.

To help characterize and identify productivity of the lower-Tuscan aquifer, a 1,018-foot test-monitoring well (T21N/R01W-24B01) and a 950-foot test-production well (T21N/R01W-24B02), were drilled and developed during Phase II. Figure 2 shows the location of these wells and the surrounding study area. Construction and E-log data for wells 24B01 and 24B02 are shown in Appendix A.

Appendix A shows that well 24B02 is 950 feet deep with a 28-inch borehole. The well is constructed using 16-inch blank casing down to 760 feet, with a 160 feet of 16-inch (0.05-inch slot), continuous wrap screen placed from 760 to 920 feet. The gravel pack in well 24B02 is placed from 730 to 950 feet and consists of uniformly-graded, coarse-grained sand ($D_{70} = 6.0$ mm). The annular cement seal is placed from 730 to the surface. Well 24B01 is 1,018 feet with an 8.5-inch borehole. The well is constructed using 2-inch galvanized pipe with a 20-foot screened interval from 820 to 840 feet. Gravel pack placement is from 1,018 to 780 feet and consists of uniformly-graded, coarse-sand ($D_{70} = 4.25$ mm). The annular cement seal begins at 780 feet and continues to the surface.

Due to drilling delays, testing of the lower-Tuscan aquifer with the test wells was not initiated until after completion of the M&T Phase II report. Since that time, several aquifer tests have been conducted. The first set of tests were conducted in June 1995. Based on the findings and recommendations from the initial tests, a second set of aquifer/well tests were conducted during April and May 1996.

June 1995 Aquifer Testing

Tests to determine aquifer performance of the lower-Tuscan and production/efficiency of the recently completed production well were conducted in June 1995. The tests included a step-drawdown, and a constant-discharge test. Groundwater level measurements were taken with a steel tape and electric sounder. Discharge measurement from the pumping well were determined with an ultrasound flow meter and adjusted using partially-full-pipe calculations. Data tables associated with the June 1995 aquifer tests are in Appendix B.

Step-drawdown Test

The purpose of the June 1995 step-drawdown test was to develop a preliminary estimate of aquifer transmissivity, to determine the optimum discharge rate that can be maintained by the production well (24B02), to estimate efficiency of the production well, and ultimately, to provide information to be used to design an appropriate constant-discharge aquifer performance test.

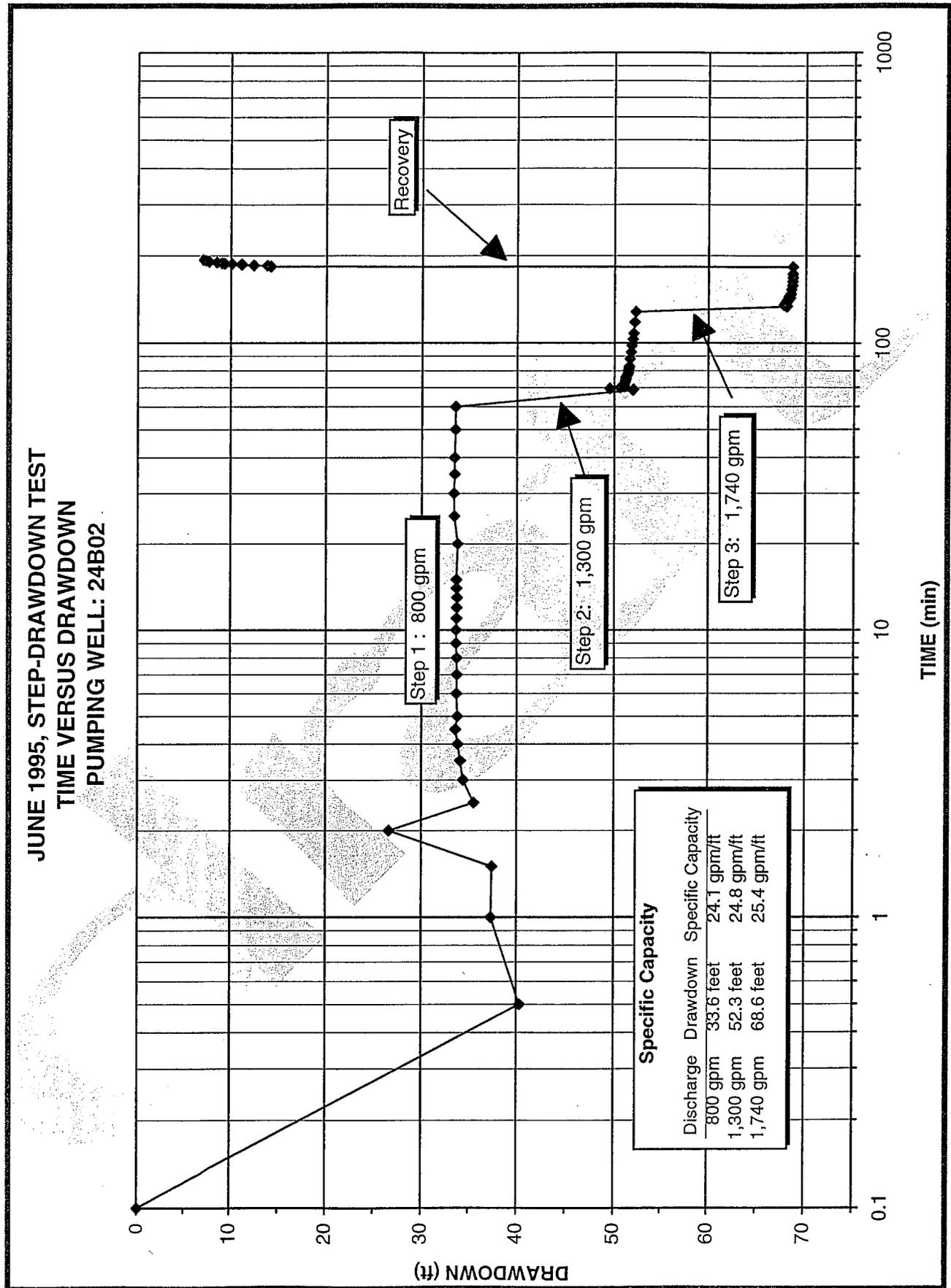
The step-drawdown test consisted of pumping well 24B02 for three one-hour steps of incrementally increasing discharge, while measuring drawdown in 24B02 and in the nearby observation well, 24B01. Groundwater discharge for steps 1, 2, and 3, were: 800 gpm, 1,300 gpm, and 1,740 gpm, respectively. The discharge rate for step 3 was measured using an ultra-sound flow meter, however, at the lower flow rates of steps 1 and 2, the rate of groundwater flow failed to fill the discharge pipe and the ultrasound flow measurement method was ineffective. For these steps, the estimated flow rate was calculated based on measurements of the horizontal and vertical drop in groundwater flow from the vertical discharge pipe. Test data recorded from the pumping well (24B02) are listed in Table B1 and illustrated in the time versus drawdown graph in Figure 3. Figure 3 also lists the drawdown and estimated specific capacity associated with each step, or incremental increase in discharge. Specific capacities calculated at the end of steps 1, 2, and 3 were estimated at 24.1 gpm/foot, 24.8 gpm/foot and 25.4 gpm/foot, respectively.

Aquifer transmissivity from the step-drawdown recovery data was estimated at about 60,000 gpd/ft by using a modified form of the Theis recovery formula. Figure 4 is a Time Function versus Residual Drawdown graph used to calculate transmissivity from the step-drawdown aquifer recovery data. It is important to note that this method of calculating transmissivity is just a rough estimate, and that actual values determined from analysis of constant discharge test data are usually larger.

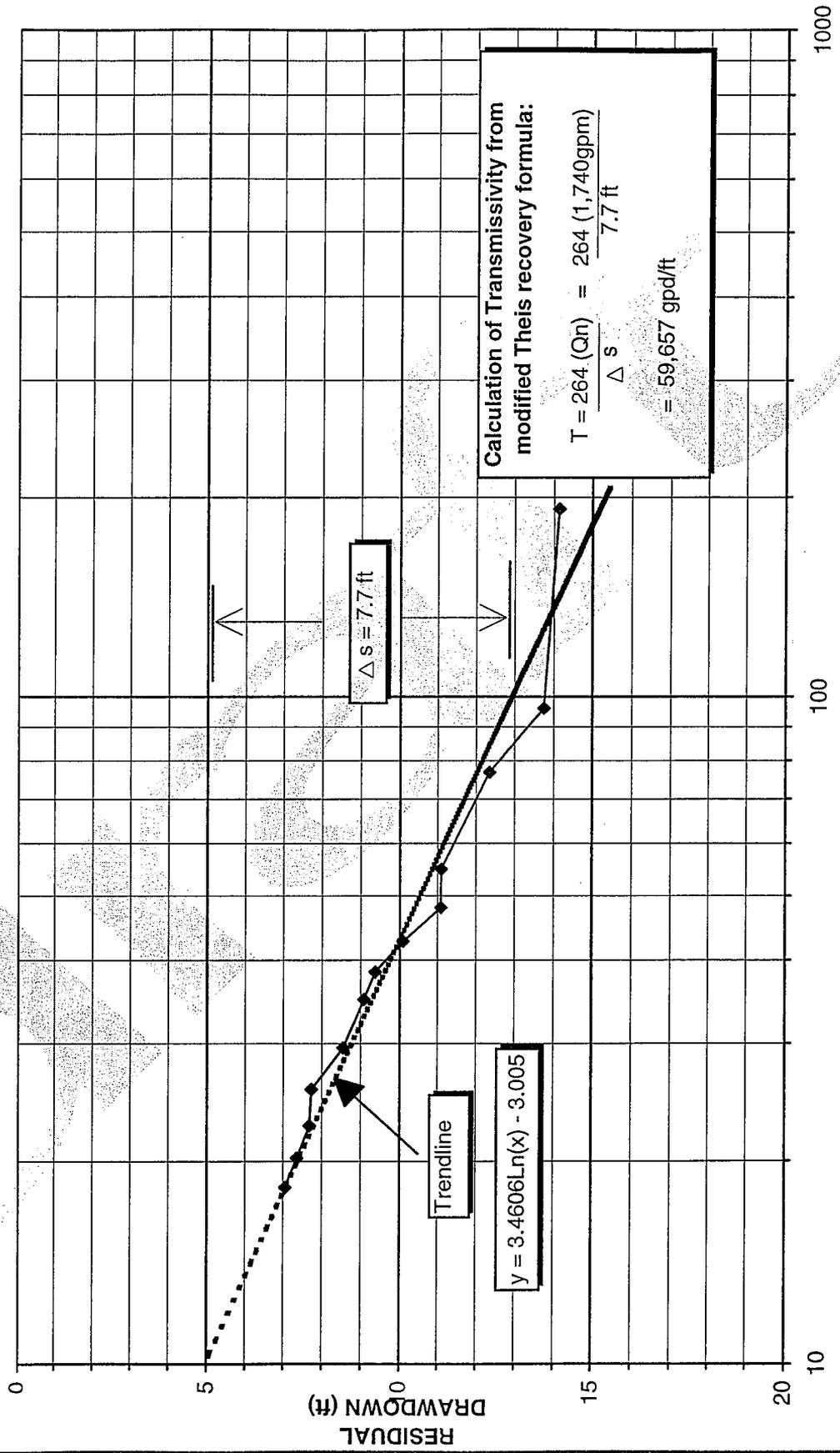
Step-drawdown test and recovery data recorded from the observation well (24B01) are listed in Table B2 and are illustrated in the time versus drawdown graph in Figure 5. Distance between well 24B01 and 24B02 was surveyed at 191 feet.

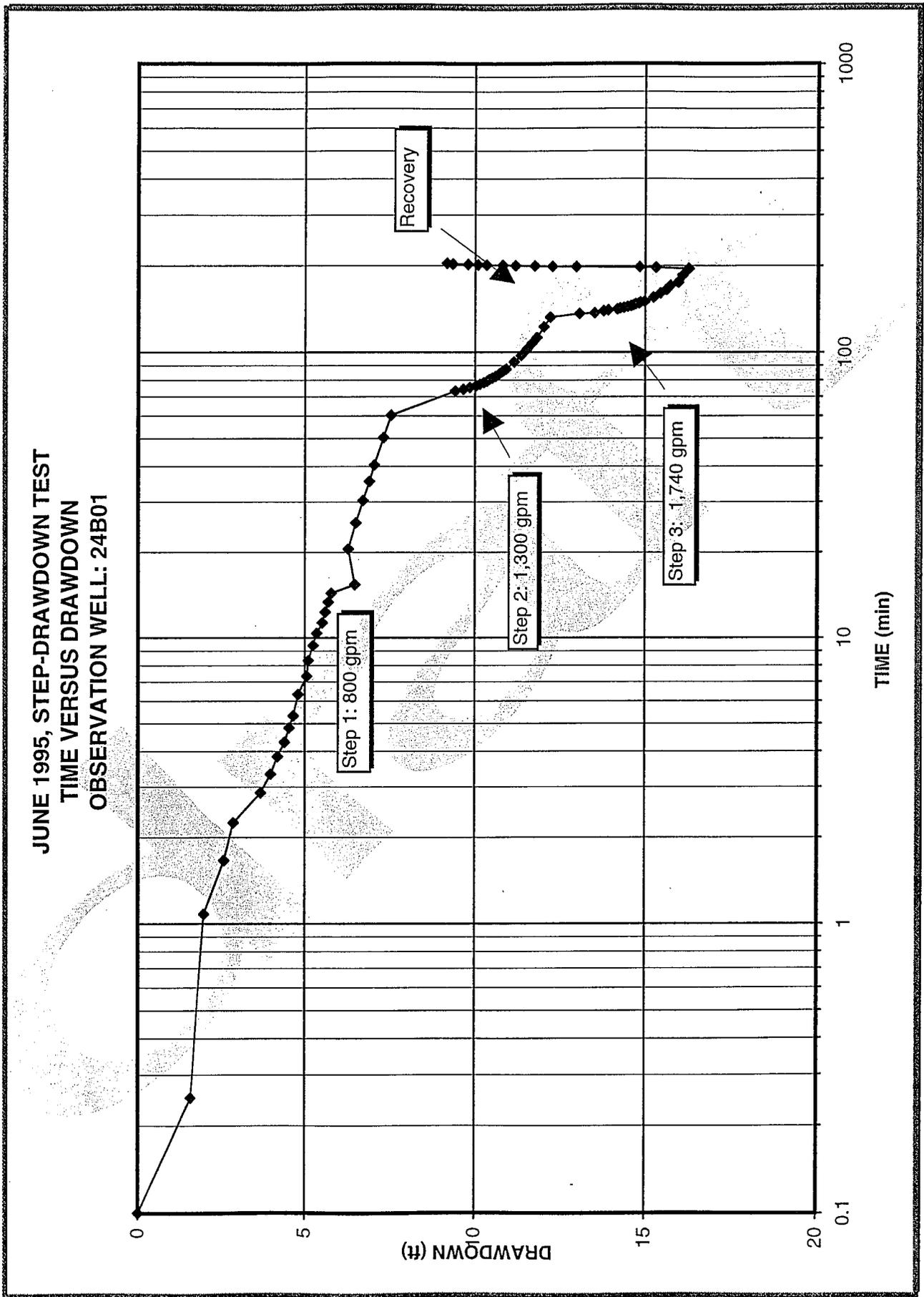
Well Efficiency: In a pumping well, only part of the total drawdown may be attributed to aquifer characteristics, or aquifer losses. The remaining portion of the drawdown is due to head losses within the well, or well losses. Well losses can stem from a number of factors, but typically, well losses are the result of less than ideal well design, construction, operation, and/or aquifer damage. By comparing the theoretical drawdown (amount of drawdown due to aquifer losses) to the actual drawdown (aquifer loss plus well loss) the efficiency of the well may be determined. Similarly, well efficiency is also commonly defined as the ratio of actual specific capacity to the theoretical specific capacity. In a 100 percent efficient well, the specific capacity (discharge in gallons per minute divided by drawdown in feet) measured at the well, would be equal to the theoretical specific capacity of the aquifer.

Figure 3



JUNE 1995, STEP-DRAWDOWN TEST
 TIME FUNCTION vs. RESIDUAL DRAWDOWN
 AQUIFER RECOVERY ANALYSIS FOR WELL: 24B02





The efficiency of well 24B02 was estimated by using the step drawdown data and the Cooper-Jacob formula to develop actual versus theoretical distance-drawdown curves for each test step. From the curves, aquifer and well losses were determined and well efficiency was calculated via comparison of theoretical versus actual specific capacity for each test step.

This method of determining well efficiency assumes that the drawdown in the observation well is solely due to characteristics of the aquifer and, that the difference between the theoretical versus actual drawdown in the pumping well is due to well efficiency losses.

Figure 6 shows the actual versus theoretical distance-drawdown curves, approximate well loss, and well efficiency estimated for each test step. The well efficiencies for Steps 1, 2 and 3 were estimated at 66, 68, and 70 percent respectively. Approximately 7 feet of the head losses in well 24B01 can be directly attributed to friction loss resulting from pulling the water 760 feet up the borehole. Also listed in Figure 6, are the aquifer parameters used in the Cooper-Jacob formula to match theoretical and actual drawdown in the observation well, and to calculate the theoretical drawdown in the pumping well.

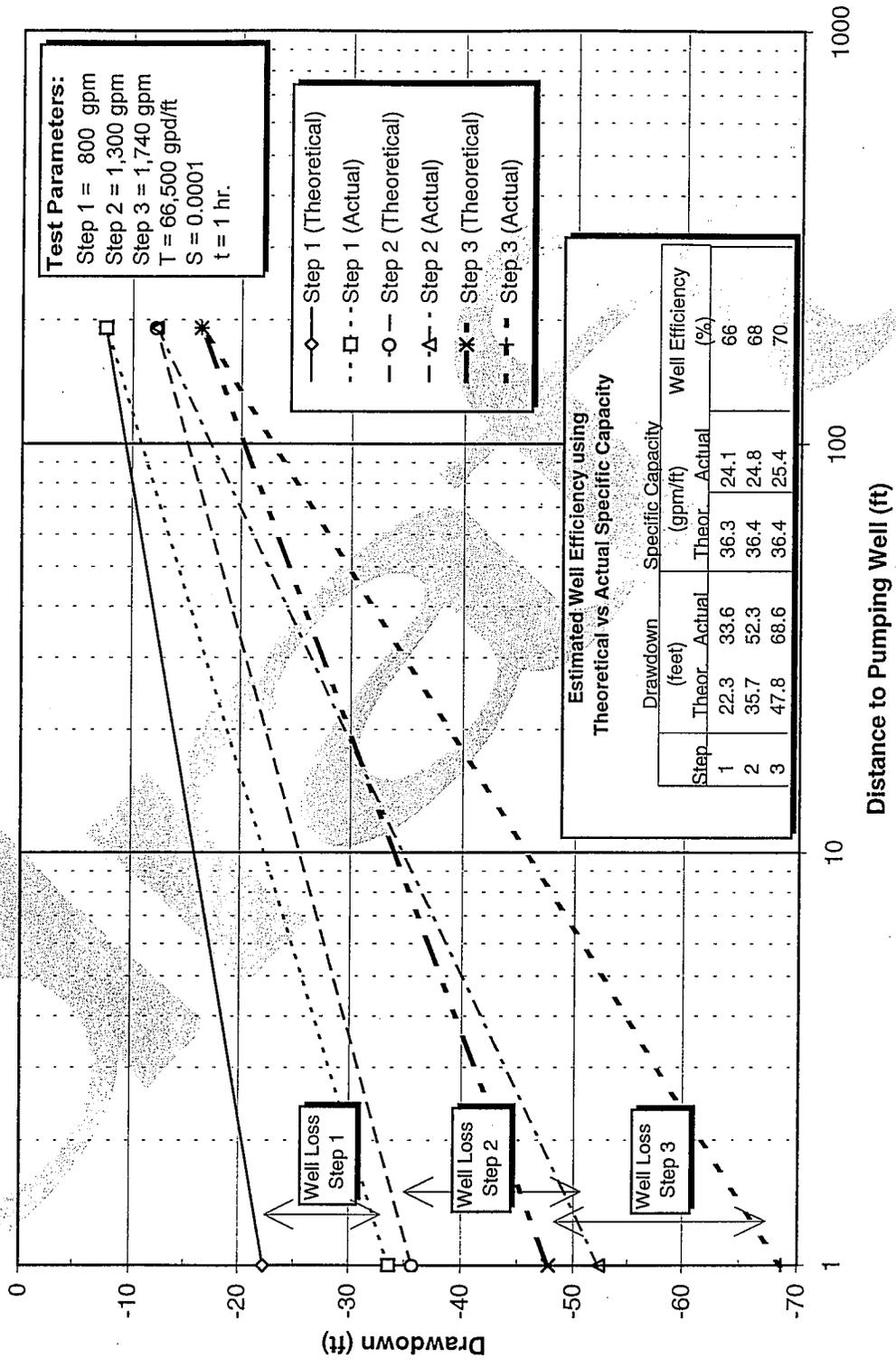
Constant Discharge Test

The Department conducted a two day aquifer test at M&T Chico Ranch starting June 14, 1995. The primary purpose of the constant discharge test was to provide a more accurate estimate of aquifer transmissivity and to determine aquifer storativity. The secondary purpose of the constant discharge test was to examine possible interconnection between shallow and deep aquifer zones.

The constant discharge test consisted of pumping well 24B02 at a rate of 1,650 gpm and recording the drawdown in seven surrounding wells. Well 24B02 was diesel powered and required a staged increase in engine speed until the desired pumping rate was established. The staging procedure for the diesel engine made estimating the exact start-time of the test difficult. The pumping well was turned off at about 45 hours into the test after drawdown in well 24B01 (closest observation well) remained constant over a 22 hour period.

The distance between the pumping well and observation wells ranged from 191 feet to 8,200 feet. Figure 7 shows the location of the wells which were monitored during the test. Figure A1 (Appendix A) and Tables B3, B4, B5, and B6 (Appendix B) lists the well construction and groundwater data recorded during the test. Figures 8 and 9 graphically illustrate the time versus drawdown for wells 24B02 (pumping well) and 24B01 (closest observation well).

**JUNE 1995, STEP DRAWDOWN TEST
ESTIMATED WELL EFFICIENCY for T21N/R01W-24B02
USING THEORETICAL VERSUS ACTUAL SPECIFIC CAPACITY**



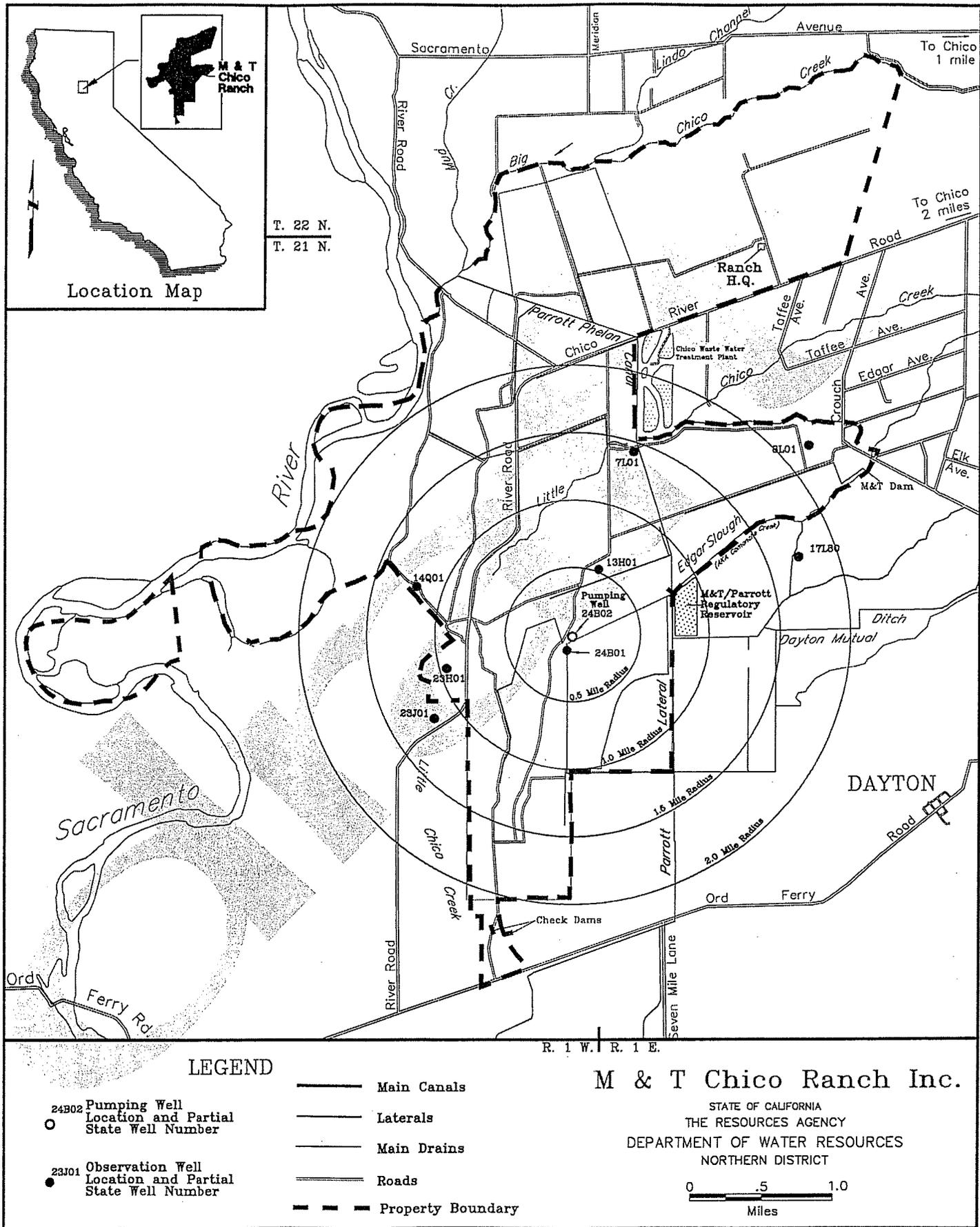


Figure 7. Location of Wells Monitored During June 1995 Aquifer Test.

Table B3 and Figure 8 shows that the total drawdown in well 24B02 (pumping well) was about 68.4 feet, with approximately 92 percent of the total drawdown occurring within the first minute of the test. The time-drawdown data for 24B02 appears characteristic of wells pumping from a leaky aquifer, or from wells which have intersected a recharge source (boundary). However, both of these possibilities become puzzling when you consider the construction of well 24B02 (sealed to 730 feet). Partial penetration of the aquifer and a deep intake section (perforation interval=760-920 ft.) could be another possible explanation for the drawdown characteristics in well 24B02. Specific Capacity of well 24B02, calculated after about 2,700 minutes of pumping, was 24.1 gpm/ft.

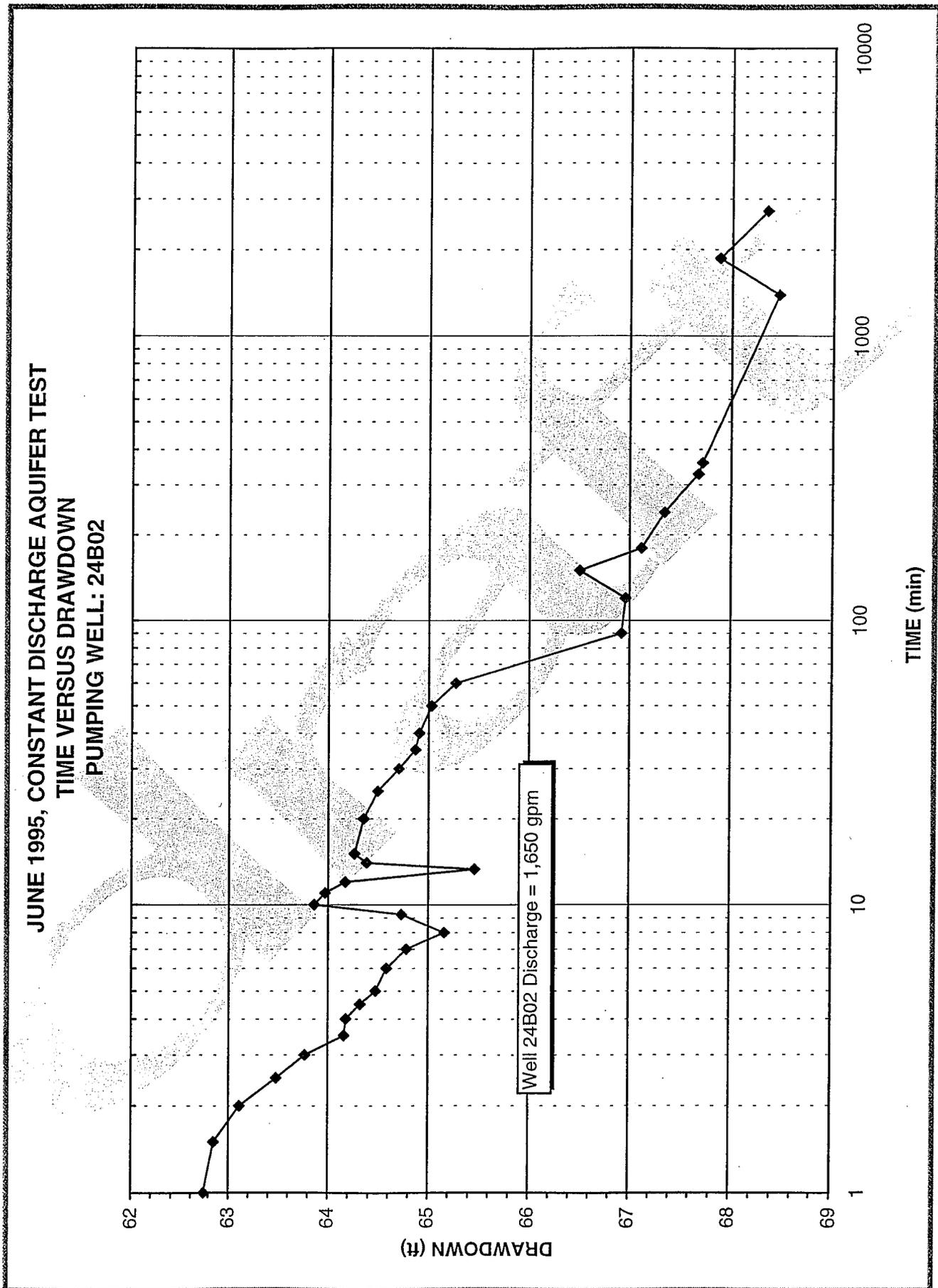
Table B4 and Figure 9 shows that the total drawdown in well 24B01 (closest observation well) was about 18.5 feet, with approximately 85 percent of the total drawdown occurring within the first two hours of the test. The distance between well 24B02 and 24B01 was surveyed at 191 feet.

Table B5 lists the depth-to-water data for the remaining six observation wells. Depth-to-water measurements for the observation wells listed in Table B5 were taken at about 6, 23 and 44 hours into the test. No post-test measurements were conducted. Flooding of adjacent fields with surface water, nearby groundwater pumping and recently pumped wells made interpretation of the groundwater level data from these wells were very difficult. However, since the second closest observation well (13H01: shallow, idle-domestic well), showed no decline in groundwater levels during the test, preliminary results seem to indicate little or no interconnection between the shallow and deep aquifer zones. Additional testing is required to confirm this observation.

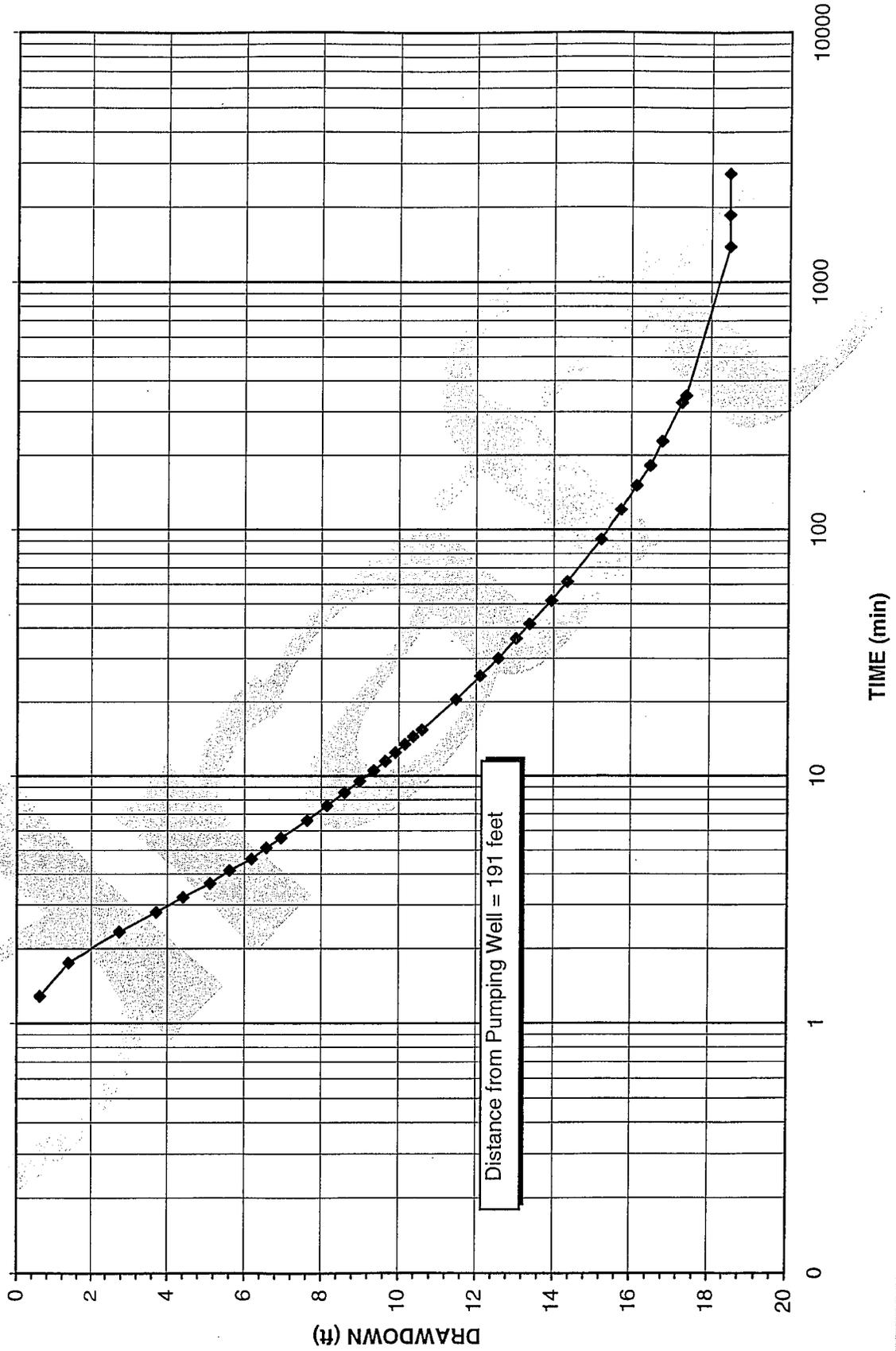
Aquifer transmissivity and storativity were calculated using the data from 24B01 and analysis methods for confined and leaky aquifers. All methods of analyzing the aquifer test data utilize formulas which assume the following conditions.

- The aquifer is homogenous, isotropic, with no restricting boundaries and its thickness is uniform throughout the area influenced by the aquifer test.
- The aquifer is porous and flow through it is laminar obeying Darcy's Law.
- Changes in water levels reflect changes in aquifer storage.
- The pumping well fully penetrates the entire aquifer thickness and water flows horizontally to the well.
- The observation wells represent the same aquifer conditions as the pumping well.
- Fluctuation in the water level due to interference from nearby wells, tides, or means other than the pumping well is negligible.

Aquifer test conditions rarely adhere to all of the assumptions listed above. In spite of the non-ideal conditions, the formulas still provide a good approximation of aquifer transmissivity and coefficient of storage.



JUNE 1995, CONSTANT DISCHARGE AQUIFER TEST
TIME VERSUS DRAWDOWN
OBSERVATION WELL: 24B01



Figures 10, and 11 were developed using *Aqtesolv* using the Theis and Cooper-Jacob formulas. Similar to the linear time-drawdown curve shown in Figure 8, the log-log and semilog time-drawdown curves illustrated in Figures 10 and 11 appear characteristic of wells pumping from a leaky aquifer, or from wells which have intersected a recharge source.

Figure 12 is an independent analysis of aquifer transmissivity (constructed without using *Aqtesolv*) using the Cooper-Jacob formula. Findings from confined method of analysis indicate aquifer transmissivity and storativity at about 77,000 gal/day-ft and 1.3×10^{-4} , respectively.

Figure 13 was developed using *Aqtesolv* solving for a leaky aquifer using the Moench formula. Findings from the leaky analysis indicates aquifer transmissivity and storativity at about 74,000 gal/day-ft and 8.0×10^{-5} , respectively.

Findings

Findings from the June 1995 aquifer performance testing of the lower-confined Tuscan aquifer are:

- ▶ Aquifer transmissivity and storativity is about 75,000 gpd/ft and .0001 respectively.
- ▶ Time-drawdown data from wells 24B01 and 24B02 could indicate a leaky aquifer and/or the presence of a recharge boundary.
- ▶ Specific capacities calculated from the step-discharge test increased with increasing discharge. However, rate of groundwater flow had to be estimated for lower discharge rates in steps 1 and 2. Specific capacity and discharge for steps 1, 2, and 3 were 24.1 gpm/foot @ 800 gpm, 24.8 gpm/foot @ 1,300 gpm, and 25.4 gpm/foot @ 1,740 gpm respectively. Total drawdown at the end of step 3 (1,740 gpm discharge) was about 68 feet.
- ▶ The pump and outflow pipe, installed by M&T Chico Ranch to develop and test the production well, was inadequate with respect to capacity and bowl placement; thereby reducing the effectiveness of the aquifer testing and eliminating possibilities for further well development.
- ▶ Well efficiency is about 70 percent.
- ▶ Observation wells constructed through the shallow and middle aquifer zones showed no apparent signs of drawdown associated with the deep aquifer pumping of the test well.

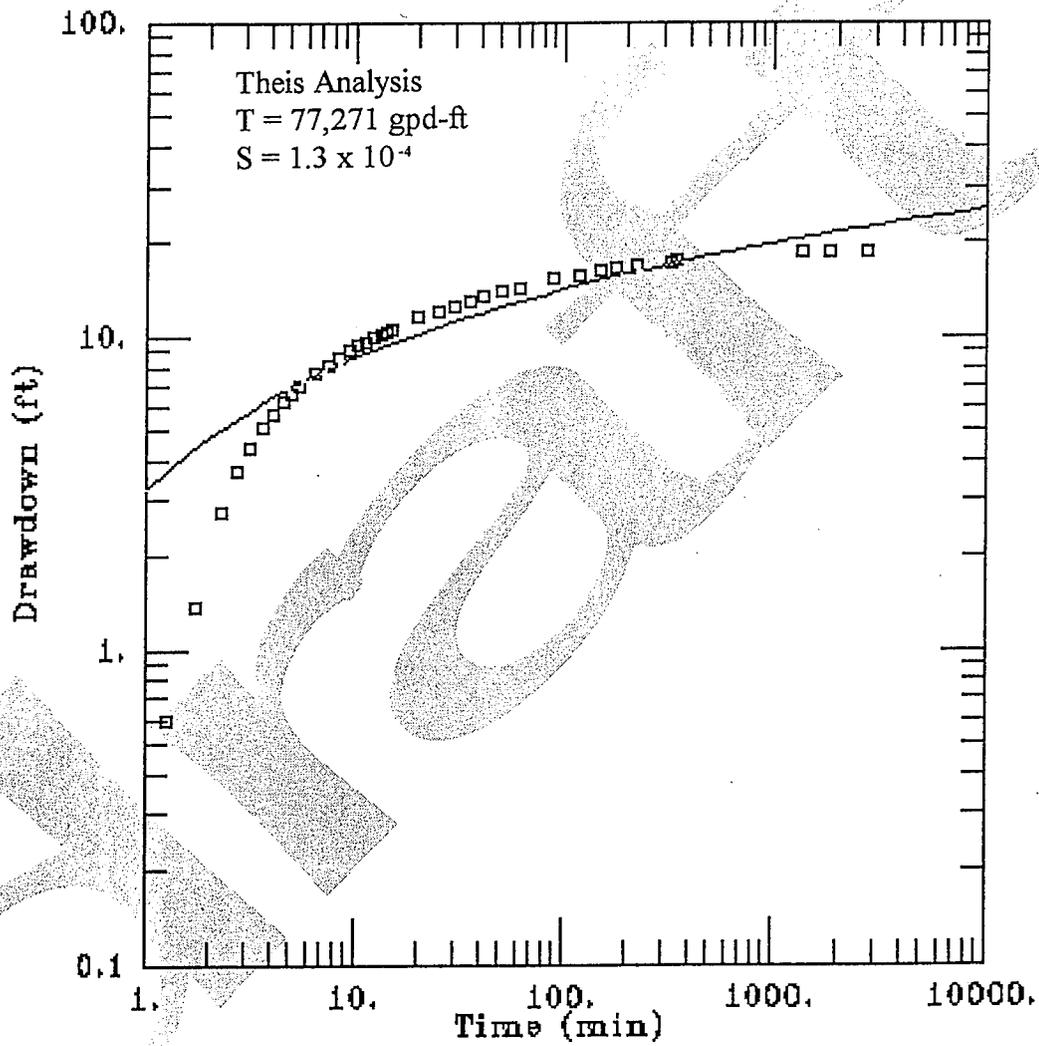


Figure 10. Aqtesolv Theis Analysis: June 1995, Aquifer Test.

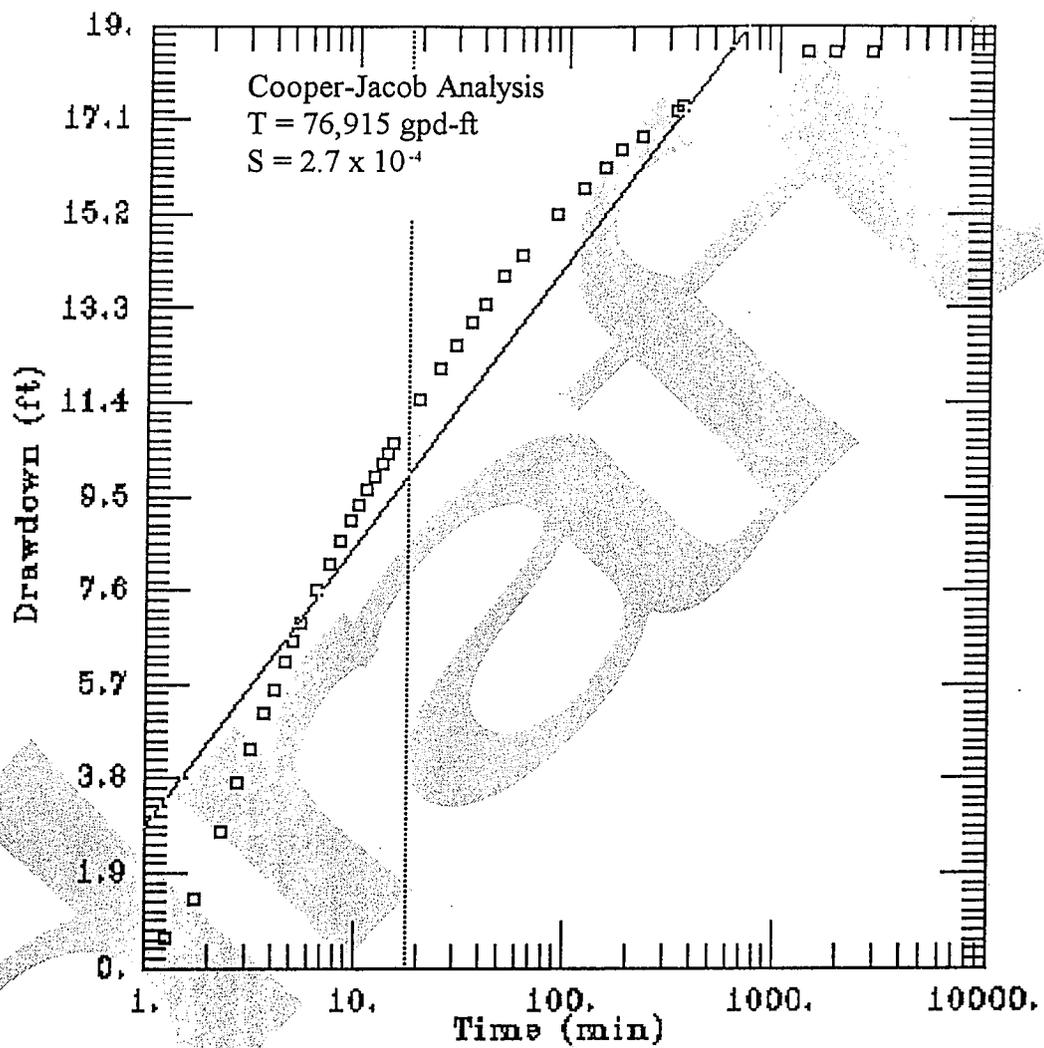
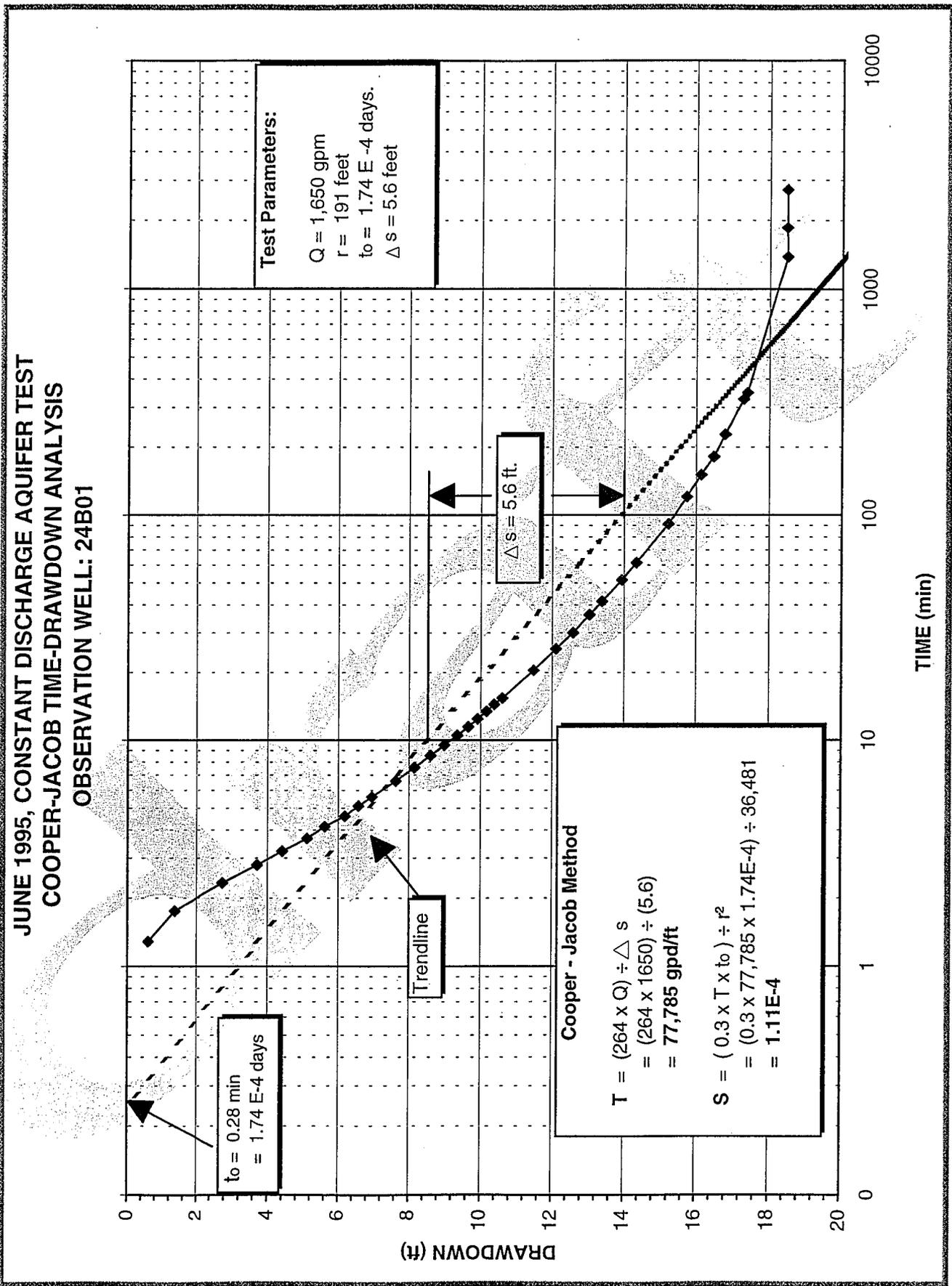


Figure 11. Aqtesolv Cooper-Jacob Analysis: June 1995, Aquifer Test



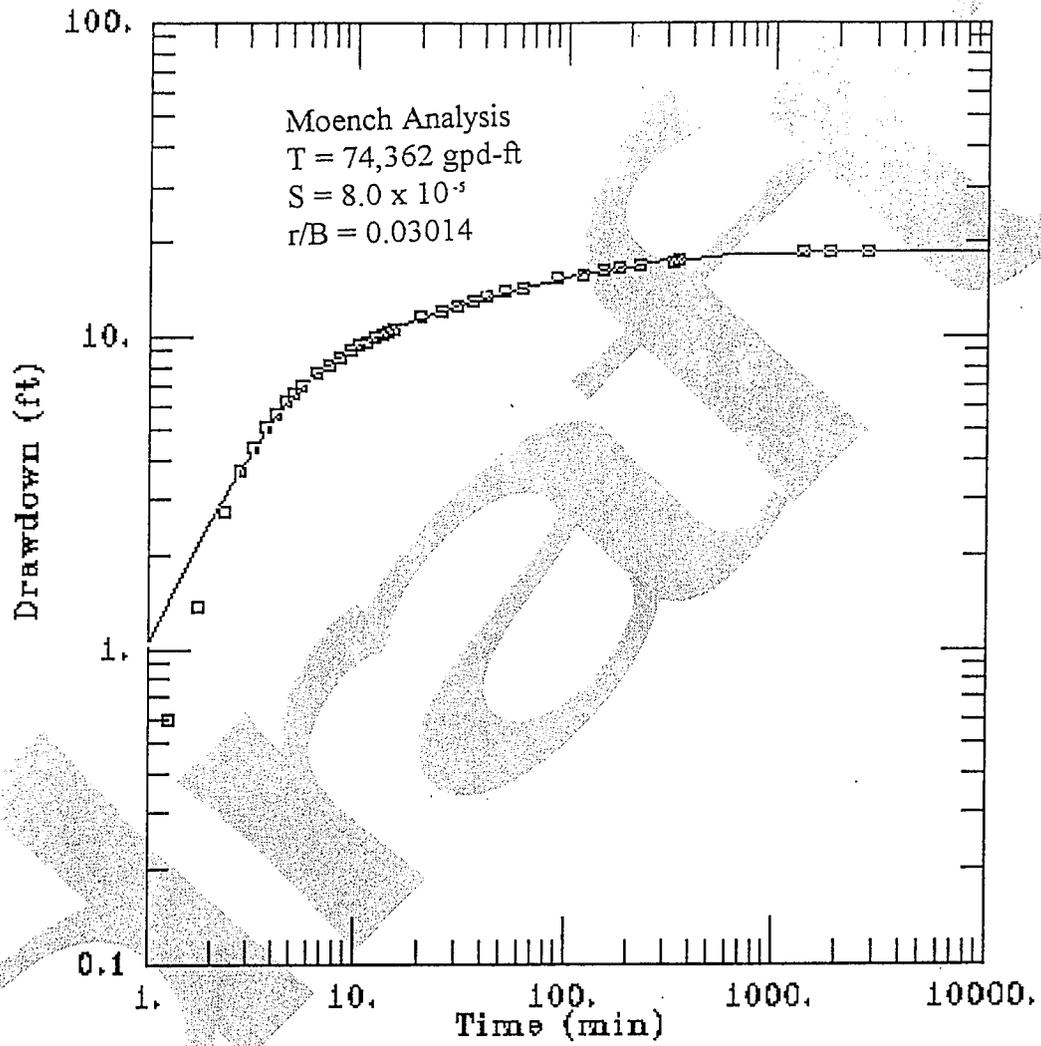


Figure 13. Aqtesolv Moench Analysis: June 1995, Aquifer Test

- ▶ Reduced well efficiency and low specific capacity could be due to inadequate well development, less than optimum gravel pack size, and/or aquifer characteristics.
- ▶ In absence of additional testing, the current well design should be considered inadequate to meet the project needs (it would take 15 wells, pumping at 1,650 gpm, 91 days to meet a 10,000 ac-ft need).
- ▶ Additional testing with appropriate size pump equipment should be conducted to better determine maximum aquifer production and clarify questions of well efficiency. Further testing will also help confirm the number of wells, well construction requirements, and costs per acre-foot necessary to substitute ground water for M&T's current surface water use.

May 1996 Well Development and Aquifer Testing

Based on the findings and recommendations of the June 1995 aquifer testing, the Department contracted services during April and May 1996 to replace the existing pump and bowls in the test well with a more adequate system and conduct further well development and aquifer testing.

Well development and testing included about seven hours of well development, six hours of step-drawdown testing, and 28 hours of constant discharge aquifer testing. Groundwater level changes were measured by steel tape, electric sounder and pressure transducer-data logger instrumentation. Groundwater discharge from the pumping well was measured using a ultra-sound flow meter and checked by calculations using the orifice-manometer method. Data associated with the June 1995 aquifer tests are presented in Appendix C. The construction of wells 24B01 and 24B02 are illustrated in Appendix A

Well Development

Development of well T21N/R01W-24B02 was conducted by Durham Pump, Inc., on April 29, 1996. The set-up for developing the well consisted of a 15-inch double-stage bowl unit, set at 160 feet and powered by a 300 horsepower diesel engine. The test-well was pumped and surged for about seven hours with peak surge discharge estimated in excess of 4,000 gpm. After the first hour of testing the well was flowing clean with no appreciable sand production. Estimated specific capacity of test-well 24B02 showed no significant change throughout development -- indicating that initial well development (conducted in April 1995) was probably adequate.

Step-drawdown Test

The step-drawdown test was conducted by the Department on May 3, 1996. The step-drawdown test provided additional data to help determine well efficiency, optimum sustainable discharge rate, and an estimate of aquifer transmissivity.

The step-drawdown test consisted of pumping well 24B02 for three one-hour steps of incrementally increasing discharge, while measuring drawdown in 24B02 and in the nearby observation well, 24B01. Discharge for steps 1, 2, and 3, were: 1,250 gpm, 2,050 gpm, and 3,000 gpm, respectively. Groundwater level measurements in the pumping well were taken every minute using a pressure-transducer and data-logger. Test data recorded from the pumping well (24B02) are listed in Table C1, and illustrated in the time versus drawdown graph in Figure 14. Figure 14 also lists the drawdown and specific capacity calculated at the end of each step. Specific capacities for steps 1, 2, and 3 were 27.2 gpm/foot, 23.8 gpm/foot and 22.6 gpm/foot, respectively.

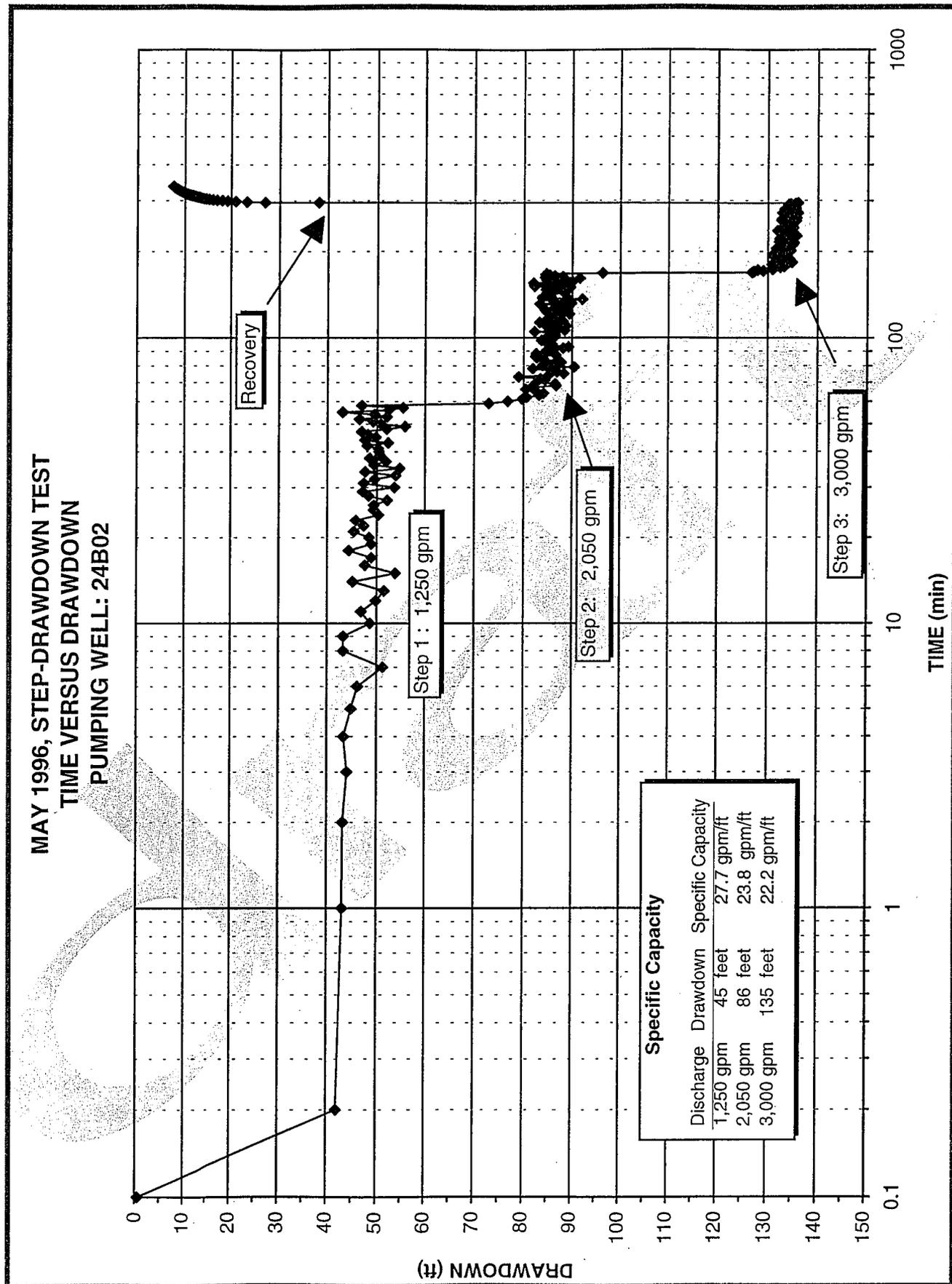
Aquifer transmissivity from the step-drawdown recovery data in well 24B02 was estimated at about 53,000 gpd/ft by using a modified form of the Theis recovery formula. Figure 15 is a Time Function versus Residual Drawdown graph used to calculate transmissivity from the step-drawdown aquifer recovery data. It is important to note that this method of calculating transmissivity is just a rough estimate, and that actual values determined from analysis of constant discharge test data are usually larger.

Step-drawdown test and recovery data recorded from the observation well (24B01) are listed in Table C2 and are illustrated in the time versus drawdown graph in Figure 16. Distance between well 24B01 and 24B02 was surveyed at 191 feet.

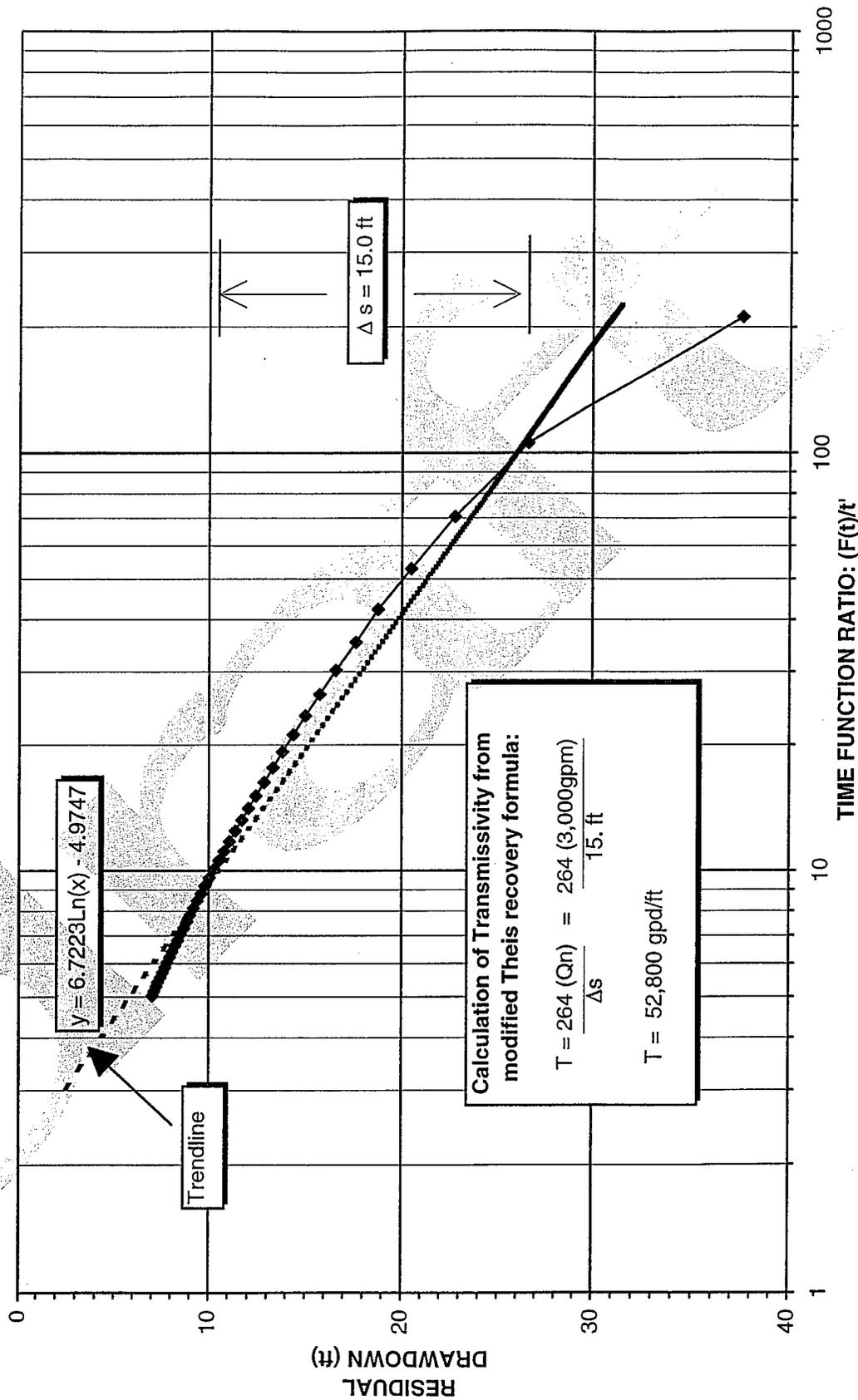
Well Efficiency: The efficiency of well 24B02 was determined by comparing actual versus theoretical drawdown for each test step similar to the methodology from the June 1995 step-drawdown test. Figure 17 shows the actual versus theoretical distance-drawdown curves, approximate well loss, and well efficiency estimated for each test step. The well efficiency for Steps 1, 2 and 3 were estimated at 68, 61, and 59 percent respectively. Approximately 7 feet of the head losses in well 24B01 can be directly attributed to friction from pulling the water from the perforations at 760 feet. Also listed in Figure 17, are the aquifer parameters used in the Cooper-Jacob formula to match theoretical and actual drawdown in the observation well, and to calculate the theoretical drawdown in the pumping well.

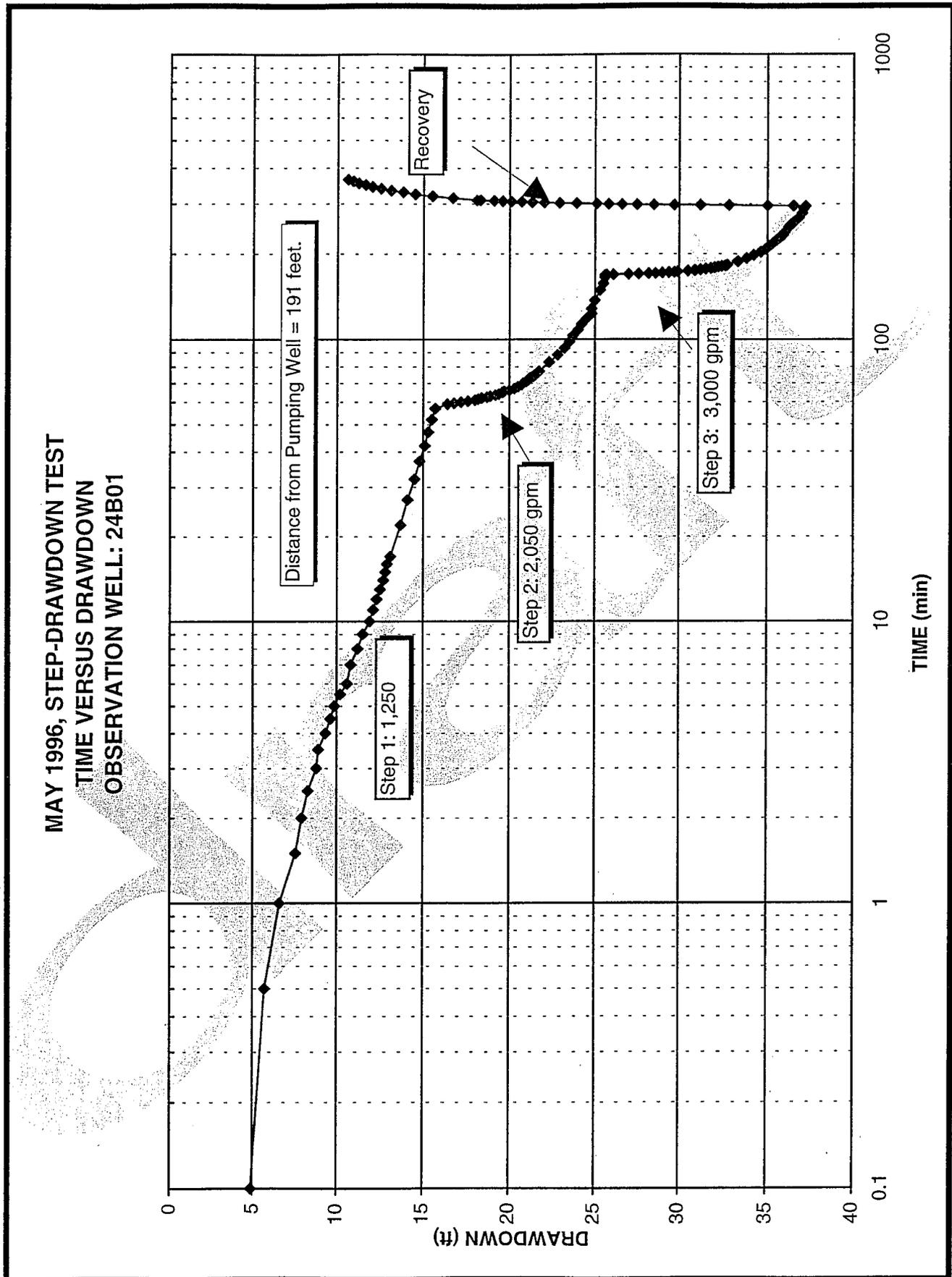
Constant-Discharge Test

The Department conducted a thirty hour aquifer test beginning May 6, 1996. The purpose of the constant-discharge test was to provide a more accurate estimate of aquifer transmissivity and storativity and, by increasing aquifer stress through increased pump rates, further examine the possible interconnection between shallow and deep aquifer zones.

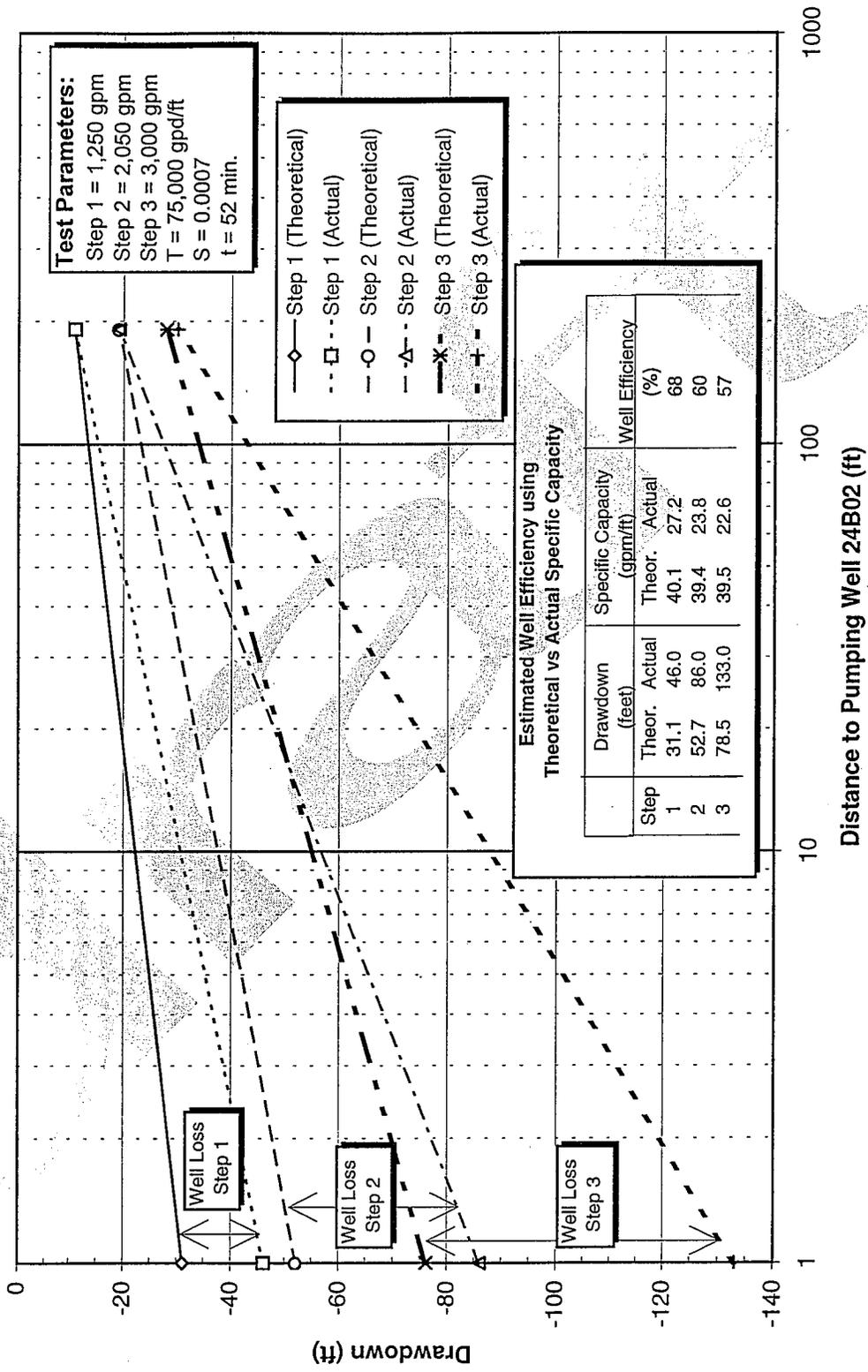


**MAY 1996, STEP-DRAWDOWN TEST
 TIME FUNCTION VERSUS RESIDUAL DRAWDOWN
 AQUIFER RECOVERY ANALYSIS FOR WELL 24B02**





**MAY 1996, STEP DRAWDOWN TEST
ESTIMATED WELL EFFICIENCY FOR T21N/R01W-24B02
USING THEORETICAL VERSUS ACTUAL SPECIFIC CAPACITY**



The constant-discharge test consisted of pumping well 24B02 at a uniform rate of 3,000 gpm and recording the drawdown in five surrounding wells; 24B01, 13H01, 14Q01, 23H01, and 23J01. The distance between the pumping well and observation wells ranged from 191 feet to about 6,000 feet. Figure 18 shows the location of the wells monitored during the test. Unfortunately, two hours into the test, well 23J01 (agricultural well belonging to an adjacent landowner) was turned on and remained on for about 18 hours. Because of the interference from the pumping of well 23J01, subsequent data collected from wells 23H01 and 14Q01 were deemed unusable. The pumping well was turned off at about 26 hours into the test after drawdown in well 24B01 (closest observation well) appeared to stabilize.

Groundwater level drawdown and recovery data, recorded from the pumping well (24B02), are listed in Table C3 and are illustrated in the time versus drawdown graph in Figure 19. Table C3 and Figure 19 shows that the total drawdown in well 24B02 (pumping well) was about 143 feet, with approximately 67 percent of the total drawdown occurring within the first minute of the test. Specific capacity of well 24B02 after about 1,500 minutes of pumping was calculated at 21.1 gpm/ft. Groundwater level recovery in the pumping well was 66 percent after the first minute and 83 percent after five minutes.

Drawdown and recovery data recorded from the nearest observation well (24B01) are listed in Table C4 and are illustrated in the time versus drawdown graph in Figure 20. Table C4 and Figure 20 shows that the total drawdown in well 24B01 (closest observation well) was about 43.2 feet, with 80 percent recovery after two hours. Well 24B01 was surveyed to be 191 feet from well 24B02 (pumping well).

Aquifer transmissivity and storativity were calculated using the data from 24B01 and analysis methods for confined and leaky aquifers. Figures 21, and Figure 22 show the results of Theis and Cooper-Jacob analysis using *Aqtesolv*. Figure 23 is an independent analysis (constructed without using *Aqtesolv*) using the Cooper-Jacob formula. Findings from the confined aquifer analysis show aquifer transmissivity and storativity at about 77,000 gal/day-ft and 1.3×10^{-4} , respectively.

Figure 24 was developed using *Aqtesolv*'s Moench formula for leaky aquifer produces aquifer transmissivity and storativity of about 79,000 gal/day-ft and 2.81×10^{-5} , respectively.

As mentioned previously, observation well 23J01 began pumping two hours into the test and continued pumping for about 18 hours. Due to the pumping of 23J01, the drawdown data from other observation wells in the area (23H01 and 14Q01) were determined inadequate for aquifer parameter analysis.

Observation well 13H01 is a shallow (less than 100 feet), idle-domestic well located about 2,700 feet northeast of the pumping well and 8,500 feet northeast of well 23J01. Using a Stevens chart recorder to monitor groundwater levels, 13H01 showed no change in groundwater levels during the deep-aquifer performance testing.

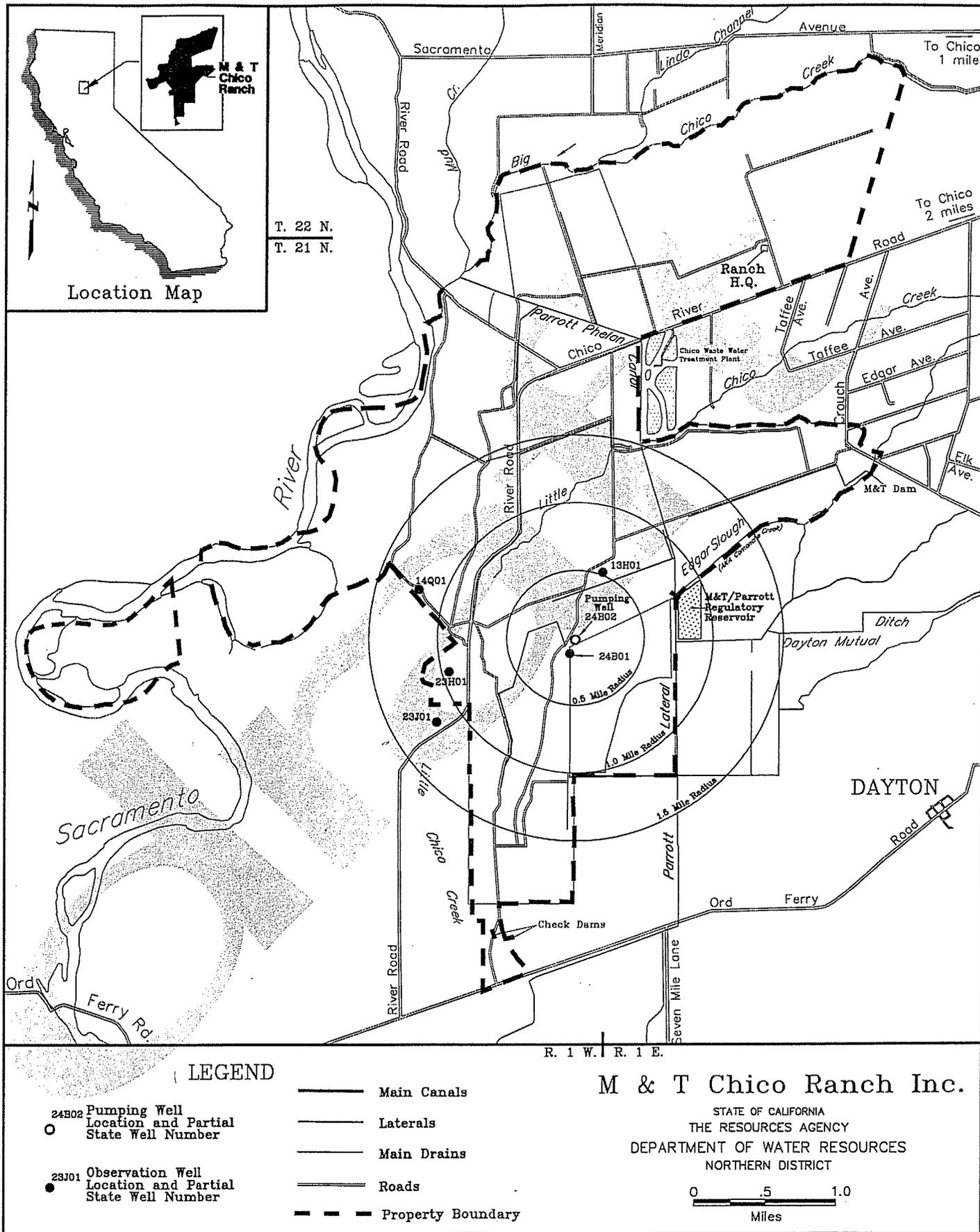
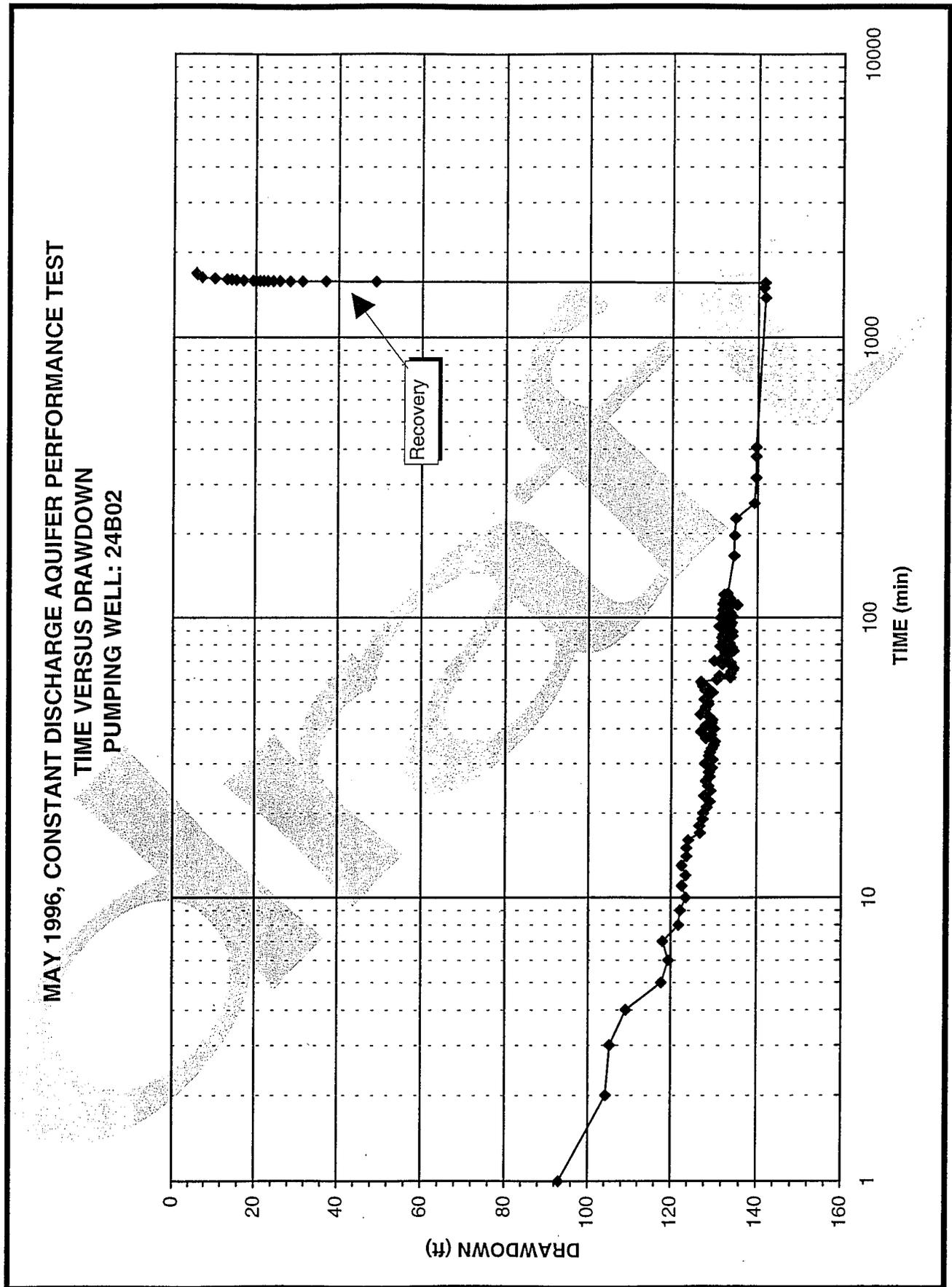
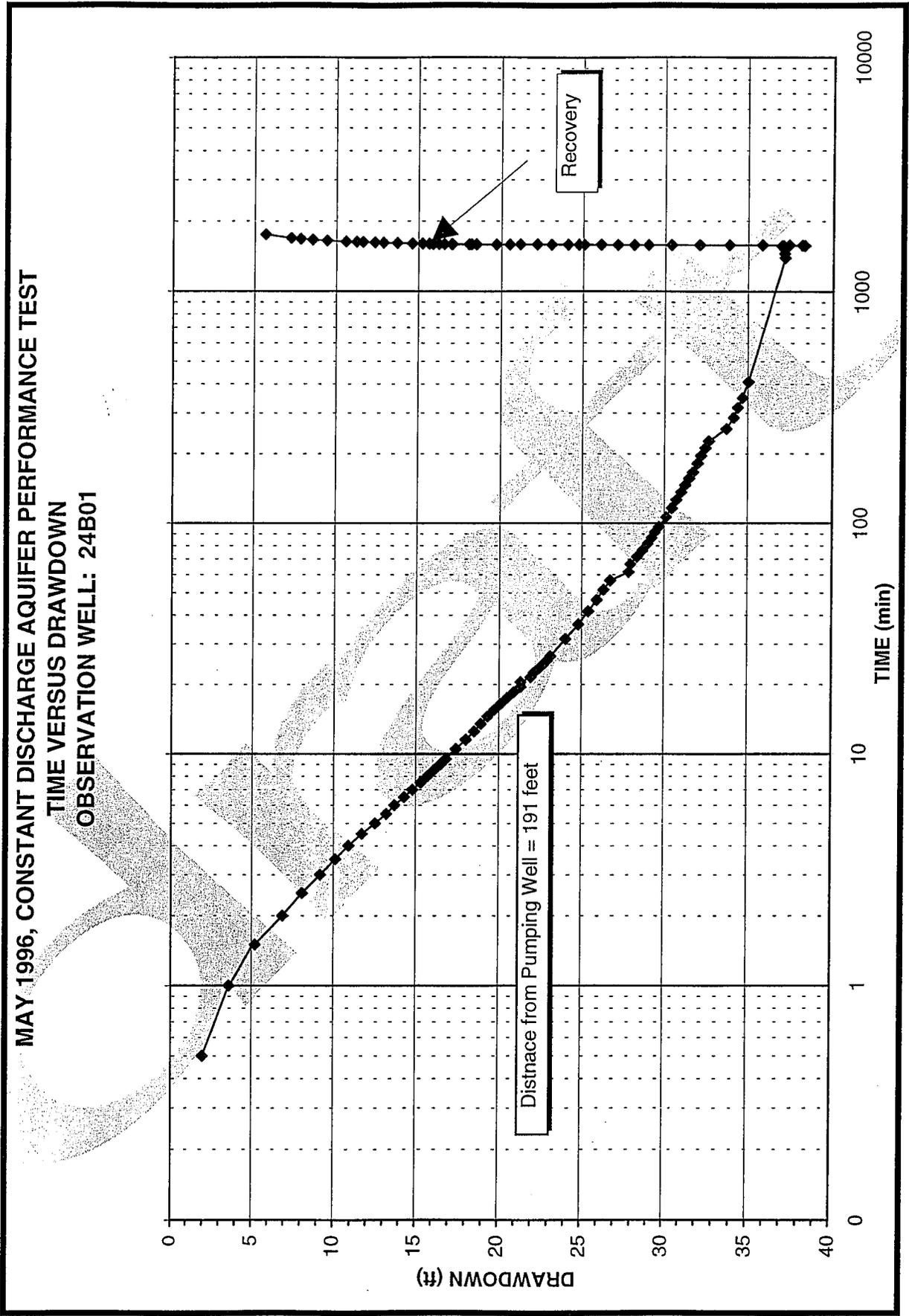


Figure 18. Location of Wells Monitored During May 1996 Aquifer Test.





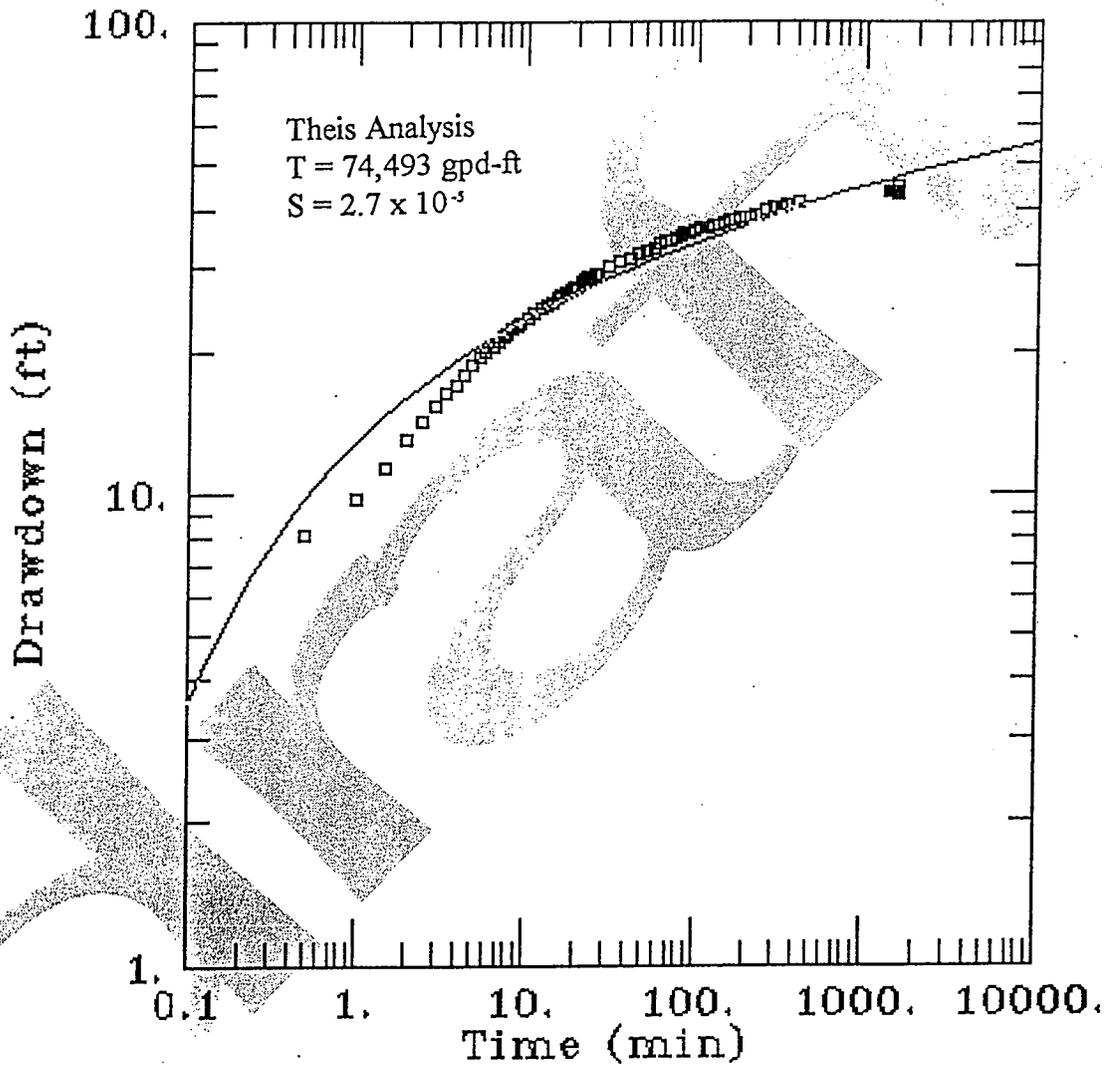


Figure 21. Aqtesolv Theis Analysis: May 1996, Aquifer Test.

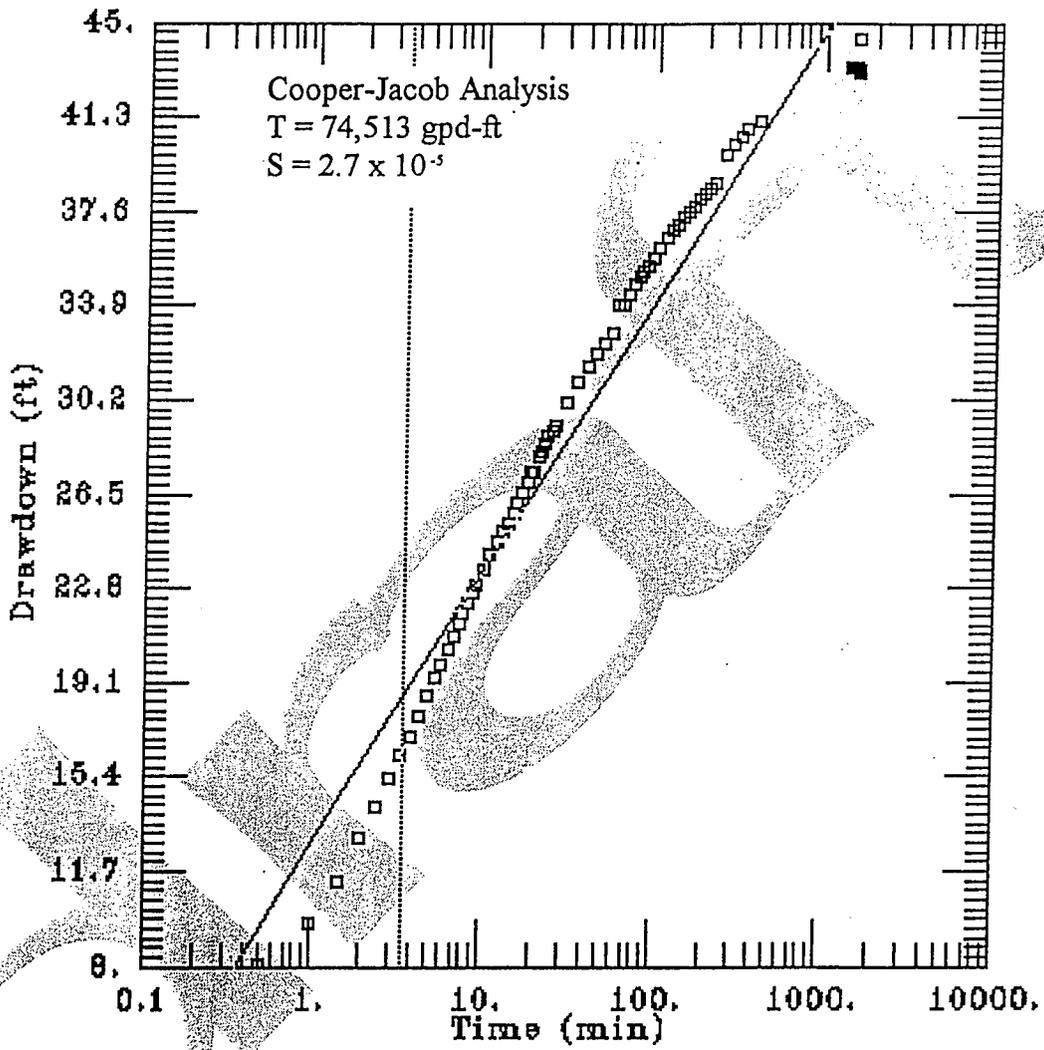
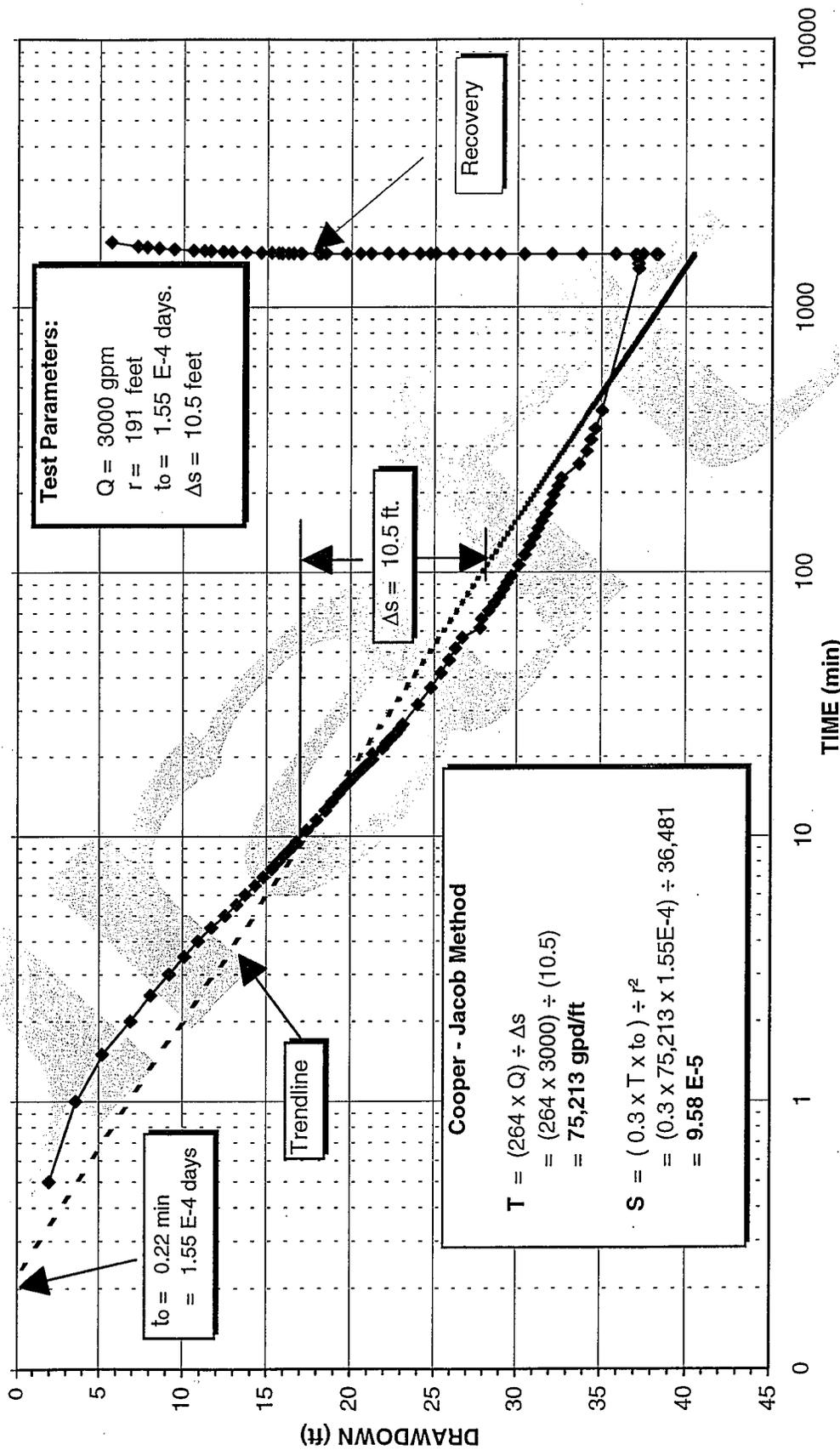


Figure 22. Aqtesolv Cooper-Jacob Analysis: May 1996, Aquifer Test

MAY 1996, CONSTANT DISCHARGE AQUIFER PERFORMANCE TEST
 COOPER-JACOB TIME-DRAWDOWN ANALYSIS
 OBSERVATION WELL: 24B01



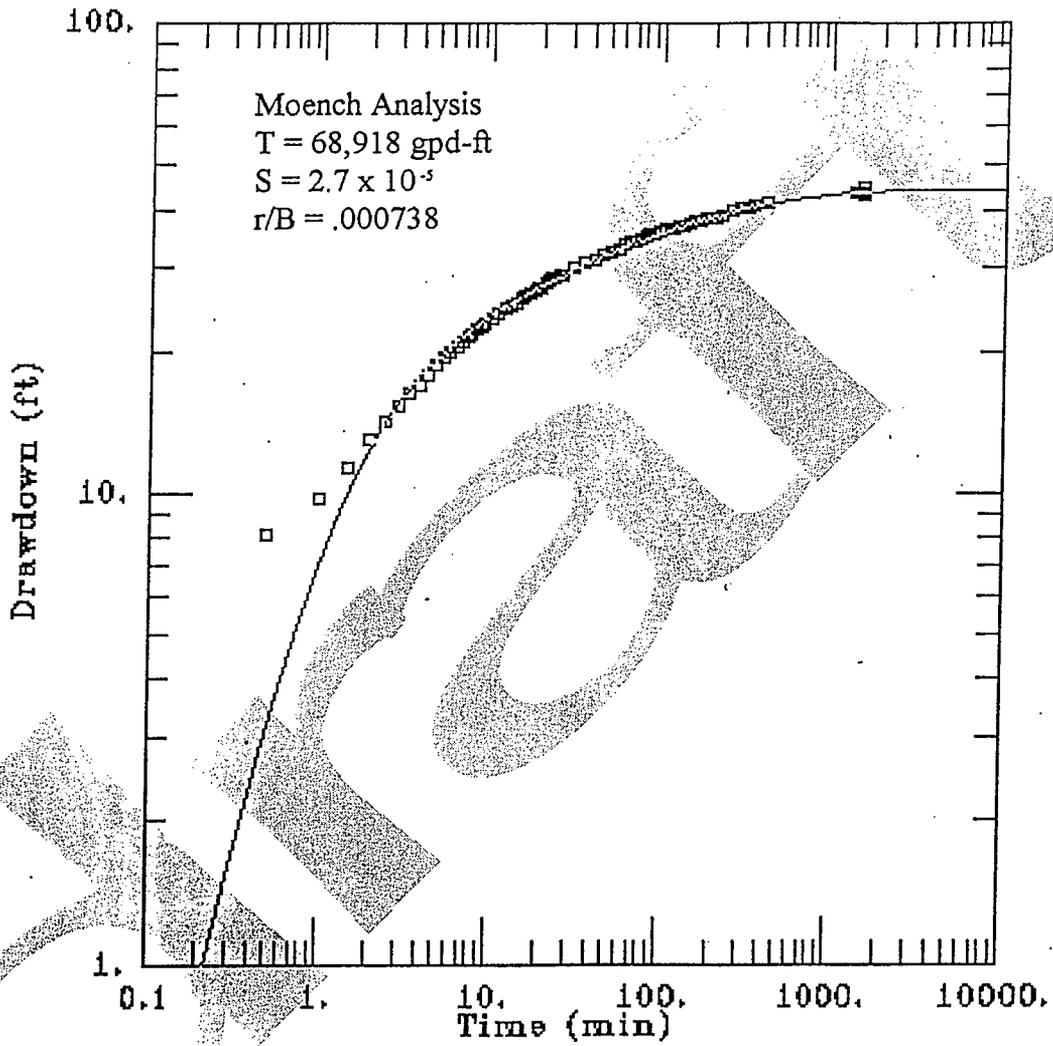


Figure 24. Aqtesolv Moench Analysis: May 1996, Aquifer Test

Findings

Findings from the May-June 1996 testing of the lower-confined Tuscan aquifer indicate:

- ▶ Additional well development showed no significant increase in specific capacity and no appreciable sand production throughout development -- indicating that initial well development (conducted in April 1995) was probably adequate.
- ▶ Specific capacities calculated from the step-discharge test decreased with increasing discharge and were slightly lower than previous tests. Variations in specific capacity associated with the two tests could be due to inaccuracies in flow measurements during the June 1995 test. Specific capacity and discharge for steps 1, 2, and 3 were: 27.2 gpm/ft at 1,250 gpm, 23.8 gpm/ft at 2,050 gpm, and 22.6 gpm/ft at 3,000 gpm respectively. Total drawdown at the end of step 3 (3,000 gpm discharge) was about 135 feet.
- ▶ Well efficiency is estimated at 63 percent -- slightly lower than previous testing.
- ▶ Continuous discharge test indicates that aquifer transmissivity is approximately 75,000 gpd/ft (slightly higher than previous testing), and aquifer storativity is between 1×10^{-4} and 1×10^{-5} (about an order of magnitude smaller than previous testing).
- ▶ Time-drawdown data is more characteristic of a confined, rather than leaky, aquifer.
- ▶ The test-production well 24B02 showed 80% recovery after about 4 minutes and 90% recovery after 34 minutes. Observation well 24B01 (191 feet away) showed 80% recovery after 2 hours.
- ▶ Observation well 13H01, located 2,700 feet from 24B02 and constructed within the upper aquifer, showed no signs of drawdown associated with the deep aquifer pumping of the test well.
- ▶ Diesel fuel consumption to pump 3,000 gpm from about 135 feet averaged 9.5 gal/hour. Assuming a price of \$1.10/gal for diesel fuel, the cost to pump 1 acre-foot of groundwater from the lower-Tuscan aquifer is about \$19.00.
- ▶ The increased cost of pumping from the lower-Tuscan versus the upper and middle-Tuscan aquifer could be offset by the reduction in drawdown related impacts and mitigation costs.

SURFACE WATER SUPPLY AND POTENTIAL SURFACE WATER REQUIREMENTS

The ability of a cooperator, participating in a conjunctive use program, to provide a reliable supply of "new" surface water for the SWP during years of need depends largely upon:

- The frequency and duration of SWP needs;
- The current amount of surface water rights available to the cooperator during years of SWP need;
- The cooperators future surface requirements during years of need.

The above factors affecting the potential surface water supply were evaluated in detail during the M&T Phase I and Phase II investigations. The following analysis of M&T's surface water supply and potential surface water requirements represent an overview and updated reevaluation of the previous Phase I and Phase II analysis.

Frequency of SWP Needs

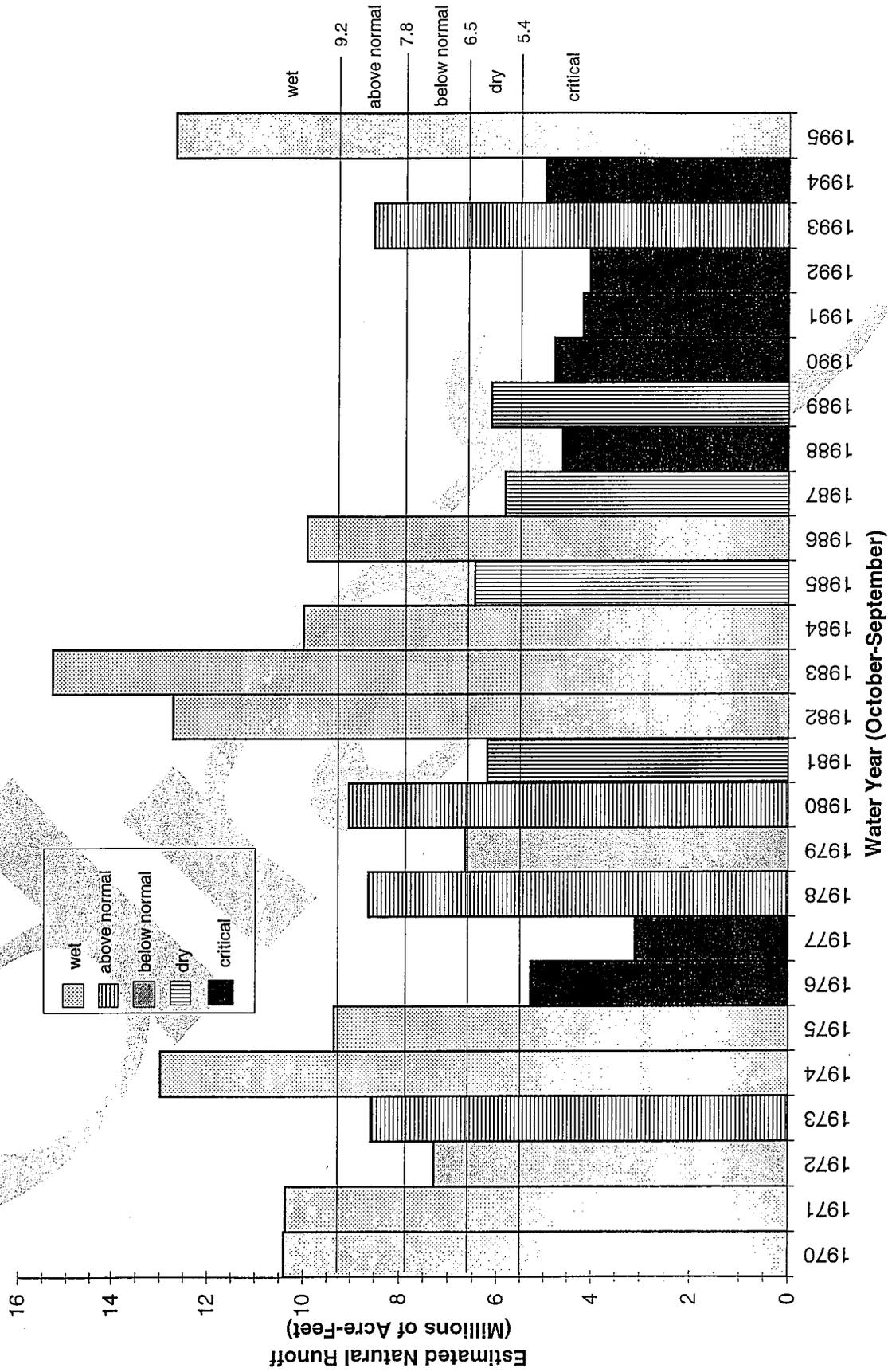
During the M&T Phase II investigation the frequency of SWP needs were estimated according to the Sacramento Valley Water Type Year Index. The Phase II investigation assumed that the SWP would request the M&T Chico Ranch to activate its conjunctive use groundwater facilities in years classified by the Sacramento River index as Below Normal, Dry or Critical.

Shortly after the completion of the Phase II investigation, the method of calculating the Sacramento River Index was adjusted. The new index, called the Sacramento Valley Water Year Type Index (40-30-30 Index), is shown in Figure 25. Similar to the Sacramento River Index, the 40-30-30 Index indicates type of water year (wet, above normal, normal, below normal, dry, and critical) by monitoring surface flows for the four major rivers in the Sacramento Valley (Sacramento River, Feather River, Yuba River and American River). Additionally, the new 40-30-30 Index also includes carry-over storage in Lake Oroville. Estimated project operation and maintenance cost for this investigation will use the new "40-30-30" index.

Under a best case scenario, the M&T based conjunctive program would be activated during years classified by the 40-30-30 Index as *Below Normal, Dry or Critical* (less than or equal to 7.8 maf). Analysis of both the old and the new index shows that the projected frequency of the M&T Chico Ranch conjunctive use program operations will not change. In the last 25 years, the number of years classified as *Below Normal, Dry or Critical* by the Sacramento River Index and the 40-30-30 Index has been the same at 13, or about 50 percent (biennial operation).

Under a worst case scenario, the M&T conjunctive use program would be activated during years classified as *Dry or Critical*. In the last 25 years, the number of years classified as *Dry or Critical* by the 40-30-30 Index has been the same at 11, or about 40 percent (triennial operations).

Sacramento River 40-30-30 Index
1970-1995



Surface Water Availability During Periods of SWP Need

Phase II investigated the amount of surface water which is available to and required by M&T Chico Ranch during water years classified as Below Normal, Dry or Critical. Based on 1994 M&T water rights and land use data, the Phase II study found that a conjunctive use program utilizing M&T's Sacramento River entitlement could provide a reliable supply of about 12,000 acre-feet of in-lieu Sacramento River water during periods of SWP need between April and October.

Since that time, M&T along with Parrott Investment Company have entered into a Butte Creek - Sacramento River surface water exchange agreement which slightly alters the Phase II estimate of the amount of water available for conjunctive use.

As part of the funding effort for relocating the M&T/Parrott pumping plant from Big Chico Creek to the Sacramento River, M&T Chico Ranch and Parrott Investment Company (PIC owns the rights to the water being used at the Llano Seco Rancho) entered into an Agreement in April 1996 with the United States Fish and Wildlife Service and the California Department of Fish and Game to enhance in-stream flows in Butte Creek. The Agreement requires M&T/PIC to allow 40 cfs of their combined West Branch Feather River and native Butte Creek water right to bypass the Parrott-Phelan Dam (Diversion 50) on Butte Creek during the designated bypass period October 1 - June 30. The Agreement also stipulates that M&T/PIC may exchange each cfs of Butte Creek bypass water for an equivalent quantity of water from the Sacramento River during the October-June bypass period.

To determine whether the April 1996 agreement could significantly increase M&T's future Sacramento River diversion, thereby increasing the amount of water available for groundwater substitution, available water versus actual diversions at Butte Creek Diversion 50 were analyzed. Analysis included diversions between 1975 and 1995 for the months of May, June and October during years classified as Below Normal, Dry and Critical. Analysis of flow data is listed in Appendix D.

Figure 25 shows that, between 1975 and 1995, seven years were classified as Critical, four were classified as Dry and two as Below Normal. Analysis of M&T/PIC flow data in Appendix D indicates that, in order to meet the 40 cfs bypass requirement of the new Agreement, additional Sacramento River water would have been historically used to maintain M&T/PIC's existing surface water requirements during all Dry and Critically Dry years. The amount of additional Sacramento River water required to meet M&T/PIC's combined surface water need during Dry and Critically Dry years was estimated at 4,000 acre-feet per year and 3,700 acre-feet per year, respectively. For the two years classified as Below Normal (1972 and 1978), it is estimated that less than 500 acre-feet additional Sacramento River diversions would be needed. Assuming that half of the combined M&T/PIC surface water would be used by M&T, it appears that under the new Agreement, M&T's future Sacramento River diversion, and subsequently the amount of water available for groundwater substitution, will increase annually by approximately 2,000 acre-feet during Dry and Critical years.

Based on the above findings, revised estimates indicate that a M&T based conjunctive use program, using M&T's Sacramento River entitlement, could provide a reliable supply of up to 14,000 acre-feet of in-lieu Sacramento River water during periods of SWP need.

PRODUCTION WELL DESIGN AND CONSTRUCTION

Production well design and construction were analyzed and developed based on several goals and objectives. The goal of the production well design was to minimize drawdown related impacts to surrounding groundwater users and maximize well/aquifer productivity. Using aquifer testing data and lithological data from M&T based investigations, and aquifer modeling software, two potential well designs were analyzed based on the above criteria.

The first well design is referred to as the deep-aquifer design, and is similar in design to the test wells which were drilled and tested during the M&T investigations. The deep-aquifer design consists of a 950 foot deep gravel packed well constructed with 16-inch casing and perforations from 760 to 920 feet. The deep-aquifer well design was originally selected as the design of choice for maximizing well production and minimizing drawdown related impacts to surrounding groundwater users. However, aquifer testing of the deep aquifer design revealed lower than expected aquifer productivity and greater than expected pumping lifts and associated pumping costs. Aquifer transmissivity associated with the deep-aquifer well design was calculated at 75,000 gallons per day per foot. Specific capacity associated with the deep-aquifer well design was calculated at 23 gallons per minute per foot.

The second proposed well design is referred to as a composite design. The overall construction of the composite well design is similar to the deep-aquifer well design, however, in addition to the deep perforations (760 to 920 feet), the composite well design is constructed with a second set of perforations between 300 and 350 feet. By drawing from the middle aquifer, as well as the deep aquifer, it is theorized that the composite well design could provide improved well production, while still minimizing drawdown related impacts to surrounding third party wells. Aquifer transmissivity associated with the composite design is estimated at 125,000 gallons per day per foot. Specific capacity associated with the composite well design is estimated at about 30 gpm/ft.

Using a program for analyzing partially penetrating wells in a water-table aquifer (WTAQ2) by Moench (USGS, 1996), both designs were analyzed for drawdown impacts to surrounding domestic and agricultural wells. The Moench WTAQ2 analysis was chosen as a conservative analysis because it assumes a water-table system, and both production well designs are expected to extract from the confined aquifer. This approach was taken because, even though the confined aquifer has been shown to date to be separate from the unconfined aquifer, the confined aquifer in this area has never been stressed to the extent proposed under this conjunctive use program. Sufficient stress within the confined system could result in groundwater drawdown within the unconfined aquifer. Domestic wells were assumed to be constructed with well perforations between 100 and 200 feet, while agricultural wells were assumed to be constructed with well perforations between 100 and 600 feet. The results of the analysis are summarized in Table 1 and illustrated in the 90-day distance-drawdown graph in Figure 26.

Table 1

ESTIMATED DISTANCE DRAWDOWN IMPACT for COMPOSITE and DEEP-AQUIFER WEL DESIGNS (based on 90 days of continuous pumping)							
Composite Well Design				Deep-Aquifer Design			
Domestic Well Impact		Agricultural Well Impact		Domestic Well Impact		Agricultural Well Impact	
T=125,000gpd-ft OB Screened 100-200 ft. PW Screened 300-900 ft.		T=125,000gpd-ft OB Screened 100-600 ft. PW Screened 300-900 ft.		T=75,000gpd-ft OB Screened 100-200 ft. PW Screened 760-920 ft.		T=75,000gpd-ft OB Screened 100-600 ft. PW Screened 760-920 ft.	
Distance (ft)	OB Well DD (ft)	Distance (ft)	OB Well DD (ft)	Distance (ft)	OB Well DD (ft)	Distance (ft)	OB Well DD (ft)
100	6.43	100	27.69	100	4.00	100	9.80
500	6.21	500	17.30	500	3.95	500	9.67
1,000	5.84	1,000	12.89	1,000	3.90	1,000	9.35
1,700	5.00	1,700	9.48	1,700	3.77	1,700	8.68
2,640	4.21	2,640	7.00	2,640	3.52	2,640	7.65
5,280	2.35	5,280	3.57	5,280	2.60	5,280	5.00
7,920	1.36	7,920	2.04	7,920	1.76	7,920	3.24

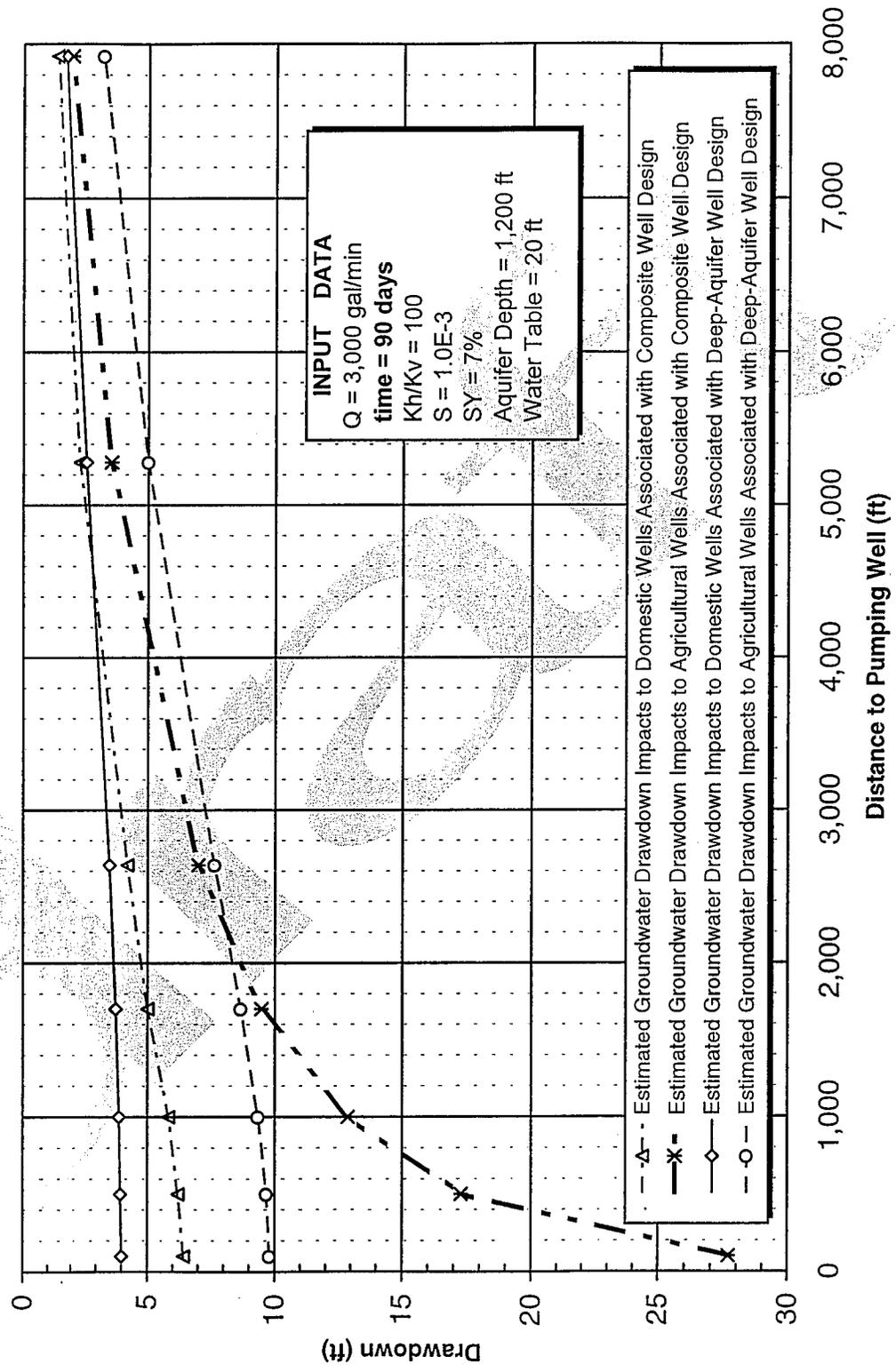
Figure 26 shows that the drawdown in the surrounding agricultural observation wells associated with pumping from the composite design is significantly greater than the deep-aquifer well design, for distances of less than 2,200 feet from the production well. However, at distances over 2,200 feet, the drawdown in the agricultural wells, associated with the composite design, becomes less than that resulting from the deep-aquifer well design. This result is most likely because, at short distances from the pumping well, the increase in drawdown resulting from the observation and pumping well being screened over similar intervals (perforations for pumping well of composite design = 300 to 900 feet, perforations for agricultural observation wells = 100 to 600 feet), outweighs any reduction in drawdown due to the greater transmissivity of the composite versus deep-aquifer production well design. However, as the distance between the pumping well and observation wells increase, the drawdown due to the similarly screened pumping and observation wells becomes overshadowed by a drawdown reduction associated with the greater transmissivity of the composite versus deep-aquifer well design. Figure 27 also shows that the drawdown in the domestic wells, associated with production well pumping, does not vary significantly between the composite versus deep-aquifer design.

Additional analysis of the composite versus deep-aquifer well design indicates that the specific capacity associated with the composite designed should be about 30 percent greater than that of the deep-aquifer design. Thus, specific capacity associated with the composite well design should increase to about 30 gallons per day per foot. Increases in specific capacity will help to reduce production well pumping costs.

Overall analysis of the proposed production well designs indicates that the composite design will be more effective at maximize well/aquifer productivity, and minimize pumping costs and drawdown related impacts to third party groundwater users.

Figure 26

ESTIMATED DISTANCE VERSUS DRAWDOWN IMPACTS TO DOMESTIC AND AGRICULTURAL TYPE WELLS USING WTAQ2 PROGRAM



WELL FIELD DESIGN

The design for an M&T based conjunctive use program would require the installation of 13 composite design wells with pumping capacity to produce sufficient groundwater to make available 14,000 ac-ft of in lieu surface water supply to the SWP for each year of operation. The location and number of wells are based on current land use, peak water demand, total applied water requirements for areas currently irrigated with surface water, and spacing/capacity regulations listed in the Butte County Well Drilling Ordinance. Well requirements are also based on the assumption that all wells will operate at a fixed pumping rate of 3,000 gallons per minute, and that some of the initial flooding for rice will be augmented by surface water. Figure 2 shows the location of the proposed production wells.

PROGRAM COSTS

Program cost are based on conservative estimates of aquifer productivity and drawdown related impacts to surrounding landowners. Estimated total costs for the M&T Chico Ranch program are summarized in Table 2. Program costs are divided into construction costs, estimated annual mitigation cost, and estimated annual operations, maintenance, power and replacement costs. Costs are also analyzed based on best case and worst case operational scenarios. The best case scenario consist of the program operating 50 percent of the time (biennially). The worst case scenario consist of the program operating 40 percent of the time (triennially). Final estimates for unit cost under biennial and triennial operations is about \$61 per acre-foot and \$77 per acre-foot respectively.

Construction Costs

Construction costs for the project facilities are listed in Table 2. Construction costs for the production wells were based on the composite well design discussed above. Construction costs for the monitoring wells were based on a 2-inch-diameter well drilled between 500 and 1,000 feet, based on estimates from recent contracts. Construction cost per production well is about \$100,000. Total cost of the production wells, based on the construction of 13 wells, is \$1,300,000. Estimated cost per monitoring well is \$20,000. Recommendations at this time are for ten monitoring wells. Total monitoring well cost is \$200,000.

Estimated unit costs for a 200-250 horsepower, self contained, trailer mounted unit diesel engine is \$20,000. The 200-250 horsepower requirement is based on a pump capacity of 3,000 gallons per minute, total pumping head of between 150 and 200 feet, 65 percent plant efficiency, and 15 percent horsepower reserve allowance.

Table 2

**ESTIMATED PROGRAM COSTS
for
M&T BASED CONJUNCTIVE USE ALTERNATIVE**

ESTIMATED CONSTRUCTION COST		
Well Construction:	1. Production Wells (13 @ \$100,000/well)	\$1,300,000
	2. Monitoring Wells (10 @ 20,000/well)	\$200,000
Pumps & Gearheads	(3,000 gpm pump & gearhead ect. 13 @ \$13,000)	\$169,000
Diesel Engines:	(250hp self contained motor 13 @ \$20,000)	\$260,000
Distribution Facilities:	(pump lifts, conveyance channels, ect.)	\$100,000
Mitigation Costs:	(One time well maintenance cost for surrounding wells)	\$56,500
	Subtotal =	\$2,085,500
	Contingency (20%) =	\$417,100
	Subtotal =	\$2,502,600
	Engineering/Inspections/Administration (20%) =	\$500,520
	Estimated Total Construction Cost =	\$3,003,120

Year	Present Value of O&M	
	% Interest = Biannual	6% Triannual
1	\$212,170	\$148,868
2	\$200,160	\$140,441
3	\$188,830	\$132,492
4	\$178,142	\$124,992
5	\$168,058	\$117,917
6	\$158,546	\$111,243
7	\$149,571	\$104,946
8	\$141,105	\$99,006
9	\$133,118	\$93,402
10	\$125,583	\$88,115
11	\$118,475	\$83,127
12	\$111,768	\$78,422
13	\$105,442	\$73,983
14	\$99,473	\$69,795
15	\$93,843	\$65,844
16	\$88,531	\$62,117
17	\$83,520	\$58,601
18	\$78,792	\$55,284
19	\$74,332	\$52,155
20	\$70,125	\$49,203
21	\$66,156	\$46,418
22	\$62,411	\$43,790
23	\$58,878	\$41,312
24	\$55,545	\$38,973
25	\$52,401	\$36,767
26	\$49,435	\$34,686
27	\$46,637	\$32,723
28	\$43,997	\$30,870
29	\$41,507	\$29,123
30	\$39,157	\$27,475
31	\$36,941	\$25,919
32	\$34,850	\$24,452
33	\$32,877	\$23,068
34	\$31,016	\$21,762
35	\$29,261	\$20,531
36	\$27,604	\$19,368
37	\$26,042	\$18,272
38	\$24,568	\$17,238
39	\$23,177	\$16,262
40	\$21,865	\$15,342
Total	\$3,383,912	\$2,374,306

**ESTIMATED ANNUAL OPERATIONS, MAINTENANCE, POWER, REPLACEMENT
and MITIGATION COST**

Power Cost:	Biennial	Triennial
Assume: 10 gal/hr @ \$1.10/gal for total of 12,700 hrs	\$139,700	
Assume: 10 gal/hr @ \$1.10/gal for total of 8,500 hrs		\$93,500
Maintenance/Replacement:		
Ann. Diesel Engine Maint./Replacement:	\$6,500	\$5,400
Assume: \$0.25/hr & one rebuild @ \$10,000 per eng.		
Ann. Pump Maintenance & Replacement:	\$5,500	\$5,100
Assume: \$0.10/hr plus one full replacement over 40 yr.		
Facility Staff and Admin. Cost:	\$15,000	\$15,000
Total OMP&R Costs:	\$166,700	\$119,000
County Permit Costs (Estimated at \$6 per ac-ft):	\$42,000	\$28,000
Mitigation Costs for Drawdown Impacts (Energy Allowance):	\$16,200	\$10,800
Total OMP&R plus Permit and Mitigation Costs:	\$224,900	\$157,800
Present Value of Total OMP&R and Mitigation Cost:	\$3,383,912	\$2,374,306

UNIT COST ANALYSIS SUMMARY

	Biennial	Triennial
Estimated Total Construction Cost:	\$3,003,120	\$3,003,120
Present Value of 40 yr. O&M:	\$3,383,912	\$2,374,306
Total Project Costs (Present Value)	\$6,387,032	\$5,377,426
Equivalent Annual Cost (PMT@6%,40yrs)	\$424,492	\$357,392
Average Annual Production: (acre-foot):	7,000	4,665
Unit Cost: (dollars per acre-foot):	\$61	\$77

Construction Costs for Well Maintenance Allowance

Total construction costs listed in Table 2 also include a one-time well maintenance allowance of \$56,500. Depending upon existing third party well construction, increased pumping levels may be sufficient to drop groundwater levels below the existing pump bowl settings -- eliminating the ability of the pump to extract water. To mitigate against this possibility, a one-time well maintenance allowance was applied to all wells within the area of impact which would require 15 feet, or greater, additional lift. Well maintenance costs for these wells is based on removal, inspection and reinstallation of the pump, pump column, and/or bowls, with sufficient extension to the pump column for proper operation. Table 3 shows the estimated well maintenance costs. Estimated maintenance costs is \$1,500 for domestic wells and \$2,500 for agricultural wells.

To determine groundwater drawdown related impacts to third party wells, groundwater drawdown associated with the M&T Based program was calculated using the Moench WTAQ2 program for partially penetrating wells in a water-table aquifer. The WTAQ2 program was used to calculate individual drawdown versus distance in observation wells associated with each of the thirteen production wells. The individual drawdown in the surrounding observation wells were calculated based on two scenarios, 1) observation wells constructed similar to domestic type wells, and 2) observation wells constructed similar to agricultural type wells. Domestic wells were assumed to be constructed with perforations from 100 to 200 feet, and agricultural wells were assumed have perforations from 100 to 600 feet. The cumulative drawdown was calculated using QuickSurf to combine individual models of the associated drawdown in each of the thirteen production wells for each scenario.

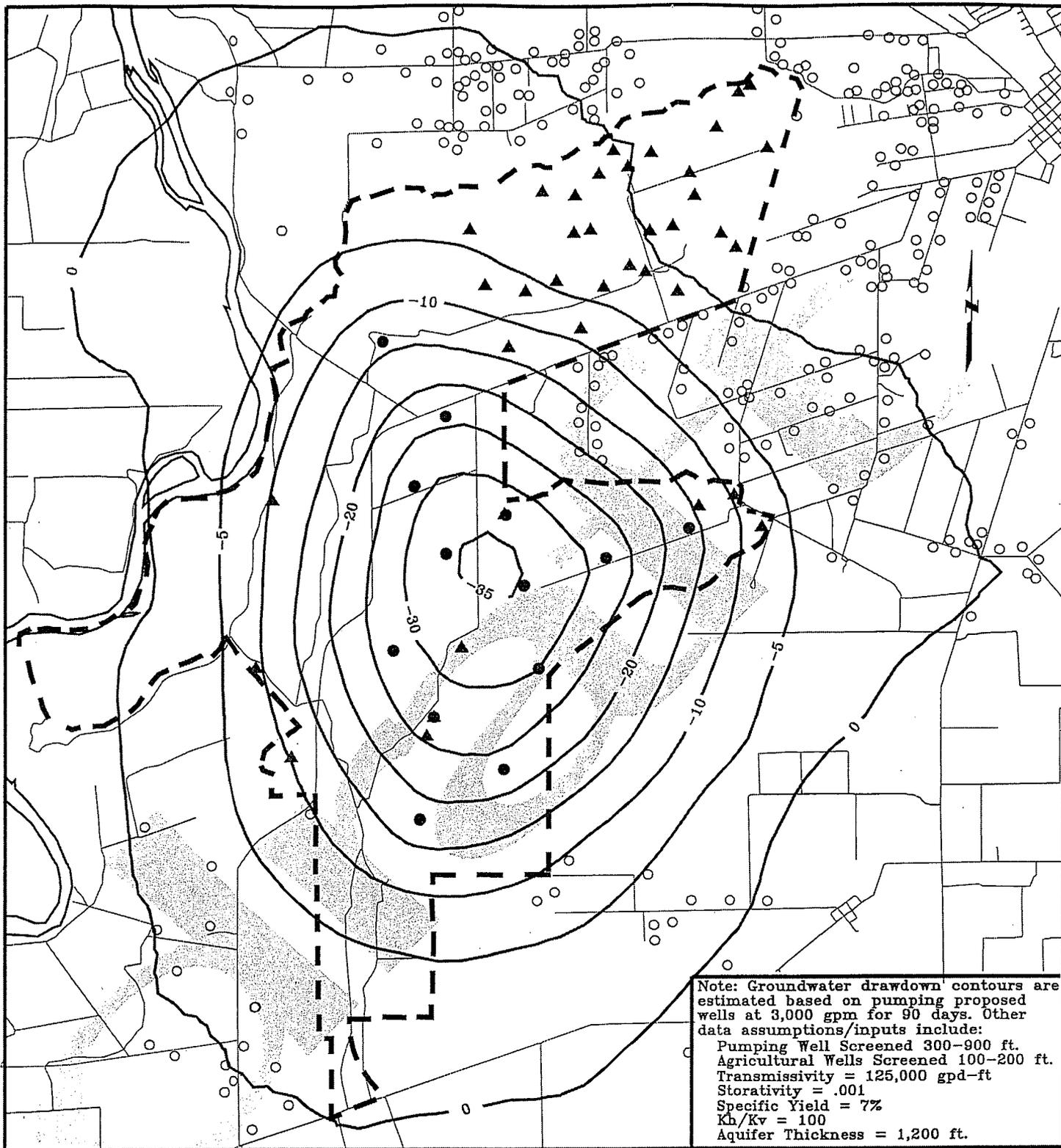
Figure 27 and Figure 28 are groundwater contour maps showing the estimated distribution and extent of groundwater drawdown, and the estimated location of surrounding domestic and agricultural wells within the project impact area. Well information is based on Water Well Drillers Report data on file at DWR, Northern District. Groundwater drawdown illustrated in these figures are based on 90 days of continuous pumping, with each of the thirteen production wells pumping at 3,000 gallons per minute. Additional aquifer parameter assumptions and inputs are listed on the figures.

Estimated total construction costs for the M&T program include the facility cost plus 20 percent construction contingency, plus an additional 20 percent for project engineering, inspections, and administrative cost. Estimated total construction costs is about \$3.0 million.

Table 3

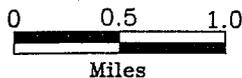
Well Maintenance Allowance

Domestic Wells			Agricultural Wells			TOTAL COSTS
Number of Wells	Estimated Maintenance Cost per Well	Costs	Number of Wells	Estimated Maintenance Cost per Well	Costs	
6	\$1,500	\$9,000	19	\$2,500	\$47,500	\$56,500
Well maintenance cost are base on wells requiring 15 feet or greater additional lift (includes 6 agricultural wells within the M&T Ranch)						



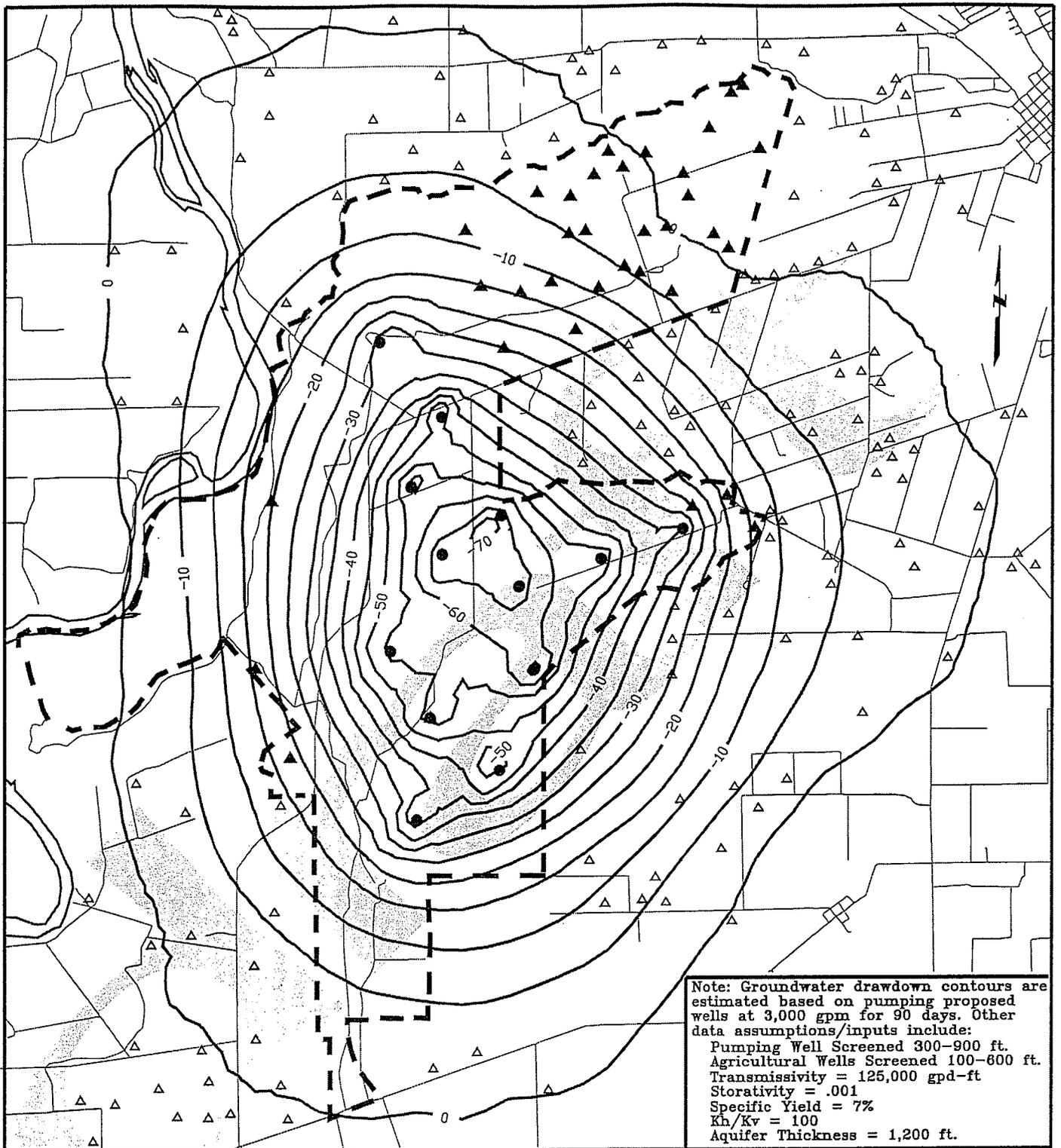
LEGEND

- Location of Proposed Production Wells
- ▲ Location of Existing M&T Production Wells
- Location of Surrounding Domestic Wells (depth < 200 ft.)



- M&T Property Boundary
- Streets/County Roads
- 40--- Estimated Groundwater Drawdown Contour. Contour Interval = 5 ft.

Figure 27. Estimated Location and Drawdown Impact to Surrounding Domestic Wells



Note: Groundwater drawdown contours are estimated based on pumping proposed wells at 3,000 gpm for 90 days. Other data assumptions/inputs include:
 Pumping Well Screened 300-900 ft.
 Agricultural Wells Screened 100-600 ft.
 Transmissivity = 125,000 gpd-ft
 Storativity = .001
 Specific Yield = 7%
 Kh/Kv = 100
 Aquifer Thickness = 1,200 ft.

LEGEND		
● Location of Proposed Production Wells		--- M&T Property Boundary
▲ Location of Existing M&T Production Wells		— Streets/County Roads
△ Location of Surrounding Agricultural Wells (depth > 200 ft.)	0 0.5 1.0 Miles	---40--- Estimated Groundwater Drawdown Contour. Contour Interval = 5 ft.

Figure 28. Estimated Location and Drawdown Impact to Surrounding Agricultural Wells.

Energy Allowance Costs

Design and construction and of the M&T based conjunctive use program is focused at minimizing any increases in groundwater pumping levels to third party wells surrounding the project area. However, under the current proposed design and construction, some impacts resulting from lower pumping levels in surrounding groundwater wells will occur. Lower pumping levels result in increased energy use from additional pumping lift and due to possible decreases in well production. The proposed mitigation of this third party impact consists of providing a monetary allowance for increased energy costs. Total energy allowance costs under the M&T alternative is estimated at about \$32,400 for each year of program operation. Unit cost for energy allowance is estimated at \$2.30 per acre-foot.

Energy Allowance for Domestic Wells

The energy mitigation allowance for domestic wells was calculated based on the Figure 27 groundwater contour map, which shows the estimated distribution and extent of groundwater drawdown and the location of surrounding domestic wells within the project impact area, and the following formula used by PG&E to determine pumping energy costs.

$$\text{Pumping Costs} = \text{Cost per kwhr} \times (1.024 \times \text{Ac-Ft Pumped} \times \text{Total Lift}) / \text{Plant Efficiency}$$

Estimated domestic well energy mitigation costs are listed in Table 4. Numbers of wells and estimated increased lift are based on Figure 27. Other input assumptions are listed below. These assumptions are based on conservative estimates for typical domestic well operations.

- Domestic pumping plant efficiency equals 60 percent,
- Amount of groundwater pumped during program operation equals 0.5 acre-feet,
- Cost per kilowatt-hour for domestic wells equals \$0.13 per kwhr.

Table 4 shows that the estimated energy allowance for domestic wells is only about \$82 for each year of program operation.

Table 4

Energy Allowance for Domestic Wells

Additional Lift (ft)	Number of Wells	Ac-Ft Pumped	Plant Efficiency	Cost per kwhrs	Additional Costs
5	88	0.5	0.60	\$0.13	\$49
10	11	0.5	0.60	\$0.13	\$12
15	4	0.5	0.60	\$0.13	\$7
20	4	0.5	0.60	\$0.13	\$9
25	2	0.5	0.60	\$0.13	\$6
30	0	0.5	0.60	\$0.13	\$0
TOTAL =					\$82

* Mitigation costs for energy are based on the following formula:
 Pumping Costs = Cost per kwhrs x {(1.024 x Ac-Ft Pumped x Total Lift)/Plant Efficiency}

Energy Allowance for Agricultural Wells

The energy allowance for surrounding agricultural wells was calculated based on the generalized land use data and the above formula for pumping costs. However, for agricultural wells, an additional 15 percent energy allowance was added to account for any reduction in pumping capacity associated with declining groundwater levels and increased pumping lift.

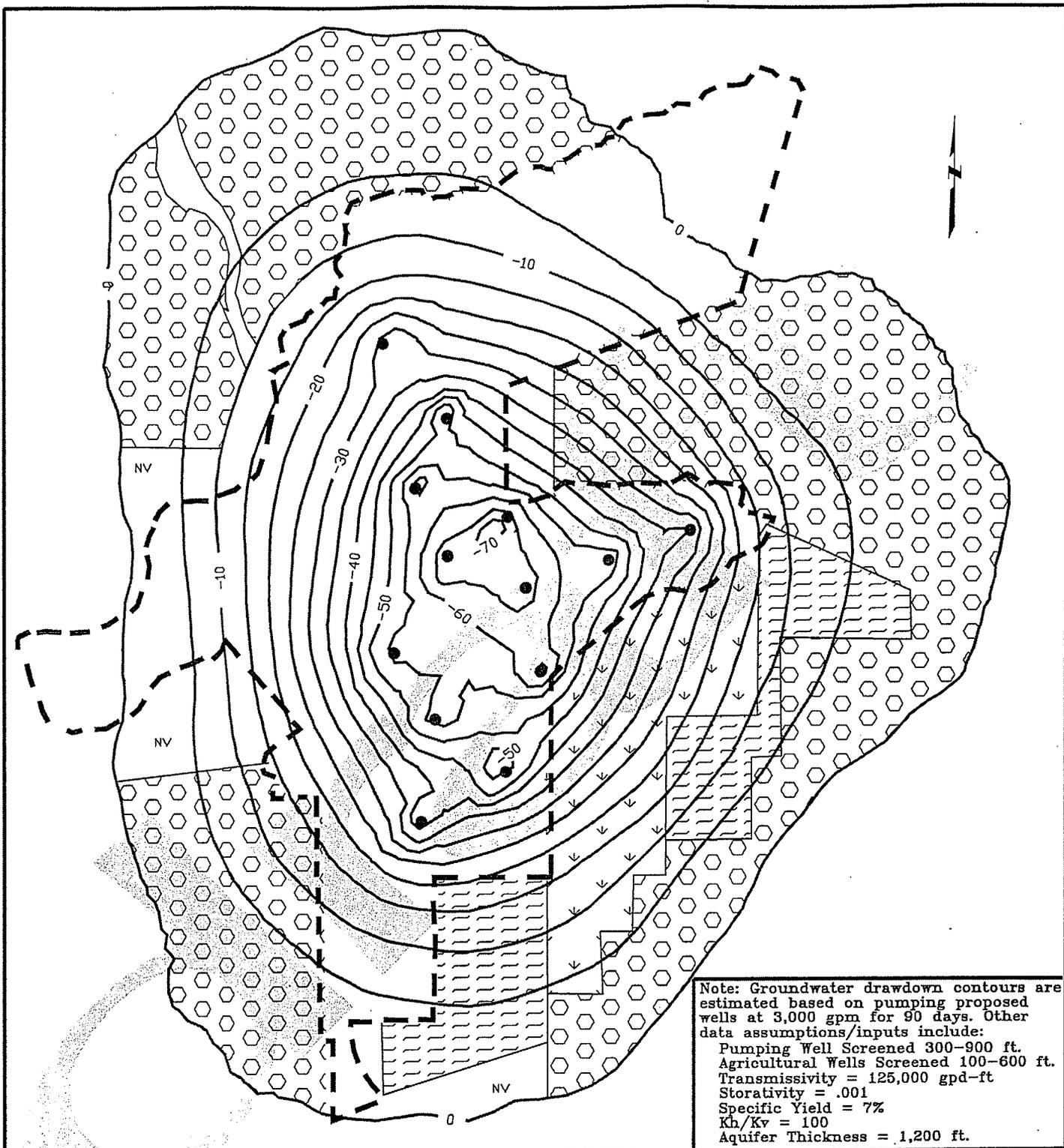
Figure 29 shows the estimated distribution and extent of groundwater drawdown along with the generalized land use associated with agricultural wells within the impact area. The generalized land use information is based on DWR, Northern District 1994 land use data

Table 5 list the planted acres and additional lift associated with the generalized land use shown in Figure 29. The four generalized land use areas within the impact area are: rice, deciduous fruits and nuts, grain and field crops, and native/riparian vegetation. Assuming an overall pumping plant efficiency of 60%, and a cost per kilowatt-hour of \$0.10, the total energy allowance for agricultural wells is estimated at about \$32,400 for each year of program operation.

Table 5

Energy Allowance for Agricultural Wells

Additional Lift (ft)	Deciduous Fruits and Nuts		Rice*		Grain and Field Crops		Pumping Plant Efficiency	Cost per kWhrs	Additional Costs**
	planted acres	applied GW per acre	planted acres	applied GW per acre	planted acres	applied GW per acre			
5	3,918	2.0	28	2.5	403	1.5	0.6	\$0.10	\$8,352
10	1,163	2.0	137	2.5	407	1.5	0.6	\$0.10	\$6,436
15	253	2.0	158	2.5	193	1.5	0.6	\$0.10	\$3,505
20	118	2.0	111	2.5	92	1.5	0.6	\$0.10	\$2,557
25	95	2.0	155	2.5	11	1.5	0.6	\$0.10	\$2,915
30	88	2.0	126	2.5	0	0.0	0.6	\$0.10	\$2,891
35	61	2.0	78	2.5	0	0.0	0.6	\$0.10	\$2,178
40	36	2.0	82	2.5	0	0.0	0.6	\$0.10	\$2,175
45	16	2.0	50	2.5	0	0.0	0.6	\$0.10	\$1,387
TOTAL =									\$32,394
<p>* Area of rice crops uses mixed water source for irrigation, assume one half of applied water is groundwater</p> <p>** Mitigation costs for energy are based on the following formula plus an additional 15% to account for any reduction in pumping capacity due to increased pumping lift: Pumping Costs = Cost per kWhrs x {(1.024 x Ac-Ft Pumped x Total Lift)/Plant Efficiency}</p>									



Note: Groundwater drawdown contours are estimated based on pumping proposed wells at 3,000 gpm for 90 days. Other data assumptions/inputs include:
 Pumping Well Screened 300-900 ft.
 Agricultural Wells Screened 100-600 ft.
 Transmissivity = 125,000 gpd-ft
 Storativity = .001
 Specific Yield = 7%
 Kh/Kv = 100
 Aquifer Thickness = 1,200 ft.

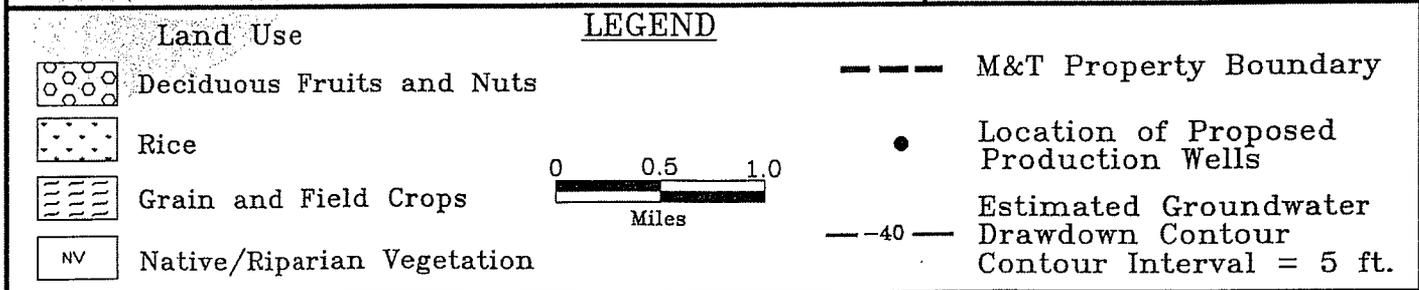


Figure 29. Estimated Drawdown Impact and Generalized Land Use to Surrounding Agricultural Wells.

Estimated Annual Operations, Maintenance, Power and Replacement Costs

Annual operations, maintenance and replacement (O.P.&R) costs for the program facilities under Alternative One are detailed in Table 2. Power costs estimates listed in Table 2 are based on biennial and triennial program operation. Cost estimates listed in Table 2 include \$15,000 for the facility's annual administration costs and staff requirements. Estimated total annual O.P.&R costs range between \$119,000 (triennial operation) and \$166,700 (biennial operation).

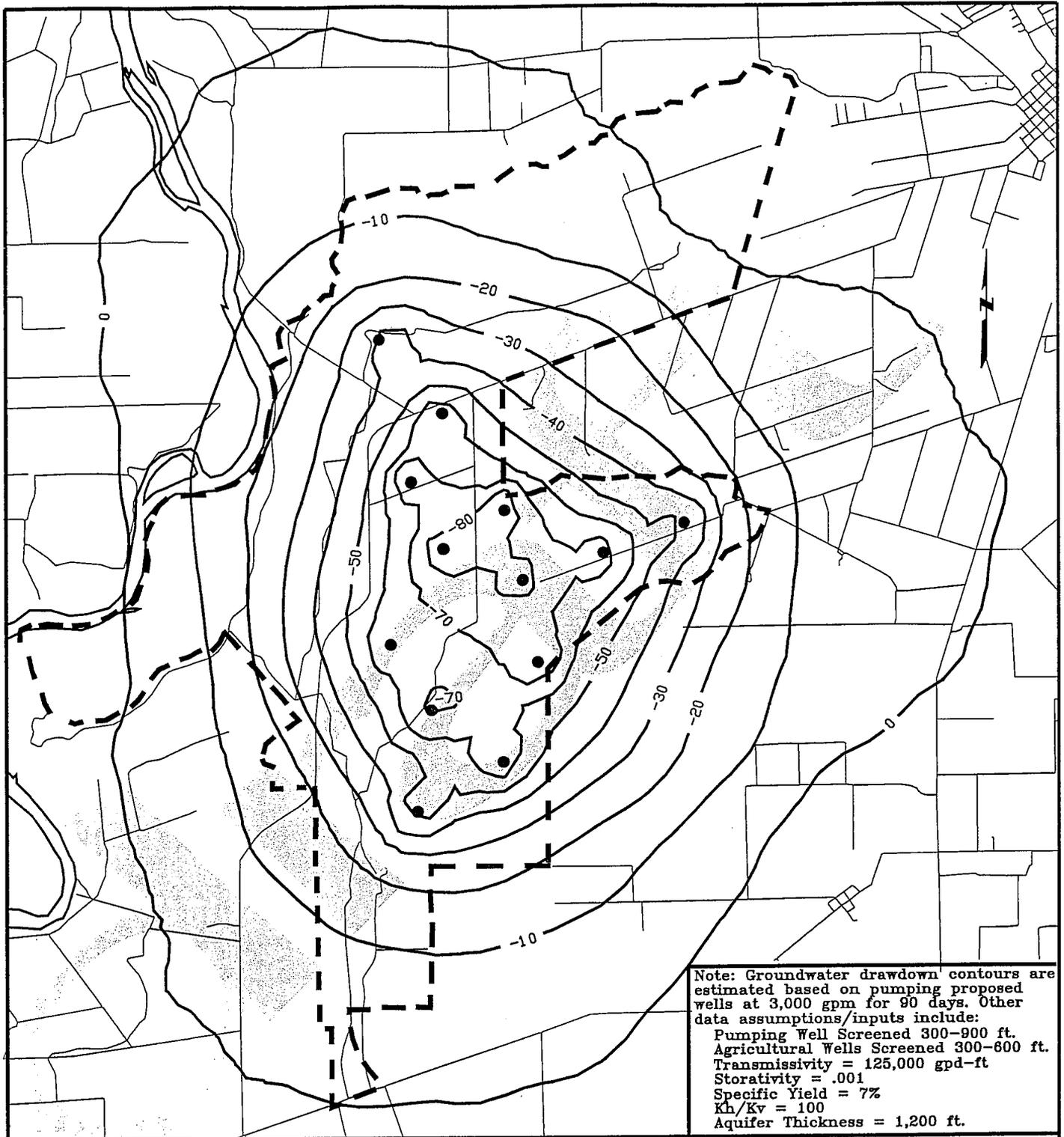
Power costs were calculated based on an estimated individual pumping lift of about 110 feet plus an addition 40 to 80 of lift due to well interference between the thirteen pumping wells. Well interference was determined using the Moench WTAQ2 program for partially penetrating wells in a water-table aquifer to calculate the individual pumping well drawdown versus distance, and QuickSurf to calculate the cumulative drawdown between the thirteen wells. Figure 30 is a groundwater contour map showing the estimated distribution and extent of well interference between the thirteen proposed production wells of similar construction. Diesel power costs are based on an estimated agricultural diesel fuel cost \$1.10 per gallon, fuel consumption of 10 gallons per hour, and an annual pumping requirement of 12,700 hours for biennial operation and 8,500 hours for (triennial operations). Total power cost for biennial program operation is estimated at \$139,700. Total power cost for triennial operations is estimated at \$93,500. Unit power cost for biennial and triennial operations is about \$20 per acre-foot

Maintenance and replacement costs for the diesel engines is based on individual engine maintenance of \$100 every 250 hours, and one \$10,000 factory rebuild per engine at 20,000 hours (only one rebuild required under both operational scenarios). Total annual diesel engine maintenance and replacement is estimated at \$6,500 for biennial program operation and \$5,400 for triennial operations.

Estimated Permit Costs

The voters of Butte County recently passed Measure G "Ordinance to Protect the Groundwater Resources in Butte County". Under Measure G, groundwater extraction permits are required for all wells pumping groundwater for use outside the County, and/or for wells pumping groundwater in substitute of surface water which would be used in the County, but is being transferred for use outside the County. An overview of Measure G and other proposed ordinances are discussed in this report under the section titled *INSTITUTIONAL RELATIONSHIPS AND POTENTIAL CONSTRAINTS*.

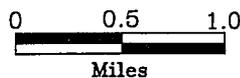
An accurate estimate the potential cost of groundwater extraction permits under Measure G is difficult to determine. For the purposes of this investigation, a conservative estimate of \$6 per acre-foot is used to determine costs associated with groundwater extraction permits. Under Alternative One, the estimated annual permit costs for biennial and triennial program operations is \$42,000 and \$28,000 respectively.



Note: Groundwater drawdown contours are estimated based on pumping proposed wells at 3,000 gpm for 90 days. Other data assumptions/inputs include:
 Pumping Well Screened 300-900 ft.
 Agricultural Wells Screened 300-600 ft.
 Transmissivity = 125,000 gpd-ft
 Storativity = .001
 Specific Yield = 7%
 Kh/Kv = 100
 Aquifer Thickness = 1,200 ft.

LEGEND

● Location of Proposed Production Wells
 — Streets/County Roads



--- M&T Property Boundary
 - - - - - Estimated Groundwater Drawdown Contour.
 Contour Interval = 10 ft.

Figure 30. Estimated Groundwater Drawdown associated with Well Interference from Proposed Pumping Wells

INSTITUTIONAL RELATIONSHIPS AND POTENTIAL CONSTRAINTS

The Butte County Board of Supervisors, along with the Farm Bureau and other water groups, have developed and implemented several ordinances designed to regulate the capacity and spacing of groundwater wells and groundwater substitute pumping. The enacted Butte County groundwater ordinances include: "*Butte County Water Well Ordinance*" and "*An Ordinance to Protect the Groundwater Resources in Butte County*". In addition to these ordinances, several other ordinance have been proposed, but are currently on hold. he proposed, but yet to be enacted, Butte County groundwater ordinances include: "*An Ordinance to Regulate The Extraction of Groundwater within the Butte Groundwater Basin*" and "*Butte County Ordinance Establishing Groundwater Management Plan For the County of Butte and Regulating Groundwater Substitute Pumping*". Although the possibility exists that portions of the proposed ordinances could be incorporated into existing and future ordinances, the overall probability is unknown. Thus, the following section will only discuss the institutional consequences and potential conjunctive use constraints of the two currently enacted ordinances.

Butte County Water Well Ordinance

The Butte County Water Well Ordinance was written by Butte County and submitted for public review and comment in March, 1995. After a much debated public review period, the final version of the ordinance emerged very similar to the draft and was enacted in June, 1996. The "*Butte County Water Well Ordinance*" is enclosed in Appendix E. The ordinance amends Chapter 23B of the Butte County Code, entitled "*Water Wells*". The purpose of this amendment is to update health and safety requirements for the deepening and/or repairing of existing wells, the construction of new wells and the destruction of abandoned wells, and to reduce potential well interference by regulating the spacing and capacity of new wells. The pump capacity versus well spacing regulations under this ordinance are listed in Table 6.

Table 6

Pump Capacity versus Well Spacing Requirement	
Pumping Capacity	Well Spacing Requirement
1,000 gpm	450 feet
2,000 gpm	1,150 feet
3,000 gpm	1,700 feet
4,000 gpm	2,200 feet
5,000 gpm	2,600 feet
> 5,000 gpm	variance is required

Maximum well capacity under this ordinance is restricted to 50 gallons per minute per acre. Additional fees required under this new ordinance are estimated at \$180 per well.

Exemptions from the ordinance include:

- Wells with a diameter of eight inches or less.
- Public supply wells located within the public water supply agency's service area.
- Repair or deepening of an existing well (as long as pumping capacity is not increased).
- Replacement of a well and pump with one of similar capacity at a similar location (within 100 feet).
- Limited Purpose wells, including frost protection wells, fire suppression wells, monitoring wells and mitigation wells.

Overall, it doesn't appear that the Butte County Water Well Ordinance would restrict the currently proposed conjunctive use program at M&T Chico Ranch. In fact, the well capacity and spacing criteria would allow for some future expansion of the program.

An Ordinance to Protect the Groundwater Resources in Butte County, (Measure G)

This ordinance was developed by the Butte County Farm Bureau in cooperation with the Butte County Board of Supervisors and local groundwater users. Supporters of Measure G claimed that other currently proposed ordinances were inordinately expensive and would over regulate groundwater users who are not involved with groundwater substitute pumping. Measure G was recently passed as the result of the local Butte County November 5, 1996 election. The Measure G ordinance is attached as Appendix F. In general, this ordinance would:

- Restructure the Butte County Water Commission;
- Establish a Technical Advisory Committee;
- Establish a Groundwater Planning Process;
- Develop a Groundwater Monitoring Program;
- Require Groundwater Extraction Permits and Establish a Process for Applications, Fees, Review and Appeal;
- Establish Fines and Criminal Penalties for noncompliance

Restructured Butte County Water Commission

The restructured Commission will include nine members appointed by the Board of Supervisors. The Commission will include one member from each board members district, two members which are landowners of property served by a district and two members which are landowners served by private wells.

Technical Advisory Committee

The Technical Advisory Committee will consist of 5 members nominated by the Commission and appointed by the Board of Supervisors. It is the intent of the ordinance that each member have substantial expertise in water management or hydrology. It is unclear, but assumed, that members would serve voluntarily.

Groundwater Planning Process

As part of the groundwater planning process, Butte County Health Department would request the BBWUA to provide groundwater status reports by January 15 of each year. The status reports would use historic data, along with data collected under the ordinance's groundwater monitoring program, to analyze and report the amount of groundwater which could be pumped in each subbasin without exceeding safe yield.

Groundwater Monitoring Program

Working through the County Health Department, the County Water Commission, in cooperation with the Technical Advisory Committee, BBWUA, and the Regional Water Quality Control Board, would develop and coordinate a county-wide groundwater monitoring program. Groundwater levels would be monitored four times per year. Districts and cities would be requested to submit annual groundwater monitoring reports to the County Health Department.

Extraction Permits and Permitting Process

Groundwater extraction permits are required for all wells pumping groundwater in substitute of surface water which would otherwise be used to serve the parcel, and/or which surface water is transferred for use outside the County. Groundwater extraction permit applications are filed with the Butte County Health Department. Permit requirements include:

- ▶ The name and address of the applicant;
- ▶ The amount of surface water available to the land and the amount proposed to be transferred, the transfer period, the physical source of the surface water to be transferred, the applicable surface water right held by the applicant, the name, address and telephone number of the proposed transferee;
- ▶ A list of all parcels of land where surface water deliveries are to be reduced;
- ▶ A list of wells, including the maximum engineered pumping capacity of each well's pump and motor, which are proposed to participate in the groundwater substitute pumping program and their location.
- ▶ A list of all wells located within the well spacing requirements of the Butte County Water Well Ordinance, along with certification that the owners of all wells within the spacing requirement have received notice of the application.
- ▶ A map showing the location of all parcels and wells identified above.
- ▶ A groundwater hydrology report paid for or otherwise provided by the applicant which identifies adverse impacts on identified wells and any other agricultural wells likely to experience significant adverse impacts. The report shall be prepared by a qualified groundwater hydrologist or licensed professional civil or agricultural engineer.
- ▶ A description of the proposed monitoring program and the pumping curtailment criteria.
- ▶ A description of the proposed mitigation program for any identified third party

impacts which may specify a dollar amount held in a trust account to satisfy potential third party claims.

- ▶ Such additional information as required by the Butte County Health Department.

Accompanying the extraction permit application, a request for environmental review under the County CEQA guidelines and the necessary fees will be required.

Within ten days, the Health Department shall review the application and determine its completeness for purposes of proceeding under the County guidelines pursuant to the CEQA requirements. Not before the next 30 days, the County Health Department along with the Technical Advisory Committee, and with possible help from the State Department of Water Resources, the Regional Water Quality Control Board-Central Valley Region, the affected County departments and any interested district within the boundaries of the proposed activity, shall review the application, review BBWUA groundwater status reports, take public comments and perform an environmental review in accordance with CEQA. All costs for the environmental review are the responsibility of the applicant.

Upon completion of the application and environmental review, a written report by the County Health Department, along with all accompanying documents, will be submitted to the County Water Commission. Upon receipt of the documents, the Commission shall hold a public review of the permit application within 15 to 30 days. During the public review, the Commission shall consider all effects that the granting of the permit would have on the subbasin and affected aquifer; including, but not limited to, the hydraulic gradient, hydrology, percolation, permeability, piezometric surface, porosity, recharge, safe yield, salt water intrusion, specific capacity, spreading water, transmissivity, water table and zone of saturation.

A permit will be granted only if the Commission decides that the extraction will not:

- Cause or increase an overdraft of the groundwater underlying the County;
- Bring about or increase salt water intrusion;
- Exceed the safe yield of the aquifer or subbasins underlying the County;
- Result in uncompensated injury to overlying groundwater users or other water users; and,
- Cause subsidence.

A decision by the Commission requires approval by six of the nine members or by an affirmative vote of a majority of the quorum present. All permits shall be valid for a three year term unless the Commission finds that a shorter term is required by the findings with respect to the above extraction conditions.

In granting a permit, the Commission can impose appropriate conditions upon the permit to satisfy the permit requirements, and may impose other conditions that it deems necessary for the health, safety and welfare of the people of the County. Conditions in the permit may include, but are not limited to, requiring metering of the wells under the permit, both short-term and annual pumping limits, prescribed groundwater levels at which groundwater pumping must cease, and additional requirements for observation and/or monitoring wells.

In denying a permit, the Commission is required to make specific their findings to support their decision.

Decisions by the Commission can be appealed by written request within 15 days of the Commission's decision. The appeal will be reviewed by the County Board of Supervisors within 20 days of receipt. The review shall require that substantial evidence be presented to prevail on an issue. The decision of a majority of the Board shall be the final decision.

An approved permit may be challenged, during the term of the permit, if:

- 1) there is a violation of the conditions of the permit;
- 2) the permit was not issued in accordance with the procedural requirements to this ordinance;
- 3) extraction of groundwater pursuant to the permit:
 - a) causes or increases an overdraft in the basin, or
 - b) brings about or increases salt water intrusion, or
 - c) exceeds the safe yield of the subbasin(s), or
 - d) results in uncompensated injury to overlying groundwater users or other water users, or
 - e) causes subsidence.

Fines and Criminal Penalties

Ordinance violations may be subject to a civil penalty not to exceed \$5,000 per separate violation. A separate violation is determined to have occurred for each and every day or portion thereof during which any violation is committed, continued or permitted as well as for each and every separate groundwater well with which any such violation is committed, continued, or permitted.

Stop orders and criminal penalties are not addressed in this ordinance.

Impacts to Conjunctive Use

Impacts to the M&T conjunctive use program are catagorize according to potential program implementation constraints such as: investigational constraints, cost constraints, time constraints, legal constraints and other unknown constraints.

Investigational Constraints:

Measure G stipulates that in order for a extraction permit to be granted, investigations by qualified professionals must determine that the extraction will not:

- a) cause or increase an overdraft in the basin;
- b) bring about or increase salt water intrusion;
- c) exceed the safe yield of the subbasin(s);

- d) result in uncompensated injury to overlying groundwater users or other water users; or
- e) causes subsidence.

With respect to the proposed M&T conjunctive use program, most of the elements are addressed in the investigations of the proposed conjunctive use program, and are thus seen as not overly burdensome. However, some additional investigational work would have to be conducted to detail subsidence potential, develop subsidence monitoring and confirm assumptions of safe yield estimates (developed by the HCI/BBW/UA model). The subsidence monitoring and safe yield estimates have been recognized by the Department as necessary investigational components for future conjunctive use programs, and are not considered constraints to future work.

Cost Constraints: This ordinance would require a fee for groundwater extraction permits. Permits would only be required during years when conjunctive use programs are active and would only be required by conjunctive use participants. It is unclear at this time whether the entire County costs to implement Measure G will be derived solely from permit fees. It is also unclear whether the County would attempt to hire permanent staff to implement an intermittent program, or whether the County will contract-out for permit review during active program years. Even though the County costs to implement an intermittent program (Measure G) would be less than that of an annual program (Measure F), the number of permits which would bear the cost of implementing an intermittent program is much less. Thus, it is expected that Measure G permit costs will be higher than Measure F. An accurate estimate of the permits costs for Measure G is difficult. However, assuming:

- County-wide conjunctive use programs pumping a total of 50,000 to 100,000 acre-feet every third year;
- County consultant costs of \$50,000 to \$100,000 to review permits during program years; and
- County costs for permanent staff (for program implementation and consultant review) of \$50,000 to \$100,000;

the costs for groundwater extraction permits under Measure G is estimated at \$2.00 to \$8.00 per acre-foot of extracted groundwater.

Based on the above estimates, the additional costs associated with permitting under Measure G may significantly impact the proposed M&T Chico Ranch Conjunctive use program.

Time Constraints: Measure G does not stipulate a formal due date for groundwater extraction permit applications. The minimum time required to process a permit (assuming no appeals to the granting or denial of a permit) is listed at about 8 weeks. If there is an appeal to the granting or denial of a permit, the permit will be subject to additional review and further delays of up to about 5 weeks. The time-lag between permit application and approval would require the Department to implement work to fulfill the application

requirements well before there is a confirmed determination of project need. The cost associated with this additional, and possibly unnecessary, work is impossible to predict. However, it is assumed that most of the background information necessary for permit application would have been completed during previous project investigations.

Legal Constraints: Although the Butte County Board of Supervisors, the local water purveyors, and potential conjunctive use participants are supporting Measure G, legal battles over the ordinance's constitutionality and/or EIR requirements could develop and result in significant impacts to future conjunctive use programs. The magnitude of these impacts appears less than those of Measure F, however, the outcome is uncertain.

Unknown Constraints:

The ordinance requires the BBWUA, through the use of the BBWUA/HCI groundwater model, to analyze and report the safe yield of each groundwater subbasin to the County Health Department by January 15th of each year. It appears that a significant amount of the Commission's permitting decisions will be based on the safe yield data reported by the BBWUA. To date, the BBWUA/HCI model has not been used to determine the safe yield at a Basin-wide scale, let alone at a subbasin scale. The ability of the model to accurately calculate safe yield at the subbasin level remains unknown.

Under Measure G the Commission will include one member from each Board of Supervisor's district, two members which are landowners of property served by a water district, and two members which are landowners served by private wells. Similar to the Measure F ordinance, a fairly significant unknown, is the expertise and general ability of the County Water Commission to make permitting decisions based on scientific evidence, and not public or political pressures.

Under Measure G the County will not have funding for in-house hydrogeologic expertise and will be contracting out for evaluation of permit applications. In absence of in-house expertise, the permitting recommendations made by the consultant could ultimately drive the County Health Department's and Water Commission's final permit determination. The consultant's ability to make accurate permit determinations and the Commissions ability to interpret these determinations is unknown.

Any and/or all of these unknowns have the potential to significantly impact future conjunctive use programs.

ENVIRONMENTAL COMPLIANCE REQUIREMENT

Examination of the environmental compliance requirements for the M&T conjunctive program and recommendations for future environmental work are presented below. Examination of the environmental compliance requirements for the conceptual M&T/Llano Seco conjunctive use program alternative were not considered appropriate under its current level of project development.

CEQA Compliance

Prior environmental review indicated that the proposed conjunctive use program should not impact any current threatened and endangered species, streams or wetlands. However, during the Phase II investigation, some environmental compliance questions remained such as:

- ▶ Will the use of diesel motors to pump groundwater violate any ambient air quality standard, contribute substantially to an existing or projected air quality violation, or expose sensitive receptors to substantial pollutant concentrations?
- ▶ Will the program reduce tailwater flow in Angel Slough? If yes, what is the significance of these possible reductions and the potential for mitigation?

The County of Butte is an attainment area under EPA air quality standards. However, the City of Chico is currently a non-attainment area under EPA ozone standards during summer months. The current proposed conjunctive use program would burn about 200,000 gallons of diesel fuel between the months of June and September in an area about 2 miles west of the City of Chico. The output of hydrocarbon, carbon monoxide and particulate matter from the proposed project is equivalent to the daily output of about 3,500 additional light-weight diesel cars. The output of oxides of nitrogen (which react to produce ozone) from the proposed project is equivalent to the daily output of about 9,700 additional light-weight diesel cars. Despite these emission increases from the proposed project, conversations with personnel from the Stationary Source Division of the Butte County Air Pollution office have reiterated that agricultural emissions from stationary sources are exempt from air quality regulations. ✓

Under current land and water use practices at M&T Chico Ranch, the tailwater from the rice fields in the south Ranch drains into Angel Slough. Investigation of the proposed M&T Chico Ranch conjunctive use program, and program alternatives, indicates that the amount of tailwater drained into Angel Slough from the proposed program should not change significantly from current amounts -- under existing land and water use practices.

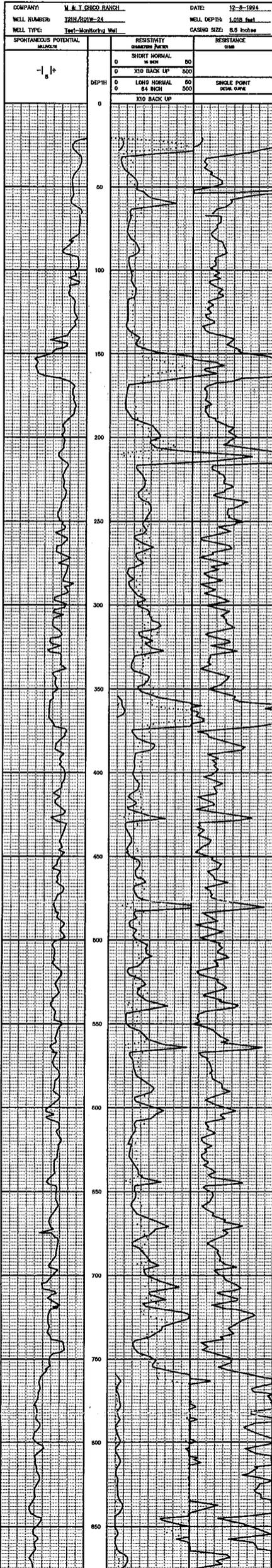
Currently there is an existing proposal to develop a gravel mining operation within the M&T Chico Ranch portion of Angel Slough. The proposed gravel mining operation would be developed within an existing wetland area of Angel Slough, and would thus require as mitigation measures, the relocation of some wetland areas. Minor changes to tailwater flows due the proposed M&T conjunctive use project would be insignificant and masked

by wetland changes resulting from the restructuring of Angel Slough for the gravel mining operations. A negative declaration for the gravel mining operation is currently being review by Butte County.

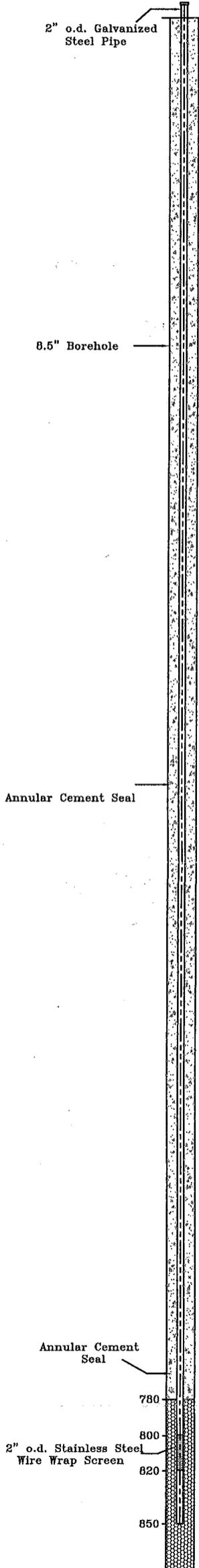
Recommendations at this time are to proceed with a formal initial study/environmental review during the well permitting/construction phase of the conjunctive use program. A more current environmental review prior to permitting groundwater extraction will most likely be required for Butte County, and will also more appropriately allow for review based on existing conditions. Based on the preliminary environmental review, all foreseeable significant impacts should be able to be clearly identified and mitigated. Thus, a negative declaration should be able to successfully address any environmental impacts under CEQA -- alleviating a full EIR. However, even though a negative declaration would most likely satisfy all CEQA requirements, public impressions and political attitudes towards conjunctive use programs in Butte County may make preparation of an full Environmental Impact Report warranted and prudent.

APPENDIX A
WELL CONSTRUCTION AND E-LOG DATA

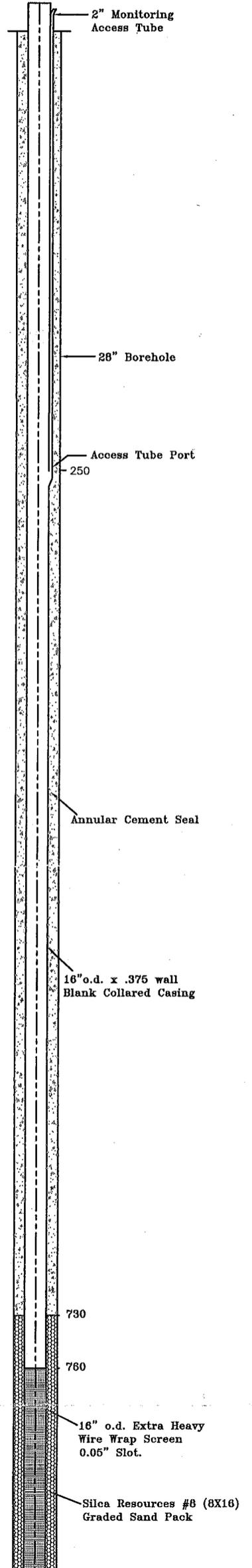
E-LOG AND WELL CONSTRUCTION DATA



Well Profile
Test-Monitoring Well



Well Profile
Test-Production Well



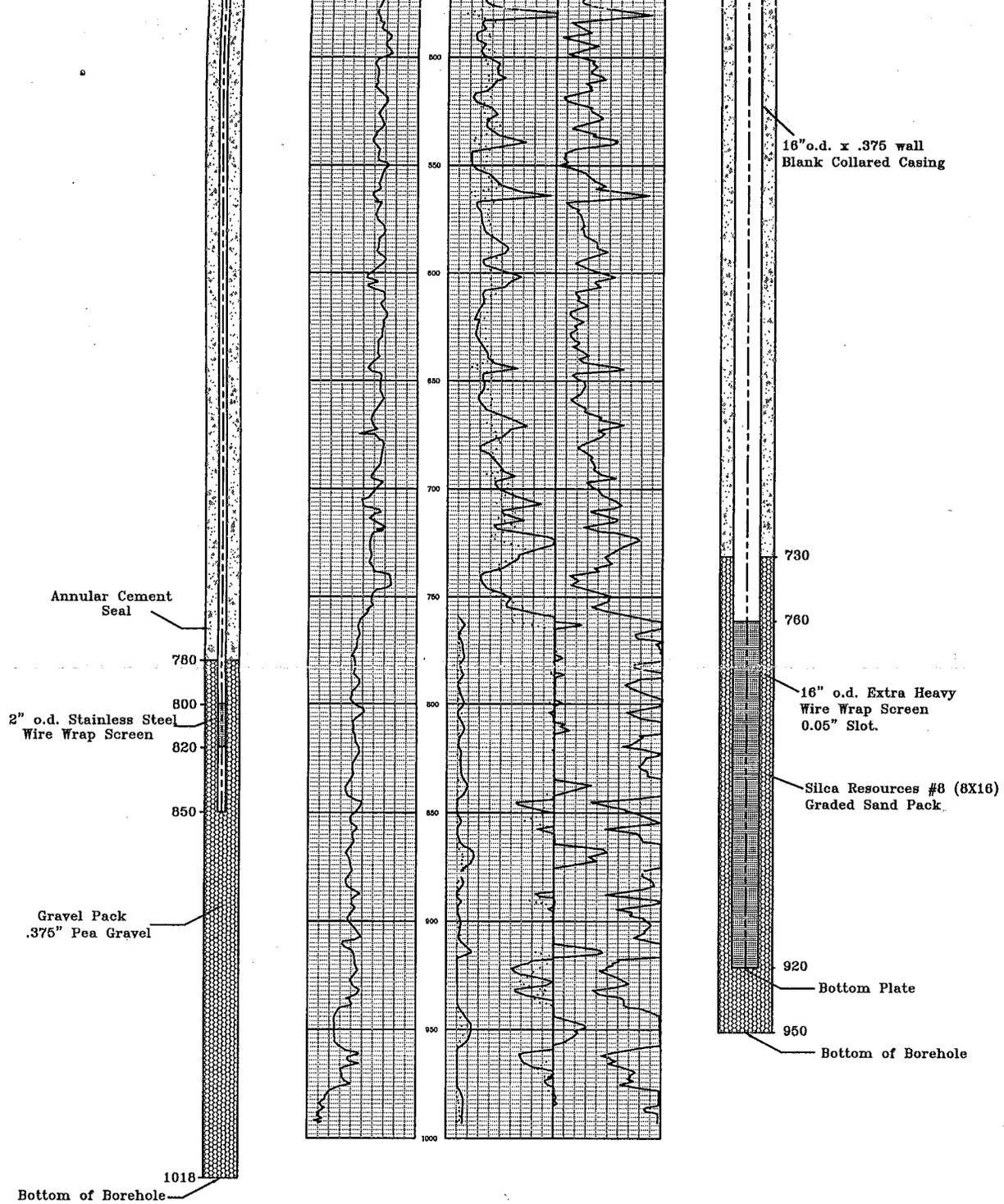


Figure A1

APPENDIX B

JUNE 1995 AQUIFER TESTING DATA

Table B1

STEP-DRAWDOWN TEST							
Pumping Well							
June 12, 1995							
WELL OWNERSHIP/LOCATION DATA							
Owner:		M & T Chico Ranch					
Address:		River Road					
State Well No.:		T21N/R01W-24B02					
Loc. Description:		South Ranch, near Edgar Slough					
WELL CONSTRUCTION DATA							
Well Use: Agricultural Production				Data Drilled: April, 1995			
Well Depth: 950 ft.				Casing Depth: 950 ft.			
Perforation Interval: 760 - 920 ft.				Pump Info: Gearhead/50hp			
Pumping Capacity (gpm)/Method: Variable Rate/Ultrasonic Flowmeter							
WELL MEASUREMENT DATA							
Reference Point: Top of 2.5 inch sounding tube, 0.5 ft. above ground surface.							
R.P. Elevation/Method: 122.96 feet / Survey							
Pump-Start Time= 12:39:00				Pump-Stop Time= 16:26:50 PM			
Date	Actual Time	Elapsed Time	Elapsed Min.	Tape Reading at R.P.	Tape Reading at W.S.	R.P to W.S.	Total Drawdown
6/10/95	12:00:00	NA		5	2.9	2.10	NA
6/12/95	09:45:00	NA		Sounder		2.82	NA
6/12/95	12:20:00	NA		Sounder		2.87	NA
STEP #1: 800 gpm @ 1,250 rpm							
6/12/95	12:39:30	00:00:30	0.5	Sounder		43.20	40.33
6/12/95	12:40:00	00:01:00	1.0	Sounder		40.20	37.33
6/12/95	12:40:30	00:01:30	1.5	Sounder		40.30	37.43
6/12/95	12:41:00	00:02:00	2.0	Sounder		29.50	26.63
6/12/95	12:41:30	00:02:30	2.5	Sounder		38.40	35.53
6/12/95	12:42:00	00:03:00	3.0	Sounder		37.30	34.43
6/12/95	12:42:30	00:03:30	3.5	Sounder		36.98	34.11
6/12/95	12:43:00	00:04:00	4.0	Sounder		36.72	33.85
6/12/95	12:43:30	00:04:30	4.5	Sounder		36.49	33.62
6/12/95	12:44:00	00:05:00	5.0	Sounder		36.68	33.81
6/12/95	12:45:00	00:06:00	6.0	Sounder		36.58	33.71
6/12/95	12:46:00	00:07:00	7.0	Sounder		36.62	33.75
6/12/95	12:47:00	00:08:00	8.0	Sounder		36.60	33.73
6/12/95	12:48:00	00:09:00	9.0	Sounder		36.53	33.66
6/12/95	12:49:00	00:10:00	10.0	Sounder		36.54	33.67
6/12/95	12:50:00	00:11:00	11.0	Sounder		36.58	33.71
6/12/95	12:51:00	00:12:00	12.0	Sounder		36.60	33.73
6/12/95	12:52:00	00:13:00	13.0	Sounder		36.62	33.75
6/12/95	12:53:00	00:14:00	14.0	Sounder		36.58	33.71
6/12/95	12:54:00	00:15:00	15.0	Sounder		36.55	33.68
6/12/95	12:59:00	00:20:00	20.0	Sounder		36.68	33.81
6/12/95	13:04:00	00:25:00	25.0	Sounder		36.32	33.45
6/12/95	13:09:00	00:30:00	30.0	Sounder		36.29	33.42
6/12/95	13:14:00	00:35:00	35.0	Sounder		36.36	33.49
6/12/95	13:19:00	00:40:00	40.0	Sounder		36.36	33.49
6/12/95	13:29:00	00:50:00	50.0	Sounder		36.44	33.57
6/12/95	13:39:00	01:00:00	60.0	Sounder		36.45	33.58

Table B1 (continued)

STEP-DRAWDOWN TEST
(pumping well continued)

STEP #2: 1,300 gpm @ 1,600 rpm							
Date	Actual Time	Elapsed Time	Elapsed Min.	Tape Reading at R.P.	Tape Reading at W.S.	R.P to W.S.	Total Drawdown
6/12/95	13:47:30	01:08:30	68.5	Sounder		54.85	51.98
6/12/95	13:48:00	01:09:00	69.0	Sounder		54.90	52.03
6/12/95	13:48:30	01:09:30	69.5	Sounder		52.39	49.52
6/12/95	13:49:00	01:10:00	70.0	Sounder		53.48	50.61
6/12/95	13:49:30	01:10:30	70.5	Sounder		53.95	51.08
6/12/95	13:50:00	01:11:00	71.0	Sounder		53.85	50.98
6/12/95	13:50:30	01:11:30	71.5	Sounder		53.90	51.03
6/12/95	13:51:00	01:12:00	72.0	Sounder		53.82	50.95
6/12/95	13:51:30	01:12:30	72.5	Sounder		53.95	51.08
6/12/95	13:52:00	01:13:00	73.0	Sounder		53.98	51.11
6/12/95	13:53:00	01:14:00	74.0	Sounder		54.02	51.15
6/12/95	13:54:00	01:15:00	75.0	Sounder		54.09	51.22
6/12/95	13:55:00	01:16:00	76.0	Sounder		54.10	51.23
6/12/95	13:56:00	01:17:00	77.0	Sounder		54.19	51.32
6/12/95	13:57:00	01:18:00	78.0	Sounder		54.28	51.41
6/12/95	13:58:00	01:19:00	79.0	Sounder		54.37	51.50
6/12/95	13:59:00	01:20:00	80.0	Sounder		54.32	51.45
6/12/95	14:00:00	01:21:00	81.0	Sounder		54.39	51.52
6/12/95	14:01:00	01:22:00	82.0	Sounder		54.42	51.55
6/12/95	14:02:00	01:23:00	83.0	Sounder		54.45	51.58
6/12/95	14:07:00	01:28:00	88.0	Sounder		54.54	51.67
6/12/95	14:12:00	01:33:00	93.0	Sounder		54.65	51.78
6/12/95	14:17:00	01:38:00	98.0	Sounder		54.72	51.85
6/12/95	14:22:00	01:43:00	103.0	Sounder		54.85	51.98
6/12/95	14:27:00	01:48:00	108.0	Sounder		54.92	52.05
6/12/95	14:37:00	01:58:00	118.0	Sounder		55.02	52.15
6/12/95	14:47:00	02:08:00	128.0	Sounder		55.15	52.28
STEP #3: 1,740 gpm @ 1,900 rpm							
6/12/95	14:52:30	02:13:30	133.5	Sounder		70.85	67.98
6/12/95	14:53:00	02:14:00	134.0	Sounder		70.90	68.03
6/12/95	14:53:30	02:14:30	134.5	Sounder		70.80	67.93
6/12/95	14:54:00	02:15:00	135.0	Sounder		70.62	67.75
6/12/95	14:54:30	02:15:30	135.5	Sounder		70.70	67.83
6/12/95	14:55:00	02:16:00	136.0	Sounder		70.75	67.88
6/12/95	14:55:30	02:16:30	136.5	Sounder		70.71	67.84
6/12/95	14:56:00	02:17:00	137.0	Sounder		70.80	67.93
6/12/95	14:56:30	02:17:30	137.5	Sounder		70.80	67.93
6/12/95	14:57:00	02:18:00	138.0	Sounder		70.84	67.97
6/12/95	14:58:00	02:19:00	139.0	Sounder		70.95	68.08
6/12/95	14:59:00	02:20:00	140.0	Sounder		71.02	68.15
6/12/95	15:00:00	02:21:00	141.0	Sounder		70.96	68.09
6/12/95	15:01:00	02:22:00	142.0	Sounder		71.10	68.23
6/12/95	15:02:00	02:23:00	143.0	Sounder		71.23	68.36
6/12/95	15:03:00	02:24:00	144.0	Sounder		71.10	68.23
6/12/95	15:04:00	02:25:00	145.0	Sounder		71.12	68.25
6/12/95	15:05:00	02:26:00	146.0	Sounder		71.20	68.33
6/12/95	15:06:00	02:27:00	147.0	Sounder		71.28	68.41
6/12/95	15:07:00	02:28:00	148.0	Sounder		71.30	68.43
6/12/95	15:12:00	02:33:00	153.0	Sounder		71.35	68.48
6/12/95	15:17:00	02:38:00	158.0	Sounder		71.45	68.58
6/12/95	15:22:00	02:43:00	163.0	Sounder		71.47	68.60
6/12/95	15:27:00	02:48:00	168.0	Sounder		71.49	68.62
6/12/95	15:32:00	02:53:00	173.0	Sounder		71.49	68.62
6/12/95	15:42:00	03:03:00	183.0	Sounder		71.50	68.63
RECOVERY							
Date	Time	Elapsed Time (min:sec)	Elapsed Time (t') (min)	Time Func. Ratio* F(t)/t'	DTW (ft.)	Residual Drawdown** (s')	
6/11/95	16:26:30	00:00:00		192.0	71.5	68.6	
6/12/95	16:27:00	00:30	0.5	---	17.0	14.1	
6/12/95	16:27:30	01:00	1.0	192.0	17.0	14.1	
6/12/95	16:28:30	02:00	2.0	96.0	16.6	13.8	
6/12/95	16:29:00	02:30	2.5	76.8	15.2	12.4	
6/12/95	16:30:00	03:30	3.5	54.9	14.0	11.1	
6/12/95	16:30:30	04:00	4.0	48.0	14.0	11.1	
6/12/95	16:31:00	04:30	4.5	42.7	13.0	10.1	
6/12/95	16:31:30	05:00	5.0	38.4	12.2	9.4	
6/12/95	16:32:00	05:30	5.5	34.9	12.0	9.1	
6/12/95	16:33:00	06:30	6.5	29.5	11.4	8.6	
6/12/95	16:34:00	07:30	7.5	25.6	10.6	7.7	
6/12/95	16:35:00	08:30	8.5	22.6	10.6	7.7	
6/12/95	16:36:00	09:30	9.5	20.2	10.2	7.4	
6/12/95	16:37:00	10:30	10.5	18.3	9.9	7.1	

*Time Function= $F(t)=120.0$, **Residual Drawdown (s')=recovered W.L - Static W.L

Table B2

STEP-DRAWDOWN TEST							
OBSERVATION WELL							
June 12, 1995							
WELL OWNERSHIP/LOCATION DATA							
Owner:		M&T Chico Ranch					
Address:		River Road					
State Well No.:		T21N/R01W-24B01					
Loc. Description:		South M&T Ranch					
WELL CONSTRUCTION DATA							
Well Use: Monitoring Well				Date Drilled: Dec., 1994			
Well Depth: 1,018 feet				Casing Depth: 850 feet			
Perf. Int.: 800-820 feet				Pump Info: NA			
Dist. from Pumping Well:				191 feet			
WELL MEASUREMENT DATA							
Ref. Pt: Top of 2 inch pipe, 0.9 feet above ground surface.							
R.P. Elev./Method: 125.6 ft./Survey							
Pump-Start Time= 12:38:35				Pump- Stop Time= 16:26:50			
Date	Actual Time	Elapsed Time	Elapsed Min.	Tape Reading at R.P.	Tape Reading at W.S.	R.P to W.S.	Total Drawdown
6/10/95	11:30:00	NA		6.00	+0.3	6.30	NA
6/12/95	09:42:00	NA		Sounder		7.12	NA
6/12/95	12:20:00	NA		Sounder		7.12	NA
Step #1: 800 gpm @ 1,250 rpm							
6/12/95	12:38:50	00:00:15	0.25	Sounder		8.70	1.58
6/12/95	12:39:40	00:01:05	1.08	Sounder		9.13	2.01
6/12/95	12:40:15	00:01:40	1.66	Sounder		9.72	2.60
6/12/95	12:40:49	00:02:14	2.25	Sounder		10.00	2.88
6/12/95	12:41:27	00:02:52	2.86	Sounder		10.81	3.69
6/12/95	12:41:54	00:03:19	3.33	Sounder		11.11	3.99
6/12/95	12:42:25	00:03:50	3.83	Sounder		11.31	4.19
6/12/95	12:42:54	00:04:19	4.30	Sounder		11.52	4.40
6/12/95	12:43:26	00:04:51	4.83	Sounder		11.66	4.54
6/12/95	12:43:55	00:05:20	5.33	Sounder		11.78	4.66
6/12/95	12:44:56	00:06:21	6.33	Sounder		11.92	4.80
6/12/95	12:45:56	00:07:21	7.33	Sounder		12.18	5.06
6/12/95	12:46:56	00:08:21	8.33	Sounder		12.23	5.11
6/12/95	12:47:59	00:09:24	9.40	Sounder		12.37	5.25
6/12/95	12:48:58	00:10:23	10.38	Sounder		12.48	5.36
6/12/95	12:49:53	00:11:18	11.30	Sounder		12.64	5.52
6/12/95	12:50:54	00:12:19	12.32	Sounder		12.73	5.61
6/12/95	12:51:57	00:13:22	13.35	Sounder		12.82	5.70
6/12/95	12:52:56	00:14:21	14.35	Sounder		12.91	5.79
6/12/95	12:53:59	00:15:24	15.40	Sounder		13.6	6.48
6/12/95	12:59:06	00:20:31	20.50	Sounder		13.41	6.29
6/12/95	13:03:55	00:25:20	25.33	Sounder		13.63	6.51
6/12/95	13:08:56	00:30:21	30.33	Sounder		13.84	6.72
6/12/95	13:13:58	00:35:23	35.38	Sounder		14.03	6.91
6/12/95	13:18:58	00:40:23	40.38	Sounder		14.17	7.05
6/12/95	13:28:57	00:50:22	50.38	Sounder		14.44	7.32
6/12/95	13:38:58	01:00:23	60.38	Sounder		14.67	7.55

**STEP-DRAWDOWN TEST
(Observation Well)**

Step #2: 1,300 gpm @ 1,600 rpm							
Date	Actual Time	Elapsed Time	Elapsed Min.	Tape Reading at R.P.	Tape Reading at W.S.	R.P to W.S.	Total Drawdown
6/12/95	13:51:43	01:13:08	73.13	Sounder		16.54	9.42
6/12/95	13:52:52	01:14:17	74.28	Sounder		16.78	9.66
6/12/95	13:53:56	01:15:21	75.35	Sounder		16.97	9.85
6/12/95	13:54:59	01:16:24	76.39	Sounder		17.15	10.03
6/12/95	13:55:59	01:17:24	77.39	Sounder		17.26	10.14
6/12/95	13:56:58	01:18:23	78.38	Sounder		17.38	10.26
6/12/95	13:57:59	01:19:24	79.39	Sounder		17.47	10.35
6/12/95	13:58:56	01:20:21	80.35	Sounder		17.54	10.42
6/12/95	13:59:55	01:21:20	81.33	Sounder		17.63	10.51
6/12/95	14:00:56	01:22:21	82.35	Sounder		17.72	10.60
6/12/95	14:01:58	01:23:23	83.38	Sounder		17.80	10.68
6/12/95	14:02:59	01:24:24	84.39	Sounder		17.84	10.72
6/12/95	14:03:59	01:25:24	85.39	Sounder		17.91	10.79
6/12/95	14:04:59	01:26:24	86.39	Sounder		17.97	10.85
6/12/95	14:05:56	01:27:21	87.35	Sounder		18.03	10.91
6/12/95	14:10:57	01:32:22	92.36	Sounder		18.27	11.15
6/12/95	14:15:59	01:37:24	97.39	Sounder		18.47	11.35
6/12/95	14:20:57	01:42:22	102.36	Sounder		18.64	11.52
6/12/95	14:25:57	01:47:22	107.36	Sounder		18.79	11.67
6/12/95	14:30:59	01:52:24	112.39	Sounder		18.94	11.82
6/12/95	14:41:05	02:02:30	122.50	Sounder		19.15	12.03
6/12/95	14:50:55	02:12:20	132.33	Sounder		19.34	12.22
Step #3: 1,740 gpm @ 1,900 rpm							
6/12/95	14:54:54	02:16:19	136.30	Sounder		20.20	13.08
6/12/95	14:55:41	02:17:06	137.10	Sounder		20.63	13.51
6/12/95	14:57:50	02:19:15	139.25	Sounder		20.90	13.78
6/12/95	14:58:59	02:20:24	140.39	Sounder		21.03	13.91
6/12/95	14:59:53	02:21:18	141.29	Sounder		21.30	14.18
6/12/95	15:00:54	02:22:19	142.30	Sounder		21.38	14.26
6/12/95	15:01:49	02:23:14	143.24	Sounder		21.49	14.37
6/12/95	15:02:53	02:24:18	144.30	Sounder		21.60	14.48
6/12/95	15:03:55	02:25:20	145.33	Sounder		21.70	14.58
6/12/95	15:04:51	02:26:16	146.26	Sounder		21.78	14.66
6/12/95	15:05:56	02:27:21	147.34	Sounder		21.84	14.72
6/12/95	15:06:59	02:28:24	148.39	Sounder		21.93	14.81
6/12/95	15:07:59	02:29:24	149.39	Sounder		21.98	14.86
6/12/95	15:08:50	02:30:15	150.25	Sounder		22.10	14.98
6/12/95	15:13:55	02:35:20	155.33	Sounder		22.36	15.24
6/12/95	15:18:58	02:40:23	160.35	Sounder		22.56	15.44
6/12/95	15:23:59	02:45:24	165.39	Sounder		22.75	15.63
6/12/95	15:28:57	02:50:22	170.37	Sounder		22.87	15.75
6/12/95	15:33:56	02:55:21	175.37	Sounder		23.10	15.98
6/12/95	15:43:56	03:05:21	185.37	Sounder		23.23	16.11
6/12/95	15:53:59	03:15:24	195.39	Sounder		23.40	16.28
RECOVERY							
Date	Time	Elapsed Time	Elapsed Time (t')	Time Func. Ratio	DTW (ft.)	Residual Drawdown (s')	
		(min:sec)	(min)	F(t)/t'			
6/12/95	16:28:39	00:01:49	1.81	67.96	22.43	15.31	
6/12/95	16:29:16	00:02:26	2.43	50.62	21.95	14.83	
6/12/95	16:29:45	00:02:55	2.91	42.27	20.10	12.98	
6/12/95	16:30:15	00:03:25	3.42	35.96	19.40	12.28	
6/12/95	16:30:47	00:03:57	3.95	31.14	18.87	11.75	
6/12/95	16:31:15	00:04:25	4.42	27.83	18.30	11.18	
6/12/95	16:31:45	00:04:55	4.91	25.05	17.92	10.80	
6/12/95	16:32:17	00:05:27	5.45	22.57	17.45	10.33	
6/12/95	16:32:45	00:05:55	5.91	20.81	17.20	10.08	
6/12/95	16:33:17	00:06:27	6.45	19.07	16.91	9.79	
6/12/95	16:34:17	00:07:27	7.45	16.51	16.46	9.34	
6/12/95	16:35:18	00:08:28	8.47	14.52	16.30	9.18	

Table B3

JUNE 1995, CONSTANT DISCHARGE AQUIFER TEST							
PUMPING WELL DATA							
State Well #: T21N/R01W-24B02				Start Date: 6/14/96			
Start Time: 09:36:00 +or- 1 min.				Finish Date: 6/16/95			
Discharge = 1,650 gpm @ 1,800 rpm				Dist. to O.B. Well = 191 ft.			
Casing I.D. = 15.25 inches				Pump = 50 hp Gearhead.			
Well Seal: 730 ft. to the surface				Perf. Interval: 760 - 920 feet			
Date	Actual Time	Elapsed time			Total Min. (dec)	Drawdown (ft)	RP-WS (ft)
		Hr	min	sec			
6/14/95	9:20:00						3.94
6/14/95	9:36:30	0	0	30	0.50	62.56	66.50
6/14/95	9:37:00	0	1	0	1.00	62.75	66.69
6/14/95	9:37:30	0	1	30	1.50	62.85	66.79
6/14/95	9:38:00	0	2	0	2.00	63.11	67.05
6/14/95	9:38:30	0	2	30	2.50	63.48	67.42
6/14/95	9:39:00	0	3	0	3.00	63.77	67.71
6/14/95	9:39:30	0	3	30	3.50	64.16	68.10
6/14/95	9:40:00	0	4	0	4.00	64.18	68.12
6/14/95	9:40:30	0	4	30	4.50	64.32	68.26
6/14/95	9:41:00	0	5	0	5.00	64.47	68.41
6/14/95	9:42:00	0	6	0	6.00	64.58	68.52
6/14/95	9:43:00	0	7	0	7.00	64.78	68.72
6/14/95	9:44:00	0	8	0	8.00	65.16	69.10
6/14/95	9:45:15	0	9	15	9.25	64.73	68.67
6/14/95	9:46:00	0	10	0	10.00	63.86	67.80
6/14/95	9:47:00	0	11	0	11.00	63.97	67.91
6/14/95	9:48:00	0	12	0	12.00	64.17	68.11
6/14/95	9:49:20	0	13	20	13.33	65.46	69.40
6/14/95	9:50:00	0	14	0	14.00	64.38	68.32
6/14/95	9:51:05	0	15	5	15.08	64.26	68.20
6/14/95	9:56:00	0	20	0	20.00	64.35	68.29
6/14/95	10:01:00	0	25	0	25.00	64.49	68.43
6/14/95	10:06:00	0	30	0	30.00	64.70	68.64
6/14/95	10:11:00	0	35	0	35.00	64.87	68.81
6/14/95	10:16:00	0	40	0	40.00	64.91	68.85
6/14/95	10:26:00	0	50	0	50.00	65.03	68.97
6/14/95	10:36:00	1	0	0	60.00	65.27	69.21
6/14/95	11:06:00	1	30	0	90.00	66.92	70.86
6/14/95	11:36:00	2	0	0	120.00	66.96	70.90
6/14/95	12:06:00	2	30	0	150.00	66.50	70.44
6/14/95	12:36:00	3	0	0	180.00	67.12	71.06
6/14/95	13:36:00	4	0	0	240.00	67.35	71.29
6/14/95	15:03:00	5	27	0	327.00	67.68	71.62
6/14/95	15:35:00	5	59	0	359.00	67.72	71.66
6/15/95	8:46:15	23	10	15	1390.25	68.47	72.41
6/15/95	16:39:15	31	3	15	1863.25	67.88	71.82
6/16/95	7:00:00	45	21	0	2721.00	68.35	72.29

Table B4

JUNE 1995, CONSTANT DISCHARGE TEST							
Observation Well Data							
State Well #: T21N/R01W-24B01				Start Date: 6/14/95			
Start Time: 09:36:00 +- 1 min.				Finish Date: 6/16/95			
Casing = 2.5 inch O.D.				Perf. Interval: 800 - 820 feet			
Well Seal = 780 ft. to the surface				Dist. from pumping well = 191 ft.			
Date	Actual Time	Elapsed time			Total Minutes	Drawdown (ft)	RP-WS (ft)
		Hr	min	sec			
6/14/95	9:12:00						8.32
6/14/95	8:37:17	0	1	17	1.28	0.6	9.10
6/14/95	9:37:45	0	1	45	1.75	1.36	9.68
6/14/95	9:38:20	0	2	20	2.33	2.75	11.07
6/14/95	9:38:48	0	2	48	2.80	3.71	12.03
6/14/95	9:39:13	0	3	13	3.22	4.41	12.73
6/14/95	9:39:40	0	3	40	3.67	5.11	13.43
6/14/95	9:40:08	0	4	8	4.13	5.61	13.93
6/14/95	9:40:36	0	4	36	4.60	6.18	14.50
6/14/95	9:41:06	0	5	6	5.10	6.57	14.89
6/14/95	9:41:36	0	5	36	5.60	6.95	15.27
6/14/95	9:42:35	0	6	35	6.58	7.63	15.95
6/14/95	9:43:33	0	7	33	7.55	8.15	16.47
6/14/95	9:44:33	0	8	33	8.55	8.6	16.92
6/14/95	9:45:30	0	9	30	9.50	8.99	17.31
6/14/95	9:46:30	0	10	30	10.50	9.35	17.67
6/14/95	9:47:28	0	11	28	11.47	9.65	17.97
6/14/95	9:48:26	0	12	26	12.43	9.91	18.23
6/14/95	9:49:25	0	13	25	13.42	10.16	18.48
6/14/95	9:50:25	0	14	25	14.42	10.37	18.69
6/14/95	9:51:23	0	15	23	15.38	10.59	18.91
6/14/95	9:56:25	0	20	25	20.42	11.47	19.79
6/14/95	10:01:26	0	25	26	25.43	12.1	20.42
6/14/95	10:06:03	0	30	3	30.05	12.57	20.89
6/14/95	10:12:05	0	36	5	36.08	13.03	21.35
6/14/95	10:17:25	0	41	25	41.42	13.38	21.70
6/14/95	10:27:28	0	51	28	51.47	13.93	22.25
6/14/95	10:37:30	1	1	30	61.50	14.34	22.66
6/14/95	11:07:20	1	31	20	91.33	15.22	23.54
6/14/95	11:36:40	2	0	40	120.67	15.74	24.06
6/14/95	12:06:59	2	30	59	150.98	16.13	24.45
6/14/95	12:37:43	3	1	43	181.72	16.47	24.79
6/14/95	13:23:50	3	47	50	227.83	16.78	25.10
6/14/95	15:02:50	5	26	50	326.83	17.28	25.60
6/14/95	15:25:40	5	48	20	348.33	17.38	25.70
6/15/95	8:42:32	23	6	32	1386.53	18.47	26.79
6/15/95	16:34:15	30	58	15	1858.25	18.46	26.78
6/16/95	6:55:00	45	19	0	2719.00	18.46	26.78

Table B5

OBSERVATION WELL MEASUREMENTS					
State Well Number	Depth to Water (ft)				Comments
	Pretest	6 hrs	23 hrs	44 hrs	
T21N/R01W-24B01	see table 4				
T21N/R01W-13H01	5.6	5.6	5.5	5.6	Flooding fields to the north & east
T21N/R01W-23H01	11.6	13.0	12.6	12.3	
T21N/R01W-23J01	10.9	9.1	8.9	8.8	Recently Pumped (???)
T21N/R01W-14Q01	12.4	12.6	12.6	12.3	
T21N/R01E-07L01	8.1	8.0	7.9	7.9	Flooding fields with surface water
					Prior to 6 hr. measurement, two wells to the north (.2 and .8 miles) were turned on and stayed on for test duration. Pumping about 2,000 gpm each.
T21N/R01E-1780	12.1	13.3	13.9	14.3	
T21N/R01E-08L01	13.0	12.5	12.8	12.6	

Table B6

OBSERVATION WELL INFORMATION				
State Well Number	Well Use	Well Depth (ft)	Perforation Interval (ft)	Distance from Pumping Well (ft)
T21N/R01W-24B01	Mont.	1,018	820-840	191
T21N/R01W-13H01	Idle Dom.	about 80	no info.	2,700
T21N/R01W-23H01	Irrig.	210	147-187	2,800
T21N/R01W-23J01	Irrig.	54	no info.	5,800
T21N/R01W-14Q01	Irrig.	223	114-154	6,000
T21N/R01E-07L01	Irrig.	640	290-640	7,300
T21N/R01E-1780	Irrig.	600	no info.	8,000
T21N/R01E-08L01	Irrig.	no info.	no info.	8,200

APPENDIX C
MAY 1996 AQUIFER TESTING DATA

Table C1

STEP-DRAWDOWN TEST						
Pumping Well						
May 3 1996						
WELL OWNERSHIP/LOCATION DATA						
Owner:		M & T Chico Ranch				
Address:		River Road				
State Well No.:		T21N/R01W-24B02				
Loc. Description:		South Ranch, near Edgar Slough				
WELL INFORMATION						
Well Use: Agricultural Production			Data Drilled: April, 1995			
Well Depth: 950 ft.			Casing Depth: 950 ft.			
Perforation Interval: 760 - 920 ft.			Pump Info: Gearhead/300hp			
Pumping Capacity (gpm)/Method: Variable Rate/Ultrasonic Flowmeter						
WELL MEASUREMENT DATA						
Ref. Point: Top of 2.5 inch sounding tube, 0.5 ft. above ground surface.						
R.P. Elevation/Method: 122.96 feet / Survey						
Pump-Start Time=		8:53:30		Pump-Stop Time= 16:26:50 PM		
Date	Actual Time	Elapsed Min.	Reading at R.P.	Tape Reading at W.S.	RP to W.S.	Total Drawdown
4/30/96	07:30:00		1.0	0.9	0.10	NA
5/3/96	07:37:00		1.0	0.5	0.50	NA
5/3/96	19:52:31		Troll		0.47	NA
STEP #1: 1,250 gpm @ 800 rpm						
5/3/96	8:54:31	1.0	Data Logger		43.17	42.70
5/3/96	8:55:31	2.0	Data Logger		43.26	42.79
5/3/96	8:56:31	3.0	Data Logger		44.10	43.63
5/3/96	8:57:31	4.0	Data Logger		43.43	42.96
5/3/96	8:58:31	5.0	Data Logger		44.87	44.40
5/3/96	8:59:31	6.0	Data Logger		46.14	45.67
5/3/96	9:00:31	7.0	Data Logger		51.30	50.83
5/3/96	9:01:31	8.0	Data Logger		43.30	42.83
5/3/96	9:02:31	9.0	Data Logger		43.33	42.86
5/3/96	9:03:31	10.0	Data Logger		48.64	48.17
5/3/96	9:04:31	11.0	Data Logger		46.84	46.37
5/3/96	9:05:31	12.0	Data Logger		49.81	49.34
5/3/96	9:06:31	13.0	Data Logger		51.53	51.06
5/3/96	9:07:31	14.0	Data Logger		45.19	44.72
5/3/96	9:08:31	15.0	Data Logger		53.83	53.36
5/3/96	9:09:31	16.0	Data Logger		47.61	47.14
5/3/96	9:10:31	17.0	Data Logger		48.92	48.45
5/3/96	9:11:31	18.0	Data Logger		44.39	43.92
5/3/96	9:12:31	19.0	Data Logger		48.90	48.43
5/3/96	9:13:31	20.0	Data Logger		48.43	47.96
5/3/96	9:14:31	21.0	Data Logger		45.37	44.90
5/3/96	9:15:31	22.0	Data Logger		47.34	46.87
5/3/96	9:16:31	23.0	Data Logger		45.74	45.27
5/3/96	9:17:31	24.0	Data Logger		50.36	49.89
5/3/96	9:18:31	25.0	Data Logger		49.40	48.93
5/3/96	9:19:31	26.0	Data Logger		49.36	48.89
5/4/96	9:20:31	27.0	Data Logger		52.18	51.71
5/5/96	9:21:31	28.0	Data Logger		48.34	47.87
5/6/96	9:22:31	29.0	Data Logger		47.12	46.65
5/7/96	9:23:31	30.0	Data Logger		53.64	53.17

Table C1 (continued)

STEP #1 (continued): 1,250 gpm @ 800 rpm						
Date	Actual Time	Elapsed Min.	Reading at R.P.	Tape Reading at W.S.	RP to W.S.	Total Drawdown
5/8/96	9:24:31	31.0	Data Logger		47.34	46.87
5/9/96	9:25:31	32.0	Data Logger		49.54	49.07
5/10/96	9:26:31	33.0	Data Logger		53.90	53.43
5/11/96	9:27:31	34.0	Data Logger		47.61	47.14
5/12/96	9:28:31	35.0	Data Logger		54.73	54.26
5/13/96	9:29:31	36.0	Data Logger		49.43	48.96
5/14/96	9:30:31	37.0	Data Logger		51.86	51.39
5/15/96	9:31:31	38.0	Data Logger		48.53	48.06
5/16/96	9:32:31	39.0	Data Logger		50.63	50.16
5/17/96	9:33:31	40.0	Data Logger		50.41	49.94
5/18/96	9:34:31	41.0	Data Logger		50.31	49.84
5/19/96	9:35:31	42.0	Data Logger		48.00	47.53
5/20/96	9:36:31	43.0	Data Logger		52.31	51.84
5/21/96	9:37:31	44.0	Data Logger		47.57	47.10
5/22/96	9:38:31	45.0	Data Logger		49.80	49.33
5/23/96	9:39:31	46.0	Data Logger		48.18	47.71
5/24/96	9:40:31	47.0	Data Logger		46.91	46.44
5/25/96	9:41:31	48.0	Data Logger		52.03	51.56
5/26/96	9:42:31	49.0	Data Logger		55.82	55.35
5/27/96	9:43:31	50.0	Data Logger		50.80	50.33
5/28/96	9:44:31	51.0	Data Logger		49.25	48.78
5/29/96	9:45:31	52.0	Data Logger		46.46	45.99
5/30/96	9:46:31	53.0	Data Logger		52.09	51.62
5/31/96	9:47:31	54.0	Data Logger		49.51	49.04
6/1/96	9:48:31	55.0	Data Logger		43.05	42.58
6/2/96	9:49:31	56.0	Data Logger		52.41	51.94
6/3/96	9:50:31	57.0	Data Logger		55.42	54.95
6/4/96	9:51:31	58.0	Data Logger		46.86	46.39
STEP #2: 2,050 gpm @ 1,050 rpm						
Date	Actual Time	Elapsed Min.	Reading at R.P.	Tape Reading at W.S.	RP to W.S.	Total Drawdown
5/3/96	9:52:31	1.0	Data Logger		72.93	72.46
5/3/96	9:53:31	2.0	Data Logger		76.79	76.32
5/3/96	9:54:31	3.0	Data Logger		79.74	79.27
5/3/96	9:55:31	4.0	Data Logger		80.59	80.12
5/3/96	9:56:31	5.0	Data Logger		83.20	82.73
5/3/96	9:57:31	6.0	Data Logger		84.06	83.59
5/3/96	9:58:31	7.0	Data Logger		82.54	82.07
5/3/96	9:59:31	8.0	Data Logger		80.44	79.97
5/3/96	10:00:31	9.0	Data Logger		81.64	81.17
5/3/96	10:01:31	10.0	Data Logger		86.69	86.22
5/3/96	10:02:31	11.0	Data Logger		86.46	85.99
5/3/96	10:03:31	12.0	Data Logger		82.59	82.12
5/3/96	10:04:31	13.0	Data Logger		84.35	83.88
5/3/96	10:05:31	14.0	Data Logger		83.44	82.97
5/3/96	10:06:31	15.0	Data Logger		78.97	78.50
5/3/96	10:07:31	16.0	Data Logger		85.09	84.62
5/3/96	10:08:31	17.0	Data Logger		88.27	87.80
5/3/96	10:09:31	18.0	Data Logger		86.85	86.38
5/3/96	10:10:31	19.0	Data Logger		85.58	85.11
5/3/96	10:11:31	20.0	Data Logger		81.88	81.41
5/3/96	10:12:31	21.0	Data Logger		90.42	89.95
5/3/96	10:13:31	22.0	Data Logger		83.87	83.40
5/3/96	10:14:31	23.0	Data Logger		84.94	84.47
5/3/96	10:15:31	24.0	Data Logger		87.73	87.26
5/3/96	10:16:31	25.0	Data Logger		86.80	86.33
5/3/96	10:17:31	26.0	Data Logger		84.16	83.69

Table C1 (continued)

STEP #2(continued): 2,050 gpm @ 1,050 rpm

Date	Actual Time	Elapsed Min.	Reading at R.P.	Tape Reading at W.S.	RP to W.S.	Total Drawdown
5/3/96	10:18:31	27.0	Data Logger		82.73	82.26
5/3/96	10:19:31	28.0	Data Logger		82.41	81.94
5/3/96	10:20:31	29.0	Data Logger		86.64	86.17
5/3/96	10:21:31	30.0	Data Logger		82.54	82.07
5/3/96	10:22:31	31.0	Data Logger		84.30	83.83
5/3/96	10:23:31	32.0	Data Logger		85.46	84.99
5/3/96	10:24:31	33.0	Data Logger		86.24	85.77
5/3/96	10:25:31	34.0	Data Logger		88.13	87.66
5/3/96	10:26:31	35.0	Data Logger		89.27	88.80
5/3/96	10:27:31	36.0	Data Logger		85.84	85.37
5/3/96	10:28:31	37.0	Data Logger		85.81	85.34
5/3/96	10:29:31	38.0	Data Logger		84.82	84.35
5/3/96	10:30:31	39.0	Data Logger		84.43	83.96
5/3/96	10:31:31	40.0	Data Logger		83.63	83.16
5/3/96	10:32:31	41.0	Data Logger		85.30	84.83
5/3/96	10:33:31	42.0	Data Logger		86.11	85.64
5/3/96	10:34:31	43.0	Data Logger		84.91	84.44
5/3/96	10:35:31	44.0	Data Logger		86.48	86.01
5/3/96	10:36:31	45.0	Data Logger		85.58	85.11
5/3/96	10:37:31	46.0	Data Logger		86.39	85.92
5/3/96	10:38:31	47.0	Data Logger		82.24	81.77
5/3/96	10:39:31	48.0	Data Logger		88.43	87.96
5/3/96	10:40:31	49.0	Data Logger		86.26	85.79
5/3/96	10:41:31	50.0	Data Logger		88.13	87.66
5/3/96	10:42:31	51.0	Data Logger		84.80	84.33
5/3/96	10:43:31	52.0	Data Logger		88.74	88.27
5/3/96	10:44:31	53.0	Data Logger		84.53	84.06
5/3/96	10:45:31	54.0	Data Logger		88.27	87.80
5/3/96	10:46:31	55.0	Data Logger		83.23	82.76
5/3/96	10:47:31	56.0	Data Logger		88.16	87.69
5/3/96	10:48:31	57.0	Data Logger		85.67	85.20
5/3/96	10:49:31	58.0	Data Logger		84.78	84.31
5/3/96	10:50:31	59.0	Data Logger		86.51	86.04
5/3/96	10:51:31	60.0	Data Logger		87.07	86.60
5/3/96	10:52:31	61.0	Data Logger		85.33	84.86
5/3/96	10:53:31	62.0	Data Logger		87.60	87.13
5/3/96	10:54:31	63.0	Data Logger		89.39	88.92
5/3/96	10:55:31	64.0	Data Logger		86.64	86.17
5/3/96	10:56:31	65.0	Data Logger		84.67	84.20
5/3/96	10:57:31	66.0	Data Logger		86.75	86.28
5/3/96	10:58:31	67.0	Data Logger		84.36	83.89
5/3/96	10:59:31	68.0	Data Logger		86.05	85.58
5/3/96	11:00:31	69.0	Data Logger		88.42	87.95
5/3/96	11:01:31	70.0	Data Logger		89.19	88.72
5/3/96	11:02:31	71.0	Data Logger		87.66	87.19
5/3/96	11:03:31	72.0	Data Logger		88.18	87.71
5/3/96	11:04:31	73.0	Data Logger		83.31	82.84
5/3/96	11:05:31	74.0	Data Logger		89.87	89.40
5/3/96	11:06:31	75.0	Data Logger		88.24	87.77
5/3/96	11:07:31	76.0	Data Logger		86.08	85.61
5/3/96	11:08:31	77.0	Data Logger		89.48	89.01

Table C1 (continued)

STEP #2(continued): 2,050 gpm @ 1,050 rpm

Date	Actual Time	Elapsed Min.	Reading at R.P.	Tape Reading at W.S.	RP to W.S.	Total Drawdown
5/3/96	11:09:31	78.0	Data Logger		92.12	91.65
5/3/96	11:10:31	79.0	Data Logger		88.96	88.49
5/3/96	11:11:31	80.0	Data Logger		83.79	83.32
5/3/96	11:12:31	81.0	Data Logger		85.57	85.10
5/3/96	11:13:31	82.0	Data Logger		84.64	84.17
5/3/96	11:14:31	83.0	Data Logger		84.70	84.23
5/3/96	11:15:31	84.0	Data Logger		85.36	84.89
5/3/96	11:16:31	85.0	Data Logger		88.40	87.93
5/3/96	11:17:31	86.0	Data Logger		85.84	85.37
5/3/96	11:18:31	87.0	Data Logger		85.47	85.00
5/3/96	11:19:31	88.0	Data Logger		88.30	87.83
5/3/96	11:20:31	89.0	Data Logger		84.56	84.09
5/3/96	11:21:31	90.0	Data Logger		86.99	86.52
5/3/96	11:22:31	91.0	Data Logger		86.72	86.25
5/3/96	11:23:31	92.0	Data Logger		89.59	89.12
5/3/96	11:24:31	93.0	Data Logger		82.21	81.74
5/3/96	11:25:31	94.0	Data Logger		82.12	81.65
5/3/96	11:26:31	95.0	Data Logger		88.67	88.20
5/3/96	11:27:31	96.0	Data Logger		89.39	88.92
5/3/96	11:28:31	97.0	Data Logger		81.96	81.49
5/3/96	11:29:31	98.0	Data Logger		87.14	86.67
5/3/96	11:30:31	99.0	Data Logger		90.03	89.56
5/3/96	11:31:31	100.0	Data Logger		88.67	88.20
5/3/96	11:32:31	101.0	Data Logger		84.64	84.17
5/3/96	11:33:31	102.0	Data Logger		88.40	87.93
5/3/96	11:34:31	103.0	Data Logger		91.56	91.09
5/3/96	11:35:31	104.0	Data Logger		84.38	83.91
5/3/96	11:36:31	105.0	Data Logger		88.03	87.56
5/3/96	11:37:31	106.0	Data Logger		86.35	85.88
5/3/96	11:38:31	107.0	Data Logger		85.29	84.82
5/3/96	11:39:31	108.0	Data Logger		84.48	84.01
5/3/96	11:40:31	109.0	Data Logger		84.67	84.20

STEP #3: 3,000 gpm @ 1,450 rpm

Date	Actual Time	Elapsed Min.	Reading at R.P.	Tape Reading at W.S.	RP to W.S.	Total Drawdown
5/3/96	11:41:31	0.5	Data Logger		96.31	95.84
5/3/96	11:42:31	1.0	Data Logger		126.79	126.32
5/3/96	11:43:31	2.0	Data Logger		127.21	126.74
5/3/96	11:44:31	3.0	Data Logger		129.00	128.53
5/3/96	11:45:31	4.0	Data Logger		127.91	127.44
5/3/96	11:46:31	5.0	Data Logger		130.90	130.43
5/3/96	11:47:31	6.0	Data Logger		130.79	130.32
5/3/96	11:48:31	7.0	Data Logger		130.84	130.37
5/3/96	11:49:31	8.0	Data Logger		132.49	132.02
5/3/96	11:50:31	9.0	Data Logger		133.19	132.72
5/3/96	11:51:31	10.0	Data Logger		131.83	131.36
5/3/96	11:52:31	11.0	Data Logger		132.21	131.74
5/3/96	11:53:31	12.0	Data Logger		130.83	130.36
5/3/96	11:54:31	13.0	Data Logger		133.11	132.64
5/3/96	11:55:31	14.0	Data Logger		134.05	133.58
5/3/96	11:56:31	15.0	Data Logger		134.76	134.29

Table C1 (continued)

STEP #3 (continued): 3,000 gpm @ 1,450 rpm

Date	Actual Time	Elapsed Min.	Reading at R.P.	Tape Reading at W.S.	RP to W.S.	Total Drawdown
5/3/96	12:52:31	71.0	Data	Logger	134.73	134.26
5/3/96	12:53:31	72.0	Data	Logger	134.94	134.47
5/3/96	12:54:31	73.0	Data	Logger	135.00	134.53
5/3/96	12:55:31	74.0	Data	Logger	133.08	132.61
5/3/96	12:56:31	75.0	Data	Logger	133.06	132.59
5/3/96	12:57:31	76.0	Data	Logger	133.37	132.90
5/3/96	12:58:31	77.0	Data	Logger	134.07	133.60
5/3/96	12:59:31	78.0	Data	Logger	134.36	133.89
5/3/96	13:00:31	79.0	Data	Logger	134.50	134.03
5/3/96	13:01:31	80.0	Data	Logger	134.59	134.12
5/3/96	13:02:31	81.0	Data	Logger	133.83	133.36
5/3/96	13:03:31	82.0	Data	Logger	133.72	133.25
5/3/96	13:04:31	83.0	Data	Logger	134.84	134.37
5/3/96	13:05:31	84.0	Data	Logger	134.84	134.37
5/3/96	13:06:31	85.0	Data	Logger	135.03	134.56
5/3/96	13:07:31	86.0	Data	Logger	133.85	133.38
5/3/96	13:08:31	87.0	Data	Logger	135.61	135.14
5/3/96	13:09:31	88.0	Data	Logger	132.73	132.26
5/3/96	13:10:31	89.0	Data	Logger	133.96	133.49
5/3/96	13:11:31	90.0	Data	Logger	135.49	135.02
5/3/96	13:12:31	91.0	Data	Logger	132.84	132.37
5/3/96	13:13:31	92.0	Data	Logger	135.53	135.06
5/3/96	13:14:31	93.0	Data	Logger	135.70	135.23
5/3/96	13:15:31	94.0	Data	Logger	134.29	133.82
5/3/96	13:16:31	95.0	Data	Logger	134.14	133.67
5/3/96	13:17:31	96.0	Data	Logger	134.53	134.06
5/3/96	13:18:31	97.0	Data	Logger	134.63	134.16
5/3/96	13:19:31	98.0	Data	Logger	134.84	134.37
5/3/96	13:20:31	99.0	Data	Logger	134.33	133.86
5/3/96	13:21:31	100.0	Data	Logger	133.39	132.92
5/3/96	13:22:31	101.0	Data	Logger	134.81	134.34
5/3/96	13:23:31	102.0	Data	Logger	133.18	132.71
5/3/96	13:24:31	103.0	Data	Logger	135.96	135.49
5/3/96	13:25:31	104.0	Data	Logger	132.92	132.45
5/3/96	13:26:31	105.0	Data	Logger	134.87	134.40
5/3/96	13:27:31	106.0	Data	Logger	135.80	135.33
5/3/96	13:28:31	107.0	Data	Logger	133.82	133.35
5/3/96	13:29:31	108.0	Data	Logger	135.05	134.58
5/3/96	13:30:31	109.0	Data	Logger	134.87	134.40
5/3/96	13:31:31	110.0	Data	Logger	135.33	134.86
5/3/96	13:32:31	111.0	Data	Logger	135.48	135.01
5/3/96	13:33:31	112.0	Data	Logger	133.40	132.93
5/3/96	13:34:31	113.0	Data	Logger	134.12	133.65
5/3/96	13:35:31	114.0	Data	Logger	135.51	135.04
5/3/96	13:36:31	115.0	Data	Logger	134.55	134.08
5/3/96	13:37:31	116.0	Data	Logger	134.25	133.78
5/3/96	13:38:31	117.0	Data	Logger	134.52	134.05
5/3/96	13:39:31	118.0	Data	Logger	134.52	134.05
5/3/96	13:40:31	119.0	Data	Logger	134.66	134.19
5/3/96	13:41:31	120.0	Data	Logger	134.20	133.73
5/3/96	13:42:31	121.0	Data	Logger	134.09	133.62
5/3/96	13:43:31	122.0	Data	Logger	134.29	133.82
5/3/96	13:44:31	123.0	Data	Logger	134.13	133.66
5/3/96	13:45:31	124.0	Data	Logger	134.55	134.08
5/3/96	13:46:31	125.0	Data	Logger	135.46	134.99
5/3/96	13:47:31	126.0	Data	Logger	136.02	135.55

Table C1 (continued)

RECOVERY					
Date	Actual Time	Elapsed Time(t')	Time Func. Ratio*	DTW (ft.)	Residual Drawdown**
	(hr/min/sec)	(min)	F(t)/t'		F(t)/t'
5/3/96	13:47:31	0.0	211.4	136.02	135.55
5/3/96	13:48:31	1.0	211.4	38.07	37.60
5/3/96	13:49:31	2.0	105.7	27.08	26.61
5/3/96	13:50:31	3.0	70.5	23.24	22.77
5/3/96	13:51:31	4.0	52.9	20.96	20.49
5/3/96	13:52:31	5.0	42.3	19.24	18.77
5/3/96	13:53:31	6.0	35.2	18.09	17.62
5/3/96	13:54:31	7.0	30.2	17.06	16.59
5/3/96	13:55:31	8.0	26.4	16.21	15.74
5/3/96	13:56:31	9.0	23.5	15.47	15.00
5/3/96	13:57:31	10.0	21.1	14.85	14.38
5/3/96	13:58:31	11.0	19.2	14.28	13.81
5/3/96	13:59:31	12.0	17.6	13.79	13.32
5/3/96	14:00:31	13.0	16.3	13.34	12.87
5/3/96	14:01:31	14.0	15.1	12.90	12.43
5/3/96	14:02:31	15.0	14.1	12.52	12.05
5/3/96	14:03:31	16.0	13.2	12.18	11.71
5/3/96	14:04:31	17.0	12.4	11.84	11.37
5/3/96	14:05:31	18.0	11.7	11.54	11.07
5/3/96	14:06:31	19.0	11.1	11.27	10.80
5/3/96	14:07:31	20.0	10.6	10.99	10.52
5/3/96	14:08:31	21.0	10.1	10.75	10.28
5/3/96	14:09:31	22.0	9.6	10.51	10.04
5/3/96	14:10:31	23.0	9.2	10.29	9.82
5/3/96	14:11:31	24.0	8.8	10.08	9.61
5/3/96	14:12:31	25.0	8.5	9.87	9.40
5/3/96	14:13:31	26.0	8.1	9.68	9.21
5/3/96	14:14:31	27.0	7.8	9.50	9.03
5/3/96	14:15:31	28.0	7.6	9.34	8.87
5/3/96	14:16:31	29.0	7.3	9.17	8.70
5/3/96	14:17:31	30.0	7.0	8.99	8.52
5/3/96	14:18:31	31.0	6.8	8.84	8.37
5/3/96	14:19:31	32.0	6.6	8.70	8.23
5/3/96	14:20:31	33.0	6.4	8.56	8.09
5/3/96	14:21:31	34.0	6.2	8.43	7.96
5/3/96	14:22:31	35.0	6.0	8.29	7.82
5/3/96	14:23:31	36.0	5.9	8.17	7.70
5/3/96	14:24:31	37.0	5.7	8.05	7.58
5/3/96	14:25:31	38.0	5.6	7.93	7.46
5/3/96	14:26:31	39.0	5.4	7.80	7.33
5/3/96	14:27:31	40.0	5.3	7.71	7.24
5/3/96	14:28:31	41.0	5.2	7.59	7.12
5/3/96	14:29:31	42.0	5.0	7.50	7.03

Table C2

STEP-DRAWDOWN TEST						
Observation Well						
May 3 1996						
WELL OWNERSHIP/LOCATION DATA						
Owner:	M & T Chico Ranch					
Address:	River Road					
State Well No.:	T21N/R01W-24B01					
Loc. Description:	South M&T Ranch					
WELL INFORMATION						
Well Use: Monitoring Well				Data Drilled: April, 1995		
Well Depth: 1018 ft.				Casing Depth: 850 ft.		
Perforation Interval: 800 - 820 ft.				Pump Info: N/A		
Distance from Pumping Well:				191 feet		
WELL MEASUREMENT DATA						
Ref.Point: Top of 2 inch pipe, 0.9 ft. above ground surface.						
R.P. Elevation/Method: 125.6 feet / Survey						
Pump-Start Time= 8:53:00 Pump-Stop Time= 16:26:50 PM						
Date	Actual Time	Elapsed Min.	Reading at R.P.	Tape Reading at W.S.	RP to W.S.	Total Drawdown
4/30/96	07:30:00				4.70	NA
5/3/96	07:23:00				4.90	NA
5/3/96	07:44:31		Sonder		4.91	NA
STEP #1: 1,250 gpm @ 800 rpm						
5/3/96	8:53:30	0.50	Sonder		5.71	0.80
5/3/96	8:54:00	1.00	Sonder		6.60	1.69
5/3/96	8:54:30	1.50	Sonder		7.55	2.64
5/3/96	8:55:00	2.00	Sonder		7.93	3.02
5/3/96	8:55:30	2.50	Sonder		8.30	3.39
5/3/96	8:56:00	3.00	Sonder		8.80	3.89
5/3/96	8:56:30	3.50	Sonder		8.91	4.00
5/3/96	8:57:00	4.00	Sonder		9.34	4.43
5/3/96	8:57:30	4.50	Sonder		9.63	4.72
5/3/96	8:58:00	5.00	Sonder		9.86	4.95
5/3/96	8:58:30	5.50	Sonder		10.20	5.29
5/3/96	8:59:00	6.00	Sonder		10.60	5.69
5/3/96	9:00:00	7.00	Sonder		10.80	5.89
5/3/96	9:01:00	8.00	Sonder		11.20	6.29
5/3/96	9:02:00	9.00	Sonder		11.50	6.59
5/3/96	9:03:00	10.00	Sonder		11.90	6.99
5/3/96	9:04:00	11.00	Sonder		12.10	7.19
5/3/96	9:05:00	12.00	Sonder		12.30	7.39
5/3/96	9:06:00	13.00	Sonder		12.50	7.59
5/3/96	9:07:00	14.00	Sonder		12.70	7.79
5/3/96	9:08:00	15.00	Sonder		12.80	7.89
5/3/96	9:09:00	16.00	Sonder		12.90	7.99
5/3/96	9:10:00	17.00	Sonder		13.10	8.19
5/3/96	9:15:00	22.00	Sonder		13.70	8.79
5/3/96	9:20:00	27.00	Sonder		14.10	9.19
5/3/96	9:25:00	32.00	Sonder		14.50	9.59
5/4/96	9:30:00	37.00	Sonder		14.80	9.89
5/5/96	9:35:00	42.00	Sonder		15.10	10.19
5/6/96	9:40:00	47.00	Sonder		15.30	10.39
5/7/96	9:45:00	52.00	Sonder		15.50	10.59
5/8/96	9:50:00	57.00	Sonder		15.70	10.79

Table C2 (continued)

STEP-DRAWDOWN TEST						
(observation well continued)						
STEP #2: 2,050 gpm @ 1,050 rpm						
Date	Actual Time	Elapsed Min.	Reading at R.P.	Tape Reading at W.S.	RP to W.S.	Total Drawdown
5/3/96	9:52:00	0.00	Sounder		16.40	11.49
5/3/96	9:52:30	0.50	Sounder		16.80	11.89
5/3/96	9:53:00	1.00	Sounder		17.20	12.29
5/3/96	9:53:30	1.50	Sounder		17.60	12.69
5/3/96	9:54:00	2.00	Sounder		18.00	13.09
5/3/96	9:54:30	2.50	Sounder		18.20	13.29
5/3/96	9:55:00	3.00	Sounder		18.40	13.49
5/3/96	9:55:30	3.50	Sounder		18.70	13.79
5/3/96	9:56:00	4.00	Sounder		18.90	13.99
5/3/96	9:56:30	4.50	Sounder		19.20	14.29
5/3/96	9:57:00	5.00	Sounder		19.40	14.49
5/3/96	9:58:00	6.00	Sounder		19.60	14.69
5/3/96	9:58:30	6.50	Sounder		19.70	14.79
5/3/96	9:59:00	7.00	Sounder		20.00	15.09
5/3/96	10:00:00	8.00	Sounder		20.30	15.39
5/3/96	10:01:00	9.00	Sounder		20.50	15.59
5/3/96	10:02:00	10.00	Sounder		20.70	15.79
5/3/96	10:03:00	11.00	Sounder		20.80	15.89
5/3/96	10:04:00	12.00	Sounder		21.00	16.09
5/3/96	10:05:00	13.00	Sounder		21.10	16.19
5/3/96	10:06:00	14.00	Sounder		21.20	16.29
5/3/96	10:07:00	15.00	Sounder		21.40	16.49
5/3/96	10:08:00	16.00	Sounder		21.50	16.59
5/3/96	10:09:00	17.00	Sounder		21.60	16.69
5/3/96	10:10:00	18.00	Sounder		21.70	16.79
5/3/96	10:15:00	24.00	Sounder		22.30	17.39
5/3/96	10:20:00	29.00	Sounder		22.80	17.89
5/3/96	10:25:00	34.00	Sounder		23.20	18.29
5/3/96	10:30:00	39.00	Sounder		23.50	18.59
5/3/96	10:35:00	44.00	Sounder		23.70	18.79
5/3/96	10:40:00	49.00	Sounder		24.00	19.09
5/3/96	10:45:00	54.00	Sounder		24.20	19.29
5/3/96	10:51:00	59.00	Sounder		24.50	19.59
5/3/96	10:56:00	64.00	Sounder		24.80	19.89
5/3/96	11:01:00	69.00	Sounder		24.80	19.89
5/3/96	11:10:00	78.00	Sounder		25.00	20.09
5/3/96	11:22:00	90.00	Sounder		25.30	20.39
5/3/96	11:30:00	98.00	Sounder		25.50	20.59
5/3/96	11:38:00	106.00	Sounder		25.60	20.69

Table C2 (continued)

STEP-DRAWDOWN TEST (observation well continued) STEP #3: 3,000 gpm @ 1,450 rpm						
Date	Actual Time	Elapsed Min.	Reading at R.P.	Tape Reading at W.S.	RP to W.S.	Total Drawdown
5/3/96	11:41:00	0.0	Sounder		25.60	20.69
5/3/96	11:41:30	0.5	Sounder		25.70	20.79
5/3/96	11:42:00	1.0	Sounder		26.10	21.19
5/3/96	11:42:30	1.5	Sounder		27.00	22.09
5/3/96	11:43:00	2.0	Sounder		27.60	22.69
5/3/96	11:43:30	2.5	Sounder		28.20	23.29
5/3/96	11:44:00	3.0	Sounder		28.60	23.69
5/3/96	11:44:30	3.5	Sounder		29.00	24.09
5/3/96	11:45:00	4.0	Sounder		29.40	24.49
5/3/96	11:45:30	4.5	Sounder		29.70	24.79
5/3/96	11:46:00	5.0	Sounder		29.90	24.99
5/3/96	11:47:00	6.0	Sounder		30.50	25.59
5/3/96	11:48:00	7.0	Sounder		30.90	25.99
5/3/96	11:49:00	8.0	Sounder		31.20	26.29
5/3/96	11:50:00	9.0	Sounder		31.50	26.59
5/3/96	11:51:00	10.0	Sounder		31.80	26.89
5/3/96	11:52:00	11.0	Sounder		32.00	27.09
5/3/96	11:53:00	12.0	Sounder		32.20	27.29
5/3/96	11:54:00	13.0	Sounder		32.40	27.49
5/3/96	11:55:00	14.0	Sounder		32.60	27.69
5/3/96	11:56:00	15.0	Sounder		32.70	27.79
5/3/96	12:01:00	20.0	Sounder		33.30	28.39
5/3/96	12:06:00	25.0	Sounder		33.80	28.89
5/3/96	12:11:00	30.0	Sounder		34.20	29.29
5/3/96	12:16:00	35.0	Sounder		34.60	29.69
5/3/96	12:21:00	40.0	Sounder		34.90	29.99
5/3/96	12:26:00	45.0	Sounder		35.10	30.19
5/3/96	12:31:00	50.0	Sounder		35.30	30.39
5/3/96	12:36:00	55.0	Sounder		35.50	30.59
5/3/96	12:41:00	60.0	Sounder		35.70	30.79
5/3/96	12:46:00	65.0	Sounder		35.90	30.99
5/3/96	12:51:00	70.0	Sounder		36.00	31.09
5/3/96	13:01:00	80.0	Sounder		36.20	31.29
5/3/96	13:11:00	90.0	Sounder		36.50	31.59
5/3/96	13:21:00	100.0	Sounder		36.80	31.89
5/3/96	13:31:00	110.0	Sounder		37.00	32.09
5/3/96	13:41:00	120.0	Sounder		37.10	32.19

Table C2 (continued)

RECOVERY: Observation Well					
Date	Actual Time	Elapsed Time(t')	Time Func. Ratio*	DTW	Residual Drawdown**
	(hr/min/sec)	(min)	F(t)/t'	(ft.)	F(t)/t'
5/3/96	13:47:15	0.0	211.4	37.2	37.20
5/3/96	13:47:45	0.5	422.8	36.50	36.50
5/3/96	13:48:15	1.0	211.4	35.00	35.00
5/3/96	13:48:45	1.5	140.9	32.80	32.80
5/3/96	13:49:15	2.0	105.7	31.20	31.20
5/3/96	13:49:45	2.5	84.6	29.70	29.70
5/3/96	13:50:15	3.0	70.5	28.50	28.50
5/3/96	13:50:45	3.5	60.4	27.50	27.50
5/3/96	13:51:15	4.0	52.9	26.60	26.60
5/3/96	13:51:45	4.5	47.0	25.80	25.80
5/3/96	13:52:15	5.0	42.3	25.10	25.10
5/3/96	13:53:15	6.0	35.2	23.90	23.90
5/3/96	13:54:15	7.0	30.2	22.90	22.90
5/3/96	13:55:15	8.0	26.4	22.00	22.00
5/3/96	13:56:15	9.0	23.5	21.30	21.30
5/3/96	13:57:15	10.0	21.1	20.70	20.70
5/3/96	13:58:15	11.0	19.2	20.10	20.10
5/3/96	13:59:15	12.0	17.6	19.60	19.60
5/3/96	14:00:15	13.0	16.3	19.10	19.10
5/3/96	14:01:15	14.0	15.1	18.10	18.10
5/3/96	14:02:15	15.0	14.1	18.30	18.30
5/3/96	14:07:15	20.0	10.6	16.70	16.70
5/3/96	14:12:15	25.0	8.5	15.50	15.50
5/3/96	14:17:15	30.0	7.0	14.50	14.50
5/3/96	14:22:15	35.0	6.0	13.80	13.80
5/3/96	14:27:15	40.0	5.3	13.10	13.10
5/3/96	14:32:15	45.0	4.7	12.50	12.50
5/3/96	14:37:15	50.0	4.2	12.00	12.00
5/3/96	14:42:15	55.0	3.8	11.60	11.60
5/3/96	14:47:15	60.0	3.5	11.20	11.20
5/3/96	14:52:15	65.0	3.3	10.90	10.90
5/3/96	14:57:15	70.0	3.0	10.60	10.60

Constant Discharge Aquifer Test					
May 6-7, 1996					
Pumping Well Data					
State Well #: T21N/R01W-24B02			Start Date: 5/06/96		
Start Time: 08:43:30 + or - 1 min.			Finish Date: 5/07/96		
Discharge = 3,000 gpm @ 1,450 rpm			Dist. to O.B. Well = 191 ft.		
Casing I.D. = 15.25 inches			Pump = 300 hp Gearhead.		
Well Seal: 730 ft. to the surface			Perf. Interval: 760 - 920 feet		
Date	Actual Time (hr:min:sec)	Elapsed Time (min)	R.P. to W.S. (ft)	Total Drawdown (ft)	Comments
Pretest Data					
5/6/96	8:40:26	0.0	1.4	0	Troll in the well
5/6/96	8:41:26	0.0	1.7	0	collecting data every
5/6/96	8:42:26	0.0	1.8	0	1 minute
5/6/96	8:43:26	0.0	1.5	0	
Test Data					
5/6/96	8:44:26	1.0	94.5	93.1	Troll in the well
5/6/96	8:45:26	2.0	105.8	104.3	collecting data every
5/6/96	8:46:26	3.0	106.7	105.2	1 minute
5/6/96	8:47:26	4.0	110.6	109.1	
5/6/96	8:48:26	5.0	119.3	117.8	
5/6/96	8:49:26	6.0	120.9	119.4	
5/6/96	8:50:26	7.0	119.6	118.1	
5/6/96	8:51:26	8.0	123.4	121.9	
5/6/96	8:52:26	9.0	123.7	122.2	
5/6/96	8:53:26	10.0	125.1	123.6	
5/6/96	8:54:26	11.0	124.2	122.7	
5/6/96	8:55:26	12.0	125.1	123.6	
5/6/96	8:56:26	13.0	124.1	122.6	
5/6/96	8:57:26	14.0	125.3	123.8	
5/6/96	8:58:26	15.0	125.3	123.8	
5/6/96	8:59:26	16.0	125.7	124.2	
5/6/96	9:00:26	17.0	128.4	126.9	
5/6/96	9:01:26	18.0	128.3	126.8	
5/6/96	9:02:26	19.0	129.0	127.5	
5/6/96	9:03:26	20.0	129.1	127.6	
5/6/96	9:04:26	21.0	130.0	128.5	
5/6/96	9:05:26	22.0	130.6	129.1	
5/6/96	9:06:26	23.0	129.3	127.8	
5/6/96	9:07:26	24.0	130.8	129.3	
5/6/96	9:08:26	25.0	130.3	128.8	
5/6/96	9:09:26	26.0	129.7	128.3	
5/6/96	9:10:26	27.0	130.5	129.0	
5/6/96	9:11:26	28.0	130.4	128.9	
5/6/96	9:12:26	29.0	131.0	129.5	
5/6/96	9:13:26	30.0	129.5	128.0	
5/6/96	9:14:26	31.0	131.2	129.7	
5/6/96	9:15:26	32.0	130.4	128.9	
5/6/96	9:16:26	33.0	130.6	129.1	
5/6/96	9:17:26	34.0	131.0	129.5	
5/6/96	9:18:26	35.0	131.5	130.0	
5/6/96	9:19:26	36.0	131.7	130.2	
5/6/96	9:20:26	37.0	129.7	128.2	
5/6/96	9:21:26	38.0	130.9	129.4	
5/6/96	9:22:26	39.0	128.5	127.0	
5/6/96	9:23:26	40.0	131.5	130.0	
5/6/96	9:24:26	41.0	129.6	128.1	
5/6/96	9:25:26	42.0	131.0	129.5	

Table C3 (continued)

Pumping Well Test Data (continued)

Date	Actual Time (hr:min:sec)	Elapsed Time (min)	R.P. to W.S. (ft)	Total Drawdown (ft)	Comments
5/6/96	9:26:26	43.0	131.1	129.6	
5/6/96	9:27:26	44.0	130.6	129.1	
5/6/96	9:28:26	45.0	128.5	127.0	
5/6/96	9:29:26	46.0	129.2	127.7	
5/6/96	9:30:26	47.0	129.5	128.0	
5/6/96	9:31:26	48.0	129.7	128.2	
5/6/96	9:32:26	49.0	130.2	128.7	
5/6/96	9:33:26	50.0	130.1	128.7	
5/6/96	9:34:26	51.0	129.4	127.9	
5/6/96	9:35:26	52.0	130.0	128.5	
5/6/96	9:36:26	53.0	130.4	128.9	
5/6/96	9:37:26	54.0	131.2	129.7	
5/6/96	9:38:26	55.0	129.5	128.0	
5/6/96	9:39:26	56.0	130.0	128.5	
5/6/96	9:40:26	57.0	129.0	127.5	
5/6/96	9:41:26	58.0	128.9	127.4	
5/6/96	9:42:26	59.0	128.6	127.1	
5/6/96	9:43:26	60.0	132.1	130.6	Incr. Q from 2,920 to 3,000 gpm
5/6/96	9:44:26	61.0	135.2	133.7	
5/6/96	9:45:26	62.0	132.7	131.2	
5/6/96	9:46:26	63.0	135.3	133.8	
5/6/96	9:47:26	64.0	135.3	133.8	
5/6/96	9:48:26	65.0	135.7	134.2	
5/6/96	9:49:26	66.0	135.8	134.3	
5/6/96	9:50:26	67.0	135.5	134.0	
5/6/96	9:51:26	68.0	133.4	131.9	
5/6/96	9:52:26	69.0	135.3	133.8	
5/6/96	9:53:26	70.0	131.6	130.1	
5/6/96	9:54:26	71.0	134.4	132.9	
5/6/96	9:55:26	72.0	133.5	132.0	
5/6/96	9:56:26	73.0	134.6	133.1	
5/6/96	9:57:26	74.0	134.8	133.3	
5/6/96	9:58:26	75.0	134.0	132.5	
5/6/96	9:59:26	76.0	135.9	134.4	
5/6/96	10:00:26	77.0	134.3	132.8	
5/6/96	10:01:26	78.0	135.5	134.0	
5/6/96	10:02:26	79.0	132.9	131.4	
5/6/96	10:03:26	80.0	133.4	131.9	
5/6/96	10:04:26	81.0	135.1	133.6	
5/6/96	10:05:26	82.0	133.5	132.0	
5/6/96	10:06:26	83.0	134.3	132.8	
5/6/96	10:07:26	84.0	134.8	133.3	
5/6/96	10:08:26	85.0	133.3	131.8	
5/6/96	10:09:26	86.0	135.6	134.1	
5/6/96	10:10:26	87.0	133.6	132.1	
5/6/96	10:11:26	88.0	134.0	132.5	
5/6/96	10:12:26	89.0	135.6	134.1	
5/6/96	10:13:26	90.0	134.3	132.8	
5/6/96	10:14:26	91.0	135.0	133.5	
5/6/96	10:15:26	92.0	134.7	133.2	
5/6/96	10:16:26	93.0	132.7	131.2	
5/6/96	10:17:26	94.0	135.2	133.7	
5/6/96	10:18:26	95.0	133.9	132.4	

Table C3 (continued)

Pumping Well Test Data (continued)

Date	Actual Time (hr:min:sec)	Elapsed Time (min)	R.P. to W.S. (ft)	Total Drawdown (ft)	Comments
5/6/96	10:19:26	96.0	135.5	134.0	
5/6/96	10:20:26	97.0	134.6	133.1	
5/6/96	10:21:26	98.0	134.1	132.6	
5/6/96	10:22:26	99.0	135.0	133.5	
5/6/96	10:23:26	100.0	133.0	131.5	
5/6/96	10:24:26	101.0	135.7	134.2	
5/6/96	10:25:26	102.0	135.3	133.8	
5/6/96	10:26:26	103.0	133.7	132.2	
5/6/96	10:27:26	104.0	135.2	133.7	
5/6/96	10:28:26	105.0	133.9	132.4	
5/6/96	10:29:26	106.0	133.6	132.1	
5/6/96	10:30:26	107.0	133.6	132.1	
5/6/96	10:31:26	108.0	134.7	133.2	
5/6/96	10:32:26	109.0	134.2	132.7	
5/6/96	10:33:26	110.0	134.0	132.5	
5/6/96	10:34:26	111.0	136.8	135.3	
5/6/96	10:35:26	112.0	133.5	132.0	
5/6/96	10:36:26	113.0	135.8	134.3	
5/6/96	10:37:26	114.0	135.3	133.8	
5/6/96	10:38:26	115.0	133.9	132.4	
5/6/96	10:39:26	116.0	134.0	132.5	
5/6/96	10:40:26	117.0	135.0	133.5	
5/6/96	10:41:26	118.0	134.5	133.0	
5/6/96	10:42:26	119.0	134.6	133.1	
5/6/96	10:43:26	120.0	134.2	132.7	
5/6/96	10:44:26	121.0	133.7	132.2	
5/6/96	10:45:26	122.0	134.5	133.0	Pull Troll from Well
5/6/96	11:30:00	166.5	136.0	134.5	
5/6/96	12:00:00	196.5	136.1	134.6	
5/6/96	12:30:00	226.5	136.4	134.9	Incr. Q from 2,900 to 3,000gpm
5/6/96	13:00:00	256.5	140.7	139.2	
5/6/96	14:00:00	316.5	141.1	139.6	
5/6/96	15:00:00	376.5	141.1	139.6	
5/6/96	15:30:00	406.5	141.1	139.6	
5/7/96	7:45:00	1381.5	143.2	141.7	
5/7/96	9:40:00	1496.5	142.8	141.3	
5/7/96	10:45:00	1561.5	143.1	141.6	
5/7/96	10:47:00	1563.5	161.0	159.5	Incr. Q from 3,000 to 3,500gpm
5/7/96	10:49:00	1565.5	149.5	148.0	Decr. Q from 3,500 to 3,000gpm
5/7/96	10:59:00	1575.5	148.1	146.6	Turn well off at 10:59:30 AM
Recovery Data					
5/7/96	11:00:00	1576.5	50.5	49.0	66% Recovery after 1 min.
5/7/96	11:01:00	1577.5	38.4	36.9	
5/7/96	11:02:00	1578.5	32.7	31.2	
5/7/96	11:03:00	1579.5	29.7	28.2	
5/7/96	11:04:00	1580.5	27.2	25.7	83% Recovery after 5 min.
5/7/96	11:05:00	1581.5	25.6	24.1	
5/7/96	11:06:00	1582.5	24.3	22.8	
5/7/96	11:07:00	1583.5	23.3	21.8	
5/7/96	11:08:00	1584.5	22.4	20.9	
5/7/96	11:09:00	1585.5	21.6	20.1	
5/7/96	11:10:00	1586.5	20.8	19.3	
5/7/96	11:15:00	1591.5	18.5	17.0	
5/7/96	11:20:00	1596.5	16.8	15.3	
5/7/96	11:25:00	1601.5	15.7	14.2	
5/7/96	11:30:00	1606.5	14.6	13.1	
5/7/96	11:40:00	1616.5	11.7	10.2	
5/7/96	12:55:00	1631.5	8.6	7.1	
5/7/96	13:31:00	1667.5	7.2	5.7	
5/7/96	13:55:00	1691.5	7.0	5.5	95% Recovery after 115 min.

Table C4

CONSTANT DISCHARGE AQUIFER TEST					
May 6-7, 1996					
O.B. WELL DATA					
State Well #: T21N/R01W-24B01			Start Date: 5/06/95		
Start Time: 08:43:30 +or- 1 min.			Finish Date: 5/07/95		
Casing = 2.5 inch O.D.			Perf. Interval: 800 - 820 feet		
Well Seal = 780 ft. to the surface			Dist. from pumping well = 191 ft.		
Date	Time (hr:min:sec)	Time (min)	W.S. (ft)	Drawdown (ft)	Comments
Pretest Data					
5/6/96	8:15:00	0.0	6.1	0	
5/6/96	8:43:30	0.0	6.1	0	
Test Data					
5/6/96	8:44:00	0.5	8.1	2.0	
5/6/96	8:44:30	1.0	9.7	3.6	
5/6/96	8:45:00	1.5	11.3	5.2	
5/6/96	8:45:30	2.0	13.0	6.9	
5/6/96	8:46:00	2.5	14.2	8.1	
5/6/96	8:46:30	3.0	15.3	9.2	
5/6/96	8:47:00	3.5	16.2	10.1	
5/6/96	8:47:30	4.0	17.0	10.9	
5/6/96	8:48:00	4.5	17.8	11.7	
5/6/96	8:48:30	5.0	18.6	12.5	
5/6/96	8:49:00	5.5	19.3	13.2	
5/6/96	8:49:30	6.0	19.8	13.7	
5/6/96	8:50:00	6.5	20.4	14.3	
5/6/96	8:50:30	7.0	20.9	14.8	
5/6/96	8:51:00	7.5	21.4	15.3	
5/6/96	8:51:30	8.0	21.8	15.7	
5/6/96	8:52:00	8.5	22.2	16.1	
5/6/96	8:52:30	9.0	22.6	16.5	
5/6/96	8:53:00	9.5	22.9	16.8	
5/6/96	8:54:00	10.5	23.5	17.4	
5/6/96	8:55:00	11.5	24.1	18.0	
5/6/96	8:56:00	12.5	24.6	18.5	
5/6/96	8:57:00	13.5	25.0	18.9	
5/6/96	8:58:00	14.5	25.4	19.3	
5/6/96	8:59:00	15.5	25.8	19.7	
5/6/96	9:00:00	16.5	26.2	20.1	
5/6/96	9:01:00	17.5	26.6	20.5	
5/6/96	9:02:00	18.5	27.0	20.9	
5/6/96	9:03:00	19.5	27.4	21.3	
5/6/96	9:04:00	20.5	27.4	21.3	
5/6/96	9:05:00	21.5	28.0	21.9	
5/6/96	9:06:00	22.5	28.2	22.1	
5/6/96	9:07:00	23.5	28.5	22.4	
5/6/96	9:08:00	24.5	28.8	22.7	
5/6/96	9:09:00	25.5	29.0	22.9	
5/6/96	9:10:00	26.5	29.2	23.1	
5/6/96	9:15:00	31.5	30.1	24.0	
5/6/96	9:20:00	36.5	30.9	24.8	
5/6/96	9:25:00	41.5	31.5	25.4	
5/6/96	9:30:00	46.5	32.0	25.9	
5/6/96	9:35:00	51.5	32.4	26.3	
5/6/96	9:40:00	56.5	32.8	26.7	
5/6/96	9:45:00	61.5	33.9	27.8	
5/6/96	9:50:00	66.5	34.0	27.9	

Table C4 (continued)

Test Data (continued)					
Date	Time (hr:min:sec)	Time (min)	W.S. (ft)	Drawdown (ft)	Comments
5/6/96	9:55:00	71.5	34.4	28.3	
5/6/96	10:00:00	76.5	34.8	28.7	
5/6/96	10:05:00	81.5	35.1	29.0	
5/6/96	10:10:00	86.5	35.3	29.2	
5/6/96	10:15:00	91.5	35.5	29.4	
5/6/96	10:20:00	96.5	35.8	29.7	
5/6/96	10:30:00	106.5	36.2	30.1	
5/6/96	10:40:00	116.5	36.6	30.5	
5/6/96	10:50:00	126.5	36.9	30.8	
5/6/96	11:00:00	136.5	37.1	31.0	
5/6/96	11:10:00	146.5	37.4	31.3	
5/6/96	11:20:00	156.5	37.6	31.5	
5/6/96	11:30:00	166.5	37.8	31.7	
5/6/96	11:45:00	181.5	38.1	32.0	
5/6/96	12:00:00	196.5	38.3	32.2	
5/6/96	12:15:00	211.5	38.5	32.4	
5/6/96	12:30:00	226.5	38.7	32.6	
5/6/96	13:00:00	256.5	39.8	33.7	
5/6/96	13:30:00	286.5	40.2	34.1	
5/6/96	14:00:00	316.5	40.5	34.4	
5/6/96	14:32:00	348.5	40.8	34.7	
5/6/96	15:30:00	408.5	41.1	35.0	
5/7/96	7:58:00	1394.5	43.3	37.2	
5/7/96	8:58:00	1454.5	43.3	37.2	
5/7/96	9:58:00	1514.5	43.3	37.2	
5/7/96	10:49:30	1566.0	43.1	37.0	Changed sounder
5/7/96	10:50:00	1566.5	43.2	37.1	
5/7/96	10:50:30	1567.0	43.2	37.1	
5/7/96	10:51:00	1567.5	43.2	37.1	
5/7/96	10:51:30	1568.0	43.2	37.1	
5/7/96	10:52:00	1568.5	43.2	37.1	

Table C4 (continued)

Recovery Data					
5/7/96	10:56:00	1572.5	44.4	38.3	
5/7/96	11:00:00	1576.5	44.3	38.2	
5/7/96	11:00:30	1577.0	43.5	37.4	
5/7/96	11:01:00	1577.5	41.9	35.8	
5/7/96	11:01:30	1578.0	39.9	33.8	
5/7/96	11:02:00	1578.5	38.1	32.0	
5/7/96	11:02:30	1579.0	36.5	30.4	
5/7/96	11:03:00	1579.5	35.1	29.0	
5/7/96	11:03:30	1580.0	34.2	28.1	
5/7/96	11:04:00	1580.5	33.2	27.1	
5/7/96	11:04:30	1581.0	32.2	26.1	
5/7/96	11:05:00	1581.5	31.2	25.1	
5/7/96	11:05:30	1582.0	30.8	24.7	
5/7/96	11:06:00	1582.5	30.2	24.1	
5/7/96	11:07:00	1583.5	29.1	23.0	
5/7/96	11:08:00	1584.5	28.3	22.2	
5/7/96	11:09:00	1585.5	27.3	21.2	
5/7/96	11:10:00	1586.5	26.6	20.5	
5/7/96	11:11:00	1587.5	25.8	19.7	
5/7/96	11:12:00	1588.5	24.6	18.5	
5/7/96	11:13:00	1589.5	24.3	18.2	
5/7/96	11:14:00	1590.5	24.1	18.0	
5/7/96	11:15:00	1591.5	23.1	17.0	
5/7/96	11:17:00	1592.5	23.1	17.0	
5/7/96	11:18:00	1593.5	22.6	16.5	
5/7/96	11:19:00	1594.5	22.3	16.2	
5/7/96	11:20:00	1595.5	22.0	15.9	
5/7/96	11:23:00	1598.5	21.8	15.7	
5/7/96	11:25:00	1600.5	21.3	15.2	
5/7/96	11:27:00	1602.5	20.7	14.6	Changed back to original sounder
5/7/96	11:32:00	1607.5	19.8	13.7	
5/7/96	11:37:00	1612.5	19.0	12.9	
5/7/96	11:42:00	1617.5	18.4	12.3	
5/7/96	11:47:00	1622.5	17.7	11.6	
5/7/96	11:52:00	1627.5	17.3	11.2	
5/7/96	11:57:00	1632.5	16.7	10.6	
5/7/96	12:12:00	1647.5	15.5	9.4	
5/7/96	12:27:00	1662.5	14.6	8.5	
5/7/96	12:42:00	1677.5	13.9	7.8	
5/7/96	12:57:00	1692.5	13.4	7.3	
5/7/96	13:57:00	1752.5	11.8	5.7	

APPENDIX D
M&T/PIC DIVERSION 50 FLOW DATA

M&T and PIC WBFR & BUTTE CR. WATER RIGHT

I. WBFR Water Right @ Div. 50:

(available water = Toadtown Diversion x 95%).

A. Dayton Mutual Right:

- Jan.1 to Dec 31, Flow \leq 10 cfs: Right = (Flow \div 3) i.e., evenly divided between Dayton Mutual, M&T and PIC.
- Jan.1 to Dec 31, Flow \geq 10 cfs: Right = 3.3 cfs

B. M&T and PIC (combined) Right:

- Jan.1 to Dec 31, Flow \leq 10 cfs: Right = (Flow \div 3), i.e., evenly divided between Dayton Mutual, M&T and PIC.
- Jan.1 to Dec 31, Flow \geq 10 cfs: Right = (Flow - 3.3), i.e., subtract Dayton Mutual's 3.3 cfs and divide evenly between M&T and PIC.

II. Butte Cr. Water Right @ Div. 50:

(available water = Flow at USGS Gage Nr. Chico - available WBFR Water).

A. Dayton Mutual Right:

- April 1 to Oct. 15, Flow \geq 96 cfs: Right = 16cfs.
- April 1 to Oct. 15, Flow \leq 96 cfs: Right = (Flow \div 96cfs) x 16 cfs.
- Oct. 15 to April 1, Flow \geq 25 cfs: Right = 5 cfs.
- Oct. 15 to April 1, Flow \leq 25 cfs: Right = (Flow \div 25cfs) x 5 cfs.

B. M&T and PIC (combined) Right:

- April 1 to June 15, Flow \leq 142 cfs: Right = 0 cfs.
- April 1 to June 15, Flow \geq 142 cfs: Right = next 50cfs.
- June 15 to Oct. 15, Flow \geq 134 cfs: Right = next 50cfs.
- Oct.15 to April 1, Flow \geq 25cfs: Right = next 10cfs.
- Oct.15 to April 1, Flow \leq 25cfs: Right = 0 cfs.

Note: M&T (and others) have the right to daily increases in their water right up to 2.5 times thier original right between April and October. However, thier total monthly diversion can not exceed thier calculated daily average right (in M&T and PIC's case, daily average for the month must be $<$ 50 cfs). Thus for calculations of water right based on daily mean flow, the 2.5 times option was not considered.

Butte Creek Diversion #50 Water Right vs Actual Diversion for Years Classified as Below Normal, Dry and Critical (1970 - 1995)

Breakdown of Water Rights/Divisions	1972 Water Year (below normal)			1976 Water Year (critical)				
	OCT 1-15 (ave. daily cfs)	OCT 16-31 (ave. daily cfs)	MAY (ave. daily cfs)	JUN (ave. daily cfs)	OCT 1-15 (ave. daily cfs)	OCT 16-31 (ave. daily cfs)	MAY (ave. daily cfs)	JUN (ave. daily cfs)
Available WBFR Water: Toadown Div. x 95% = USGS Gage (Butte Cr. Nr. Chico) =	36.1	36.1	104.2	84.4	54.5	54.5	9.3	88.1
Available Butte Creek Water: USGS Gage - Toadown =	124.8	124.8	331.4	207.2	167.8	167.8	217.3	136.7
Diversion 50 Rights	88.7	88.7	227.2	122.8	113.3	113.3	208.0	88.6
I. Dayton Mutual								
A. W.B.F.R. Water =	3.3	3.3	34.7	3.3	3.3	3.3	3.1	3.3
B. Butte Creek Water =	14.8	5.0	16.0	16.0	16.0	5.0	16.0	11.4
Dayton Mutual Total =	18.1	8.3	50.7	19.3	19.3	8.3	19.1	14.7
II. M&T and P.I.C.								
A. W.B.F.R. Water =	32.8	32.8	69.5	81.1	51.2	51.2	6.2	64.8
B. Butte Creek Water =	0.0	10.0	50.0	0.0	0.0	10.0	50.0	0.0
M&T and PIC Total =	32.8	42.8	119.5	81.1	51.2	61.2	56.2	64.8
Total Diversion #50 Rights (M&T, PIC & Dayton Mut.) =	50.9	51.1	170.2	100.4	70.5	69.5	75.3	79.6
Actual Div. #50 Diversion (M&T, PIC & Dayton Mut.) =	NO DATA: ASSUME FULL DAYTON DIV. & NO M&T/PIC DIV.			110.9	5.4	5.4	117.1	74.3
Surplus: (diversion right - actual diversion) =	32.8	42.8	26.7	NONE	65.1	64.1	NONE	5.2
Surplus - 40 cfs =	-6.2	2.8	-13.3	-40.0	25.1	24.1	-40.0	-34.8
Is additional Sac. Riv. Water Required to meet Historic Div. ?	-	-	Yes	Yes	No	No	Yes	Yes
Ave. Daily cfs of Sac. Riv. Required to meet Historic Div. =	-	-	13.0	40.0	-	-	40.0	34.8
COMMENTS (see notes below) :	*1,*2	*2	-	*3	-	-	*3	-
Total Monthly Sacramento River Water Needed: (cfs)			403	1,240			1,240	1,044
Total Monthly Sacramento River Water Needed: (ac-ft)			798	2,455			2,455	2,067

Total M&T/PIC Sac. Riv. Water Needed to meet Historic Div. During Wet, Dry, and Below Normal Years (1975-1995):

 Total M&T and PIC (cfs) = 22,878

 Total M&T and PIC (ac-ft) = 45,298

 M&T and PIC Acre Feet per Year = 3,484

 Average Acre Feet per Year for M&T only: 1,742 (all years), 2,006 (Dry Years), and 1,859 (Critical Years).

ASSUMPTIONS: (1) Dayton Mutual will divert total right. (2) When diversion exceeds right, assume diversion equal to right. (3) For months with No Data, assume no M&T and PIC div.

NOTES:

*1 Not enough W.B.F.R. and Butte Creek water to make 40 cfs commitment.

*2 Data incomplete.

*3 Diverted more than right assume M&T/PIC need full right (Could be due to averaging of monthly flow data).

Butte Creek Diversion #50 Water Right vs Actual Diversion for Years Classified as Below Normal, Dry and Critical (1970 - 1995)

Breakdown of Water Rights/Diversions	1977 Water Year (critical)			1979 Water Year (below normal)				
	OCT 1-15 (ave. daily cfs)	OCT 16-31 (ave. daily cfs)	MAY (ave. daily cfs)	JUN (ave. daily cfs)	OCT 1-15 (ave. daily cfs)	OCT 16-31 (ave. daily cfs)	MAY (ave. daily cfs)	JUN (ave. daily cfs)
Available WFR Water: Toadown Div. x 95% = USGS Gage (Butte Cr. Nr. Chico) =	15.2	15.2	41.6	22.4	46.9	46.9	112.2	97.6
Available Butte Creek Water: USGS Gage - Toadown =	85.0	85.0	134.2	79.6	115.7	115.7	567.1	245.6
Diversion 50 Rights								
I. Dayton Mutual								
A. W.B.F.R. Water =	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
B. Butte Creek Water =	11.6	5.0	15.4	9.5	11.5	5.0	16.0	16.0
Dayton Mutual Total =	14.9	8.3	18.7	12.8	14.8	8.3	19.3	19.3
II. M&T and P.I.C.								
A. W.B.F.R. Water =	11.9	11.9	38.3	19.1	43.6	43.6	108.9	94.3
B. Butte Creek Water =	0.0	10.0	0.0	0.0	0.0	10.0	125.0	125.0
M&T and PIC Total =	11.9	21.9	38.3	19.1	43.6	53.6	233.9	219.3
Total Diversion #50 Rights (M&T, PIC & Dayton Mut.) =	26.9	30.2	57.1	31.9	58.4	61.9	253.2	238.6
Actual Div. #50 Diversion (M&T, PIC & Dayton Mut.) =	NO DATA: ASSUME FULL DAYTON DIV. & NO M&T/PIC DIV.			41.8	NO DATA: ASSUME FULL DAYTON DIV. & NO M&T/PIC DIV.			127.4
Surplus: (diversion right - actual diversion) =	NONE			NONE	43.6	53.6	83.3	111.1
Surplus - 40 cfs =	-40.0			-40.0	3.6	13.6	43.3	71.1
Is additional Sac. Riv. Water Required to meet Historic Div. ?	Yes			Yes	-	-	No	No
Ave. Daily cfs of Sac. Riv. Required to meet Historic Div. =	38.3			19.1	-	-	-	-
COMMENTS (see notes below) :	*1,*2	*1,*2	*1,*3	*1,*3	*2	*2	-	-
Total Monthly Sacramento River Water Needed: (cfs)				1,187				
Total Monthly Sacramento River Water Needed: (ac-ft)				2,351				

Total M&T/PIC Sac. Riv. Water Needed to meet Historic Div. During Wet, Dry, and Below Normal Years (1975-1995):

 Total M&T and PIC (cfs) = 21,638

 Total M&T and PIC (ac-ft) = 42,843

 M&T and PIC Acre Feet per Year = 3,296

 Average Acre Feet per Year for M & T only: 1,649 (all years), 2,006 (Dry Years), and 1,859 (Critical Years).

ASSUMPTIONS: (1) Dayton Mutual will divert total right. (2) When diversion exceeds right, assume diversion equal to right. (3) For months with No Data, assume no M&T and PIC div.

NOTES:

*1 Not enough W.B.F.R. and Butte Creek water to make 40 cfs commitment.

*2 Data incomplete.

*3 Diverted more than right assume M&T/PIC need full right (Could be due to averaging of monthly flow data).

Butte Creek Diversion #50 Water Right vs Actual Diversion for Years Classified as Below Normal, Dry and Critical (1970 - 1995)

Breakdown of Water Rights/Diversions	1987 Water Year (dry)			1988 Water Year (critical)			
	OCT 1-15	OCT 16-31	MAY	OCT 1-15	OCT 16-31	MAY	JUN
	(ave. daily cfs)	(ave. daily cfs)	(ave. daily cfs)	(ave. daily cfs)	(ave. daily cfs)	(ave. daily cfs)	(ave. daily cfs)
Available WBFR Water: Toadown Div. x 95% =	54.9	54.9	87.8	11.9	11.9	105.4	66.5
USGS Gage (Butte Cr. Nr. Chico) =	153.0	153.0	237.7	79.3	79.3	289.8	197.3
Available Butte Creek Water: USGS Gage - Toadown =	98.0	98.0	149.9	67.5	67.5	184.4	130.8
Diversion 50 Rights							
I. Dayton Mutual							
A. W.B.F.R. Water =	3.3	3.3	3.3	3.3	3.3	3.3	3.3
B. Butte Creek Water =	16.0	5.0	16.0	11.2	5.0	16.0	16.0
Dayton Mutual Total =	19.3	8.3	19.3	14.5	8.3	19.3	19.3
II. M&T and P.I.C.							
A. W.B.F.R. Water =	51.6	51.6	84.5	8.6	8.6	102.1	63.2
B. Butte Creek Water =	0.0	10.0	7.9	0.0	10.0	42.4	0.0
M&T and PIC Total =	153.0	61.6	92.4	8.6	18.6	144.5	63.2
Total Diversion #50 Rights (M&T, PIC & Dayton Mut.) =	172.3	69.9	111.7	23.1	26.9	163.8	82.5
Actual Div. #50 Diversion (M&T, PIC & Dayton Mut.) =	45.9	45.9	130.0	20.7	20.7	132.4	76.8
Surplus: (diversion right - actual diversion) =	126.3	24.0	NONE	2.4	6.2	31.4	5.8
Surplus - 40 cfs =	86.3	-16.0	-40.0	-37.6	-33.8	-8.6	-34.2
Is additional Sac. Riv. Water Required to meet Historic Div. ?	No	Yes	Yes	Yes	Yes	Yes	Yes
Ave. Daily cfs of Sac. Riv. Required to meet Historic Div. =	-	16.0	40.0	8.6	18.6	8.6	34.2
COMMENTS (see notes below) :			*3	*1	*1	-	-
Total Monthly Sacramento River Water Needed: (cfs)		256	1,240	129	298	267	1,026
Total Monthly Sacramento River Water Needed: (ac-ft)		507	2,455	255	589	528	2,031
Total M&T/PIC Sac. Riv. Water Needed to meet Historic Div. During Wet, Dry, and Below Normal Years (1975-1995):							
Total M&T and PIC (cfs) =	21,638						
Total M&T and PIC (ac-ft) =	42,843						
M&T and PIC Acre Feet per Year =	3,296						
Average Acre Feet per Year for M & T only: 1,649 (all years), 2,006 (Dry Years), and 1,859 (Critical Years).							

ASSUMPTIONS: (1) Dayton Mutual will divert total right. (2) When diversion exceeds right, assume diversion equal to right. (3) For months with No Data, assume no M&T and PIC div.

NOTES:

*1 Not enough W.B.F.R. and Butte Creek water to make 40 cfs commitment.

*2 Data incomplete.

*3 Diverted more than right assume M&T/PIC need full right (Could be due to averaging of monthly flow data).

Butte Creek Diversion #50 Water Right vs Actual Diversion for Years Classified as Below Normal, Dry and Critical (1970 - 1995)

Breakdown of Water Rights/Divisions	1989 Water Year (dry)			1990 Water Year (critical)				
	OCT 1-15 (ave. daily cfs)	OCT 16-31 (ave. daily cfs)	MAY (ave. daily cfs)	JUN (ave. daily cfs)	OCT 1-15 (ave. daily cfs)	OCT 16-31 (ave. daily cfs)	MAY (ave. daily cfs)	JUN (ave. daily cfs)
Available WBFR Water: Toadtown Div. x 95% =	7.4	7.4	102.5	49.9	36.5	36.5	75.7	84.1
USGS Gage (Butte Cr. Nr. Chico) =	74.1	74.1	304.0	169.9	167.3	167.3	250.4	244.9
Available Butte Creek Water: USGS Gage - Toadtown =	66.8	66.8	201.5	120.0	130.8	130.8	174.7	160.8
Diversion 50 Rights								
I. Dayton Mutual								
A. W.B.F.R. Water =	2.5	2.5	3.3	3.3	3.3	3.3	3.3	3.3
B. Butte Creek Water =	11.1	5.0	16.0	16.0	16.0	5.0	16.0	16.0
Dayton Mutual Total =	13.6	7.5	19.3	19.3	19.3	8.3	19.3	19.3
II. M&T and P.I.C.								
A. W.B.F.R. Water =	4.9	4.9	99.2	46.6	33.2	33.2	72.4	80.8
B. Butte Creek Water =	0.0	10.0	50.0	0.0	0.0	10.0	32.7	18.8
M&T and PIC Total =	4.9	14.9	149.2	46.6	33.2	43.2	105.1	99.6
Total Diversion #50 Rights (M&T, PIC & Dayton Mut.) =	18.5	22.4	168.5	65.9	52.5	51.5	124.4	118.9
Actual Div. #50 Diversion (M&T, PIC & Dayton Mut.) =	NO DATA: ASSUME FULL DAYTON DIV. & NO M&T/PIC DIV.		137.1	78.6	27.1	27.1	92.5	108.3
Surplus: (diversion right - actual diversion) =	NONE		31.4	NONE	25.5	24.5	32.0	10.7
Surplus - 40 cfs =	-		-8.6	-40.0	-7.8	-15.6	-8.0	-29.3
Is additional Sac. Riv. Water Required to meet Historic Div. ?	-		Yes	Yes	Yes	Yes	Yes	Yes
Ave. Daily cfs of Sac. Riv. Required to meet Historic Div. =	-		8.6	33.4	7.8	15.6	8.0	29.3
COMMENTS (see notes below) :	*1,*2	*1,*2	-	*3	*1	*1	-	-
Total Monthly Sacramento River Water Needed: (cfs)			267	1,002	117	250	248	879
Total Monthly Sacramento River Water Needed: (ac-ft)			528	1,984	232	494	491	1,740

Total M&T/PIC Sac. Riv. Water Needed to meet Historic Div. During Wet, Dry, and Below Normal Years (1975-1995):

Total M&T and PIC (cfs) = 21,638

Total M&T and PIC (ac-ft) = 42,843

M&T and PIC Acre Feet per Year = 3,296

Average Acre Feet per Year for M & T only: 1,649 (all years), 2,006 (Dry Years), and 1,859 (Critical Years).

ASSUMPTIONS: (1) Dayton Mutual will divert total right. (2) When diversion exceeds right, assume diversion equal to right. (3) For months with No Data, assume no M&T and PIC div.

NOTES:

*1 Not enough W.B.F.R. and Butte Creek water to make 40 cfs commitment.

*2 Data incomplete.

*3 Diverted more than right assume M&T/PIC need full right (Could be due to averaging of monthly flow data).

Butte Creek Diversion #50 Water Right vs Actual Diversion for Years Classified as Below Normal, Dry and Critical (1970 - 1995)

Breakdown of Water Rights/Diversions	1991 Water Year (critical)				1992 Water Year (critical)			
	OCT 1-15 (ave. daily cfs)	OCT 16-31 (ave. daily cfs)	MAY (ave. daily cfs)	JUN (ave. daily cfs)	OCT 1-15 (ave. daily cfs)	OCT 16-31 (ave. daily cfs)	MAY (ave. daily cfs)	JUN (ave. daily cfs)
Available WBFR Water: Toadown Div. x 95% =	14.2	14.2	106.5	76.4	10.8	10.8	101.7	47.0
USGS Gage (Butte Cr. Nr. Chico) =	75.9	75.9	358.7	189.6	65.8	65.8	246.7	139.7
Available Butte Creek Water: USGS Gage - Toadown =	61.7	61.7	252.3	113.1	55.0	55.0	145.0	92.7
Diversion 50 Rights								
I. Dayton Mutual								
A. W.B.F.R. Water =	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
B. Butte Creek Water =	10.3	5.0	16.0	16.0	9.2	5.0	16.0	15.5
Dayton Mutual Total =	13.6	8.3	19.3	19.3	12.5	8.3	19.3	18.8
II. M&T and P.I.C.								
A. W.B.F.R. Water =	10.9	10.9	103.2	73.1	7.5	7.5	98.4	43.7
B. Butte Creek Water =	0.0	10.0	50.0	0.0	0.0	10.0	3.0	0.0
M&T and PIC Total =	10.9	20.9	153.2	73.1	7.5	17.5	101.4	43.7
Total Diversion #50 Rights (M&T, PIC & Dayton Mut.) =	24.5	29.2	172.5	92.4	20.0	25.8	120.7	62.5
Actual Div. #50 Diversion (M&T, PIC & Dayton Mut.) =	21.1	21.1	134.9	96.3	30.4	30.4	126.3	51.9
Surplus: (diversion right - actual diversion) =	3.4	8.1	37.6	NONE	NONE	NONE	NONE	10.6
Surplus - 40 cfs =	-36.6	-31.9	-2.4	-40.0	-40.0	-40.0	-40.0	-29.4
Is additional Sac. Riv. Water Required to meet Historic Div. ?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ave. Daily cfs of Sac. Riv. Required to meet Historic Div. =	10.9	20.9	2.4	40.0	7.5	17.5	40.0	29.4
COMMENTS (see notes below) :	*1	*1	-	*3	*1 *3	*1 *3	*3	-
Total Monthly Sacramento River Water Needed: (cfs)	164	334	74	1,200	113	280	1,240	882
Total Monthly Sacramento River Water Needed: (ac-ft)	324	662	147	2,376	223	554	2,455	1,746

Total M&T/PIC Sac. Riv. Water Needed to meet Historic Div. During Wet, Dry, and Below Normal Years (1975-1995):

 Total M&T and PIC (cfs) = 21,638

 Total M&T and PIC (ac-ft) = 42,843

 M&T and PIC Acre Feet per Year = 3,296

 Average Acre Feet per Year for M & T only: 1,649 (all years), 2,006 (Dry Years), and 1,859 (Critical Years).

ASSUMPTIONS: (1) Dayton Mutual will divert total right. (2) When diversion exceeds right, assume diversion equal to right. (3) For months with No Data, assume no M&T and PIC div.

NOTES:

*1 Not enough W.B.F.R. and Butte Creek water to make 40 cfs commitment.

*2 Data incomplete.

*3 Diverted more than right assume M&T/PIC need full right (Could be due to averaging of monthly flow data).

Butte Creek Diversion #50 Water Right vs Actual Diversion for Years Classified as Below Normal, Dry and Critical (1970 - 1995)

Breakdown of Water Rights/Diversions	1994 Water Year (critical)			
	OCT 1-15 (ave. daily cfs)	OCT 16-31 (ave. daily cfs)	MAY (ave. daily cfs)	JUN (ave. daily cfs)
Available WBFR Water: Toadown Div. x 95% =	37.8	37.8	106.6	64.8
USGS Gage (Butte Cr. Nr. Chico) =	124.5	124.5	294.9	165.8
Available Butte Creek Water: USGS Gage - Toadown =	86.7	86.7	188.2	101.1
Diversion 50 Rights				
I. Dayton Mutual				
A. W.B.F.R. Water =	3.3	3.3	3.3	3.3
B. Butte Creek Water =	14.5	5.0	16.0	16.0
Dayton Mutual Total =	17.8	8.3	19.3	19.3
II. M&T and P.I.C.				
A. W.B.F.R. Water =	34.5	34.5	103.3	61.5
B. Butte Creek Water =	0.0	10.0	46.2	0.0
M&T and PIC Total =	34.5	44.5	149.6	61.5
Total Diversion #50 Rights (M&T, PIC & Dayton Mut.) =	52.2	52.8	168.9	80.8
Actual Div. #50 Diversion (M&T, PIC & Dayton Mut.) =	28.1	28.1	6.2	88.9
Surplus: (diversion right - actual diversion) =	24.1	24.6	162.7	NONE
Surplus - 40 cfs =	-15.9	-15.4	122.7	-40.0
Is additional Sac. Riv. Water Required to meet Historic Div. ?	Yes	Yes	No	Yes
Ave. Daily cfs of Sac. Riv. Required to meet Historic Div. =	10.3	15.3	-	40.0
COMMENTS (see notes below) :	*1	-	-	*3
Total Monthly Sacramento River Water Needed: (cfs)	155	245	-	1,200
Total Monthly Sacramento River Water Needed: (ac-ft)	306	485	-	2,376

Total M&T/PIC Sac. Riv. Water Needed to meet Historic Div. During Wet, Dry, and Below Normal Years (1975-1995):

 Total M&T and PIC (cfs) = 21,638

 Total M&T and PIC (ac-ft) = 42,843

 M&T and PIC Acre Feet per Year = 3,296

 Average Acre Feet per Year for M & T only: 1,649 (all years), 2,006 (Dry Years), and 1,859 (Critical Years).

ASSUMPTIONS: (1) Dayton Mutual will divert total right. (2) When diversion exceeds right, assume diversion equal to right. (3) For months with No Data, assume no M&T and PIC div.

NOTES:

*1 Not enough W.B.F.R. and Butte Creek water to make 40 cfs commitment.

*2 Data incomplete.

*3 Diverted more than right assume M&T/PIC need full right (Could be due to averaging of monthly flow data).

**AGREEMENT FOR RELOCATION OF M&T/PARROTT PUMPING PLANT
PROVIDING FOR BYPASS OF FLOWS IN BUTTE CREEK**

RECITALS

1. M&T Chico Ranch ("M&T") and Parrott Investment Company ("PIC") are the holders of certain water rights to the waters in Butte Creek, a tributary of the Sacramento River, to serve their respective properties shown on the map attached hereto as Appendix A and incorporated herein by reference thereto. The rights include rights to divert so-called "foreign" water (i.e., waters transferred into the Butte Creek watershed from other watersheds by PG&E in connection with upstream hydroelectric facilities) and certain appropriative rights. The rights of M&T and PIC are also described and incorporated in adjudications with respect to the waters of Butte Creek. The Butte Creek waters to which M&T and PIC have rights are referred to herein as the "Butte Creek Waters".

2. M&T and PIC have entered into an Agreement dated April 22, 1991 (referred to by the parties in other documents and herein as the "M&T Agreement") concerning management, maintenance, operation, and expansion of certain water delivery facilities used by M&T and PIC to deliver Butte Creek Waters and waters diverted by M&T and PIC from the Sacramento River (such waters being referred to herein as the "Sacramento River Waters") to their respective properties. The Butte Creek Waters and the Sacramento River Waters are delivered to the properties of PIC and M&T through various canals and other works, with the water to be delivered to PIC being delivered to the northerly boundary of the PIC property.

3. The United States Fish and Wildlife Service ("FWS") and the California Department of Fish and Game ("CDF&G") are the owners of and/or have easements in certain parcels of property described in Appendix B, attached hereto and incorporated herein by reference thereto.

FWS, CDF&G, The Nature Conservancy, and PIC have entered into an agreement dated April 25, 1991 entitled Agreement Concerning Joint Management of Water and Other Matters Pertaining to Parrott Ranch Property (referred to by the parties in other documents and herein as the "Joint Management Agreement") concerning the conveyance of land (fee title and easement), management, and water supply and conveyance. The fee title and easement interests held by FWS and CDF&G were acquired from PIC, together with the nonexclusive right to use waters as specified in the Joint Management Agreement. The rights of use acquired by the FWS and CDF&G are expressly subject to the terms of the M&T Agreement. By virtue of the acquisition from PIC, and as specified in the Joint Management Agreement, FWS and CDF&G have a nonexclusive right to use Butte Creek Waters and Sacramento River Waters to be delivered through the Phelan/Parrott canal derived from the rights of PIC, subject to the terms of the M&T Agreement.

4. The United States Bureau of Reclamation (USBR) is the owner and operator of the Central Valley Project of California and, in accordance with the operations of said project, the USBR provides water to M&T under Contract No. 14-06-200-940A dated May 25, 1964.

5. M&T and PIC are the owners of a surface water pumping plant located on Big Chico Creek in Butte County, California. The pumping plant is used to provide Sacramento River Water service to lands of PIC, M&T, FWS, and CDF&G. The pumping plant is operated pursuant to the terms of the M&T Agreement.

6. (a) The parties to this agreement have acquired funding from a variety of sources to (i) relocate the pumping plant to a point on the Sacramento River, (ii) enhance the capacity of the pumping plant, and (iii) provide the pumping plant intakes with fish screens.

(b) Funding is being pursued by FWS to provide adequate downstream canal

capacity to meet the requirements of the water users. Moving and upgrading the pumping plant will enhance stream flow conditions in Big Chico Creek for the benefit of chinook salmon and steelhead. The existing pumping plant location and the new location are both shown on the map attached hereto as Appendix C and incorporated herein by reference thereto. The facilities to be constructed are described in exhibit (A).

(c) FWS and CDF&G will provide criteria for design of the fish screens, will review the design to insure it incorporates said criteria, and will inspect the construction and installation of the screens for consistency with said design. Review by FWS and CDF&G will not render them liable for defects in material and workmanship. M&T and PIC will be given an adequate opportunity to review and have input into the final plans and specifications. The plant will be constructed and completed in accordance with the final plans and specifications. PIC and M&T shall be responsible for the adequacy and operation of the pumping plant as a water diversion and delivery system. The pumping plant will be constructed in accordance with the policies and procedures established by the Wildlife Conservation Board, Ducks Unlimited, Category III, and Central Valley Project Improvement Act, hereinafter referred to as the Funding Partners. The sources of which are stated in Appendix D, attached hereto and incorporated herein by reference thereto.

(d) The Funding Partners have imposed a requirement that M&T and PIC, to whom ownership of the pumping plant will be transferred upon completion, contribute to the project by providing waters to be used by FWS and CDF&G for the enhancement of instream flows in Butte Creek to improve the habitat in that watercourse for chinook salmon and steelhead. To accomplish this purpose, the parties M&T, PIC, CDF&G, and FWS agree to forego diversion from Butte Creek of certain Butte Creek Waters that they would otherwise be able to divert to enhance instream flows

in the amounts specified herein. The term "Bypass Waters" as used in this Agreement shall mean that amount of Butte Creek Waters otherwise available to M&T and PIC for diversion that will not be so diverted during the Bypass period, as defined in Section 1 of this Agreement.

7. The parties desire to enter into agreements containing the following elements:

(a) Commitment of FWS and CDF&G, with the diligent cooperation of M&T and PIC, to assist in obtaining the full funding necessary to relocate the pumping plant, including necessary design, environmental review, construction and supervision, contingencies, power supply, and overruns, if any.

(b) Exchange of the portion of the Butte Creek Waters to be bypassed by M&T and PIC for equivalent flow of water to be available at the relocated pumping facilities in the Sacramento River so that a fixed flow of water can remain in Butte Creek to its eventual confluence with the Sacramento River for the improvement of conditions beneficial to chinook salmon and steelhead in Butte Creek. FWS and CDF&G shall diligently cooperate with M&T and PIC to finalize said exchange or otherwise obtain additional water from the Sacramento River to replace any portion of Butte Creek Waters bypassed for enhancement of instream flows so that M&T and PIC (and FWS and CDF&G, as successors to PIC with respect to the properties and interests that they hold) shall suffer no net loss in water available to them from all sources by reason hereof.

(c) PIC and M&T may divert that portion of the Bypass Waters in excess of 25 cfs that is available to M&T and PIC during the period October 1 through November 15 in any year where the water is required for seasonal waterfowl habitat on the PIC and M&T lands and withholding of the water from Bypass Waters will not harm chinook salmon and steelhead resources in Butte Creek as reasonably determined in advance by FWS and CDF&G fishery biologists.

(d) Any future policy developed by the CDF&G and FWS to provide a "Safe Harbor" concept with respect to fish screens shall be incorporated into this agreement. Furthermore, CDF&G and FWS will facilitate execution of Memoranda of Understanding, pursuant to Section 2081 of the California Fish and Game Code, and incidental take permits pursuant to Section (a) and (2)(a) of the Endangered Species Act of 1973, as amended, for appropriate state and federal listed species.

AGREEMENT

1. In recognition of the foregoing, the signatories hereto agree as follows: This agreement shall be effective and binding upon the parties upon execution, subject to the terms and conditions herein contained. Upon completion of construction and delivery of title to the pumping plant, and upon request from FWS and CDF&G delivered in writing, M&T and PIC shall not exercise their diversion rights to Butte Creek Waters and shall provide Bypass Waters past their existing point of diversion known as the Parrott-Phelan Dam on Butte Creek in the total amount of the flow of Butte Creek Waters or 40 cfs, whichever is the lesser, for the period October 1 - June 30 (the "Bypass Period"). Bypass Waters shall be left in Butte Creek to its confluence with the Sacramento River for enhancement of instream flows.

2. The amount of Bypass Waters shall be allocated between M&T and PIC as they shall agree in writing.

3. For each cfs of Bypass Waters in Butte Creek in accordance with this agreement, M&T and PIC shall be allowed, in exchange therefore, to divert an equivalent quantity ("Exchange Water") from the Sacramento River at the pumping plant proposed to be relocated under the terms and conditions of this agreement. Said Exchange Water will be ordered, delivered, and paid for as

Timing

provided in the M&T Agreement and the Joint Management Agreement regarding water management.

4. The quantities of Exchange Water provided for in paragraph 3 shall be in addition to any other water rights, quantities, or entitlement available to M&T and PIC at the pumping plant and in Butte Creek and shall in no way limit or reduce the amount of water that may be taken by said entities in accordance with their other water rights from said facilities.

5. M&T and PIC shall cooperate as required to obtain the appropriate authority for the exchange contemplated herein and the other provisions hereof from the Superior Court of the County of Butte, the Water Resources Control Board of the State of California, and the USBR. FWS and CDF&G shall cooperate as reasonably requested in obtaining such authority. The parties acknowledge that consummation of the exchange will depend upon assurance by the USBR and others that Bypass Waters in Butte Creek in fact returns to the Sacramento River (as they will be required to do in order to improve in-stream habitat for chinook salmon and steelhead).

6. FWS and CDF&G agree that if any court or administrative agency should hereafter hold or require that diverters from Butte Creek should contribute bypass flows to improve the instream flow conditions in Butte Creek, then the flows provided hereunder by M&T and PIC should be credited against any such obligation imposed on them; and FWS and CDF&G shall diligently seek to obtain such flows from other Butte Creek diverters before seeking any additional flows from M&T and/or PIC beyond those provided for herein. Notwithstanding the foregoing, this Agreement shall not constitute an admission or contention by M&T, PIC, FWS, and/or CDF&G that any such requirement for additional instream flows may lawfully be imposed or ordered.

7. FWS and CDF&G agree that as long as Bypass Waters is made available, they shall

have no further right to use any other water diverted by PIC and M&T from Butte Creek, it being understood that PIC and M&T shall be entitled to the use on their lands of any additional waters of Butte Creek available for diversion by them at the Parrott-Phelan Dam. Notwithstanding the foregoing, should additional water be available to M&T and PIC at the Parrott-Phelan Dam in Butte Creek, and neither M&T nor PIC has use for such water, then water shall be made available to FWS and CDF&G in lieu of pumped water. (from SAC River?)

8. M&T and/or PIC will operate and maintain the new pumping plant in accordance with generally accepted standards for similar facilities. General accepted maintenance standards will include, but not be limited to, regular removal of normal sediment and debris from the intake structure, regular repair and maintenance to ensure functionality of all structural components of the new plant, and compliance with all manufacturers' service requirements for maintenance of pumps, motors, and any associated equipment. All parties will diligently assist in obtaining any necessary permits for maintenance of the pumping facility.

9. Whenever Exchange Water or other water to be delivered at the pumping plant is not available or otherwise non-deliverable due to failure of supply or delivery capacity, and said failure of supply or delivery capacity is not the result of failure on the part of M&T and/or PIC to maintain and operate the pumping plant in accordance with generally accepted maintenance standards for comparable facilities, then Butte Creek Waters, up to the full quantity of PIC's and M&T's rights thereto, in excess of 25 cfs during a Bypass Period, shall be available to M&T and PIC at the Parrott-Phelan Dam on Butte Creek upon demand of M&T and PIC. Not less than seven (7) days prior to such demand, M&T and PIC shall notify FWS and CDF&G of such requirement for water, unless a shorter time is agreed to by all parties in writing. It shall be the goal of all parties to protect critical

crop, fishery, and wildlife and balance these needs in periods of shortage for the reasons specified in this paragraph.

10. M&T and PIC, and each of them, upon receiving notice from FWS and CDF&G to do so, shall take all appropriate legal action available, including the commencement, prosecution, or defense of appropriate legal or administrative action, to prevent the hostile, adverse, unreasonable demands or diversions of water by others of Butte Creek Waters above the Parrott-Phelan Dam. The parties shall cooperate to provide legal and technical support to M&T and PIC in defense of said rights as may be requested. To avoid frustration of the purpose of this agreement, FWS and CDF&G shall diligently seek to assure that Butte Creek Bypass Waters are protected against downstream diversion and remain in Butte Creek to its confluence with Sacramento River below the M&T/PIC diversion point. All parties shall diligently defend against adverse claims to Butte Creek Bypass Waters.

11. This Agreement shall never be construed as a conveyance, abandonment, sale, or waiver of any rights of PIC and M&T to Butte Creek Waters or as conferring any right whatsoever upon any person, public agency, firm, or corporation, to effect or interfere in any manner with the full rights of M&T and PIC to the use of Butte Creek Waters, in channels, sloughs, and tributaries except as specifically set forth herein. Neither M&T nor PIC warrant, represent, or guarantee the water rights from which the Bypass Waters are derived. Future judicial or administrative orders limiting or reducing such rights shall not constitute a default under this Agreement.

12. Nothing herein contained shall serve to diminish or reduce any right of M&T and/or PIC to Butte Creek Waters; nor shall FWS and CDF&G assert any ownership of such rights beyond the entitlement to use of waters expressly conferred upon them under their acquisitions from

PIC and as specified in the Joint Management Agreement and subject to the M&T Agreement, it being the intention of this agreement to provide for the delivery of equivalent quantities of water to M&T and PIC, under and in conformance with their rights to Butte Creek Waters, on the Sacramento River at the foregoing described pumping plant. Said exchange shall not, by virtue of this agreement, be considered as a contract for the supply of water from the Central Valley Project nor shall M&T and PIC be considered contractors of the Central Valley Project, it being the intention of this agreement to effectuate a change in the point of diversion of existing rights of PIC and M&T in order to permit water otherwise available for the diversion to remain in Butte Creek to its confluence with Sacramento River.

13. M&T and PIC shall remain responsible for the use, control, diversion, and rediversion of Butte Creek Waters referred to under the terms and conditions of this agreement, all as provided in the M&T Agreement and the Joint Management Agreement and the water rights referred to therein; provided, however, that neither M&T nor PIC shall have any responsibility for securing the enhanced flows in Butte Creek desired by FWS and CDF&G beyond their agreement to bypass available water as expressly stated herein. Neither FWS nor CDF&G shall be responsible for the carriage, control, and delivery of water provided to M&T and PIC (and FWS and CDF&G as specified in their respective agreements with PIC) except as expressly otherwise provided in the M&T Agreement and Joint Management Agreement between PIC, FWS, and CDF&G. No change in existing rights of M&T and PIC, as set forth in the water rights decrees, permits, and licenses for Butte Creek, or as set forth in any contracts for the delivery of water from the Sacramento River currently in force and effect, or in connection with delivery of water, the rights to which are claimed as riparian or pre-1914 appropriative rights by M&T and/or PIC, or any entitlement to the use of

water acquired by CDF&G and FWS under the Joint Management Agreement, shall be affected by the terms and conditions of this agreement.

14. The obligation to provide Bypass Waters shall commence upon the completion of the following events:

(a) Construction of the pumping plant according to approved plans and specifications, as generally described in contract No. CA-0062-0001 awarded to Montgomery Watson and delivery of title thereto, without cost, to M&T and PIC in a manner satisfactory to M&T and PIC as evidenced by their written confirmation of acceptance.

(b) Receipt of all warranties and guarantees for the satisfactory installation of the civil, electrical, and mechanical components of the pumping plant and screens, and canal improvements with assignment of enforcement rights jointly to FWS, CDF&G, PIC, and M&T.

15. In accordance with Section 8.0 of the M&T Agreement, no party to this Agreement, their agents or successors, shall argue for or contest the water rights of M&T and PIC. Nothing herein contained shall be deemed to require FWS and/or CDF&G to take any action which is contrary to the law establishing or controlling such agency, or require them to refrain from taking action required of said agency by law.

16. The operating cost of the pumping plant and the cost of capital additions, replacements, and repairs thereof shall be allocated as provided in the M&T Agreement. As between PIC, FWS, and CDF&G, the costs of delivery of water downstream of the regulating reservoir on M&T property shall be allocated between PIC, FWS, and CDF&G as provided in the Joint Management Agreement.

17. Notwithstanding anything to the contrary herein contained, the obligation of M&T

and/or PIC to provide for bypass of Butte Creek Waters for instream flow enhancement in excess of 25 cfs (13,500 acre-feet annually) during the Bypass Period (October 1 through June 30) shall be limited as hereinafter defined.

(a) The total annual cost of water pumped from the Sacramento River to replace Butte Creek Waters in excess of 25 cfs (13,500 acre-feet annually during the Bypass Period) and not to exceed 7.5 cfs (4,050 acre-feet annually during the Bypass Period) each for M&T and PIC, referred to herein as "Substitute Waters", shall not exceed a capped amount, as hereinafter defined. The amount paid for Substitute Waters each by M&T or PIC, during the initial Bypass Period shall not exceed \$17,000, referred to herein as "Capped Amount", for the entire Bypass Period. The Capped Amount shall be adjusted annually in accordance with the U.S. Department of Labor, Bureau of Labor Statistics Producer Price Indexes, Fuel and Related Products and Power Index. The Capped Amount will under no circumstances be reduced below \$17,000.

(b) If either M&T or PIC determines that it has incurred costs that exceed the Capped Amount for any Bypass Period, it shall notify FWS and CDF&G in writing not later than August 15 for the Bypass Period ending on the immediately preceding June 30. The notice shall be accompanied with supporting data and information to establish how M&T and/or PIC (whichever is the claiming party, referred to herein as the "Claiming Party") has determined that the limit has been exceeded and the extent of the excess. The Claiming Party shall provide CDF&G and FWS representatives such access as they may reasonably require to the cost and diversion records upon which the Claiming Party relies for determining that the Capped Amount has been exceeded.

(c) As soon as reasonably possible after receipt by FWS and CDF&G of a notice delivered pursuant to subparagraph (b) above, the parties shall meet and confer to determine

the best method for adjustment of bypass requirements hereunder so that the cost of Substitute Waters for ensuing Bypass Periods shall not exceed the Capped Amount specified in subparagraph (a) taking into account, to the extent possible, a reasonable balance of fisheries needs, other beneficial uses served by the waters, and the rights of M&T and PIC to incur no higher costs for Substitute Waters than the Capped Amount. The purpose of the meeting shall be to derive a method for reduction of the bypass commitment to enable a lesser use of Substitute Waters so that the cost thereof will remain within the Capped Amount.

(d) If the parties are unable to agree to an appropriate reduction as specified in subparagraph (c), then the Claiming Party shall have the right to reduce its current bypass commitment for Substitute Waters only, as specified in subparagraph (a), but only to the extent necessary to reduce its costs to the Capped Amount as specified in subparagraph (a). The agencies at their sole discretion shall have the option to reimburse the Claiming Party for the cost of the Substitute Waters in excess of the Capped Amount in lieu of the Claiming Party reducing its current bypass commitment. The inability of the parties to agree pursuant to subparagraph (c) above shall not reduce the obligation of the Claiming Party to adjust its bypass commitment in order to reduce its costs of Substitute Waters in a manner it reasonably determines will do the least harm to fisheries resources, taking into account the data reasonably available to it.

(e) If the bypass commitment of any Claiming Party is reduced pursuant to subparagraph (c) or (d) above, such reduction shall not carry over to future Bypass Periods beyond the Bypass Period next ensuing. The bypass commitment for Substitute Waters for later periods shall be restored to the full amount subject to reduction for those future years in which the limit stated in subparagraph (a) is exceeded.

18. The cost to CDF&G and FWS for water received from the Sacramento River pump station shall be the same cost per acre-foot as the cost to M&T and PIC for pumping, conveyance, and delivery charges to the PIC meter at the outlet of the regulating reservoir on M&T property. In addition, CDF&G and FWS shall pay to PIC the cost of delivery downstream of the PIC meter in accordance with the Joint Management Agreement for such waters.

19. The parties (M&T, PIC, FWS, and CDF&G) agree that the water exchange initiated in this agreement will require additional monitoring and measurement of flows to ensure compliance, both as it relates to the respective obligations of the parties to this agreement, and as it relates to the requirements of any subsequent agreement with either the USBR or State Water Resources Control Board for exchange of flows in Butte Creek for flows in the Sacramento River. The Funding Partners shall purchase and install at the new pumping facility, a flow measuring device with the capability of measuring any and all flows delivered through the pumping facility from the Sacramento River. Flow measurements will be permanently recorded and will be available to all parties to this agreement. M&T and PIC agree, subject to availability of funds provided by other than M&T or PIC, to operate the existing flow measuring device currently in existence in the canal below their Butte Creek diversion, during additional periods of diversion other than as currently required (April through October) by agreement with the California Department of Water Resources. Any additional funds provided will be applied only to additional periods of flow monitoring beyond those currently required under existing agreements. M&T and PIC agree that all Butte Creek flows so measured, will be permanently recorded and available to all parties to this agreement.

DISPUTE RESOLUTION

1. MEET AND CONFER. Should there arise a dispute among the Parties with respect to the enforcement or implementation of any provision of this Agreement the Parties shall meet and confer in good faith to attempt to resolve the dispute. If the dispute is not resolved to the satisfaction of all Parties, a complaining party may provide a written notice which sets forth a description of the dispute to each of the other Parties.

(a) Should the Parties be unable to agree upon a resolution of the dispute within 30 days of the notice from the complaining Party, that Party may either (1) commence an action to enforce the provisions of this Agreement, or (2) submit the matter for dispute resolution. A complainant Party may not commence an action to enforce the provisions of this Agreement, or commence dispute resolution procedures set forth below, unless that Party has first complied with the foregoing meet and confer provisions.

2. MEDIATION OR ARBITRATION. Following notice of commencement of dispute resolution, a mutually acceptable mediator or arbitrator will be retained to assist the Parties in resolving the issue. After giving each Party an opportunity to represent its views on the dispute, the mediator or arbitrator will issue a written decision which resolves the dispute and written notice setting forth the decision to the Parties.

(a) If the Parties are unable to mutually agree upon a mediator within 30 days of the notice which commenced the dispute resolution process, a complaining Party may commence an action to enforce the provisions of this Agreement. If a complainant Party decides to commence litigation over the dispute, the Party must provide a written notice of such intent to each of the other Parties. The written notice must be provided within 45 days of the notice which commenced the

dispute resolution process.

(b) Unless otherwise mutually agreed by the Parties, the decision of the mediator shall not be required to be implemented until 14 days after the date of the notice of the decision. If the decision of the mediator becomes the subject of litigation, implementation of the decision shall be stayed pending an order by the court.

(c) If a Party is dissatisfied with the decision of the mediator, the Party may commence an action to enforce the provisions of this Agreement. If a complainant Party decides to commence litigation over the dispute, the Party must provide a written notice of such intent to each of the other Parties. The written notice must be provided within 14 days of the notice of the mediator's decision. A failure to provide the appropriate written notice within this time period shall bar the commencement of an action to enforce the provisions of this Agreement. Any action to enforce the provisions of this Agreement must be commenced within 30 days of the notice of the litigation. A failure to commence the litigation within this time period shall bar the commencement of litigation over the dispute. In the event that such litigation is not commenced within the specified time period, the decision of the mediator shall be deemed final and shall be immediately implemented.

3. COSTS OF DISPUTE RESOLUTION. Each participating Party will bear its own costs and a proportionate share of the costs of mediation.

A Dale Hall

U.S. Fish and Wildlife Service

5/21/96

Date

Gregorio P. Sanchez

California Department of Fish and Game

5/20/96

Date

WT by *[Signature]* its

M&T Chico Ranch Vice Pres.

5-20-96

Date

Jim Brown Vice Pres.
Parrott Investment Company

5/20/96

Date

APPENDIX A LANDOWNERSHIP

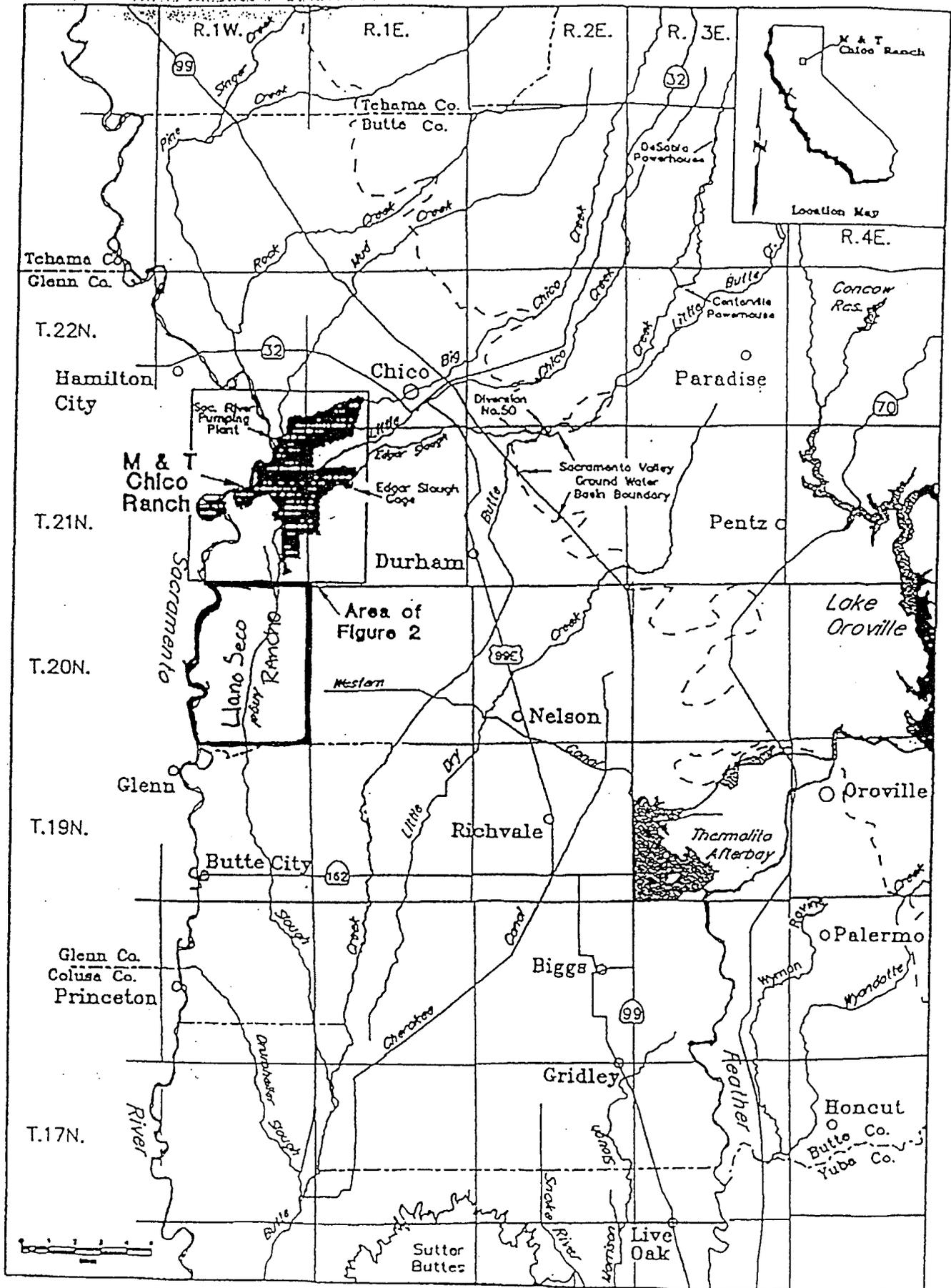
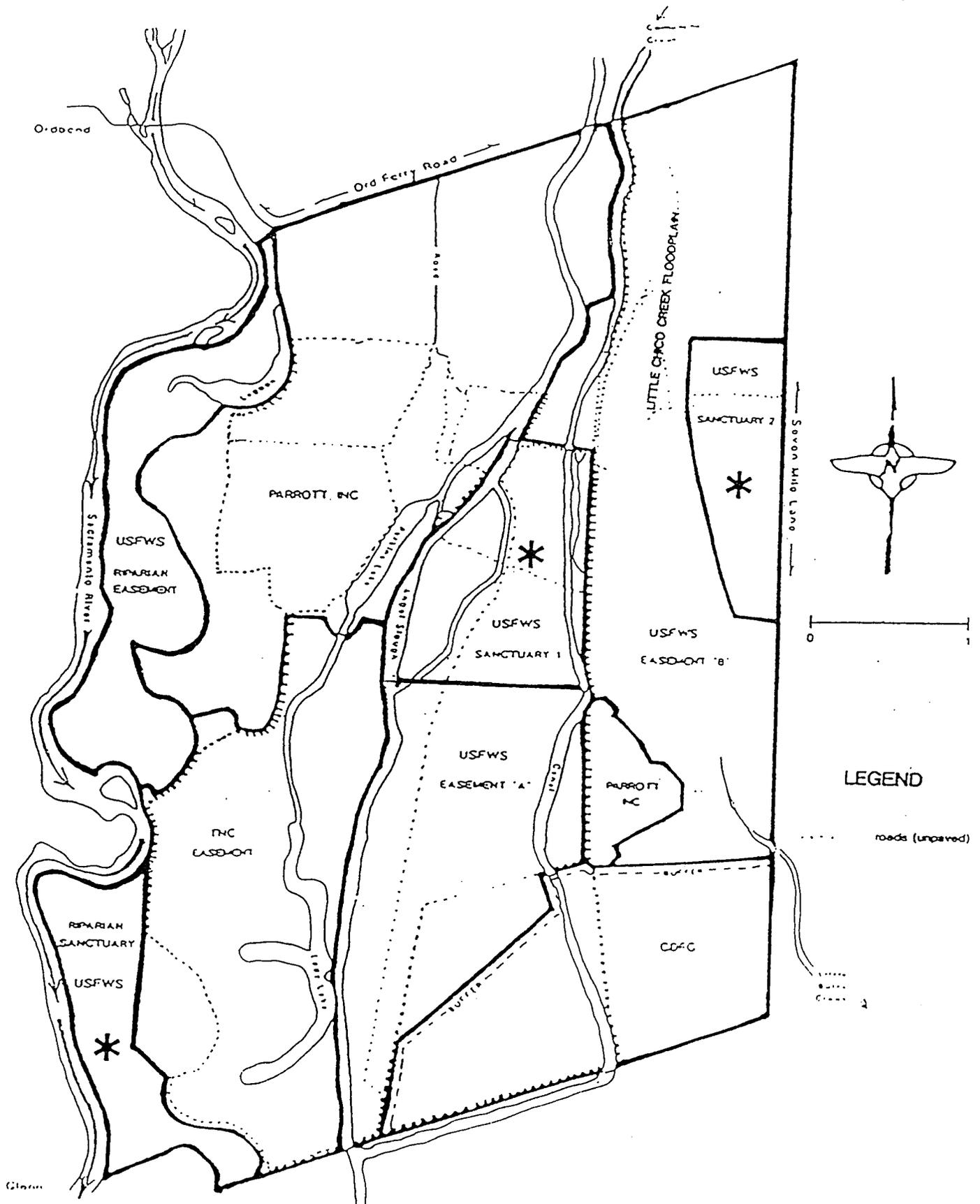


Figure 1. M & T Chico Ranch: Location Map.

APPENDIX B LANDOWNERSHIP DESCRIPTION



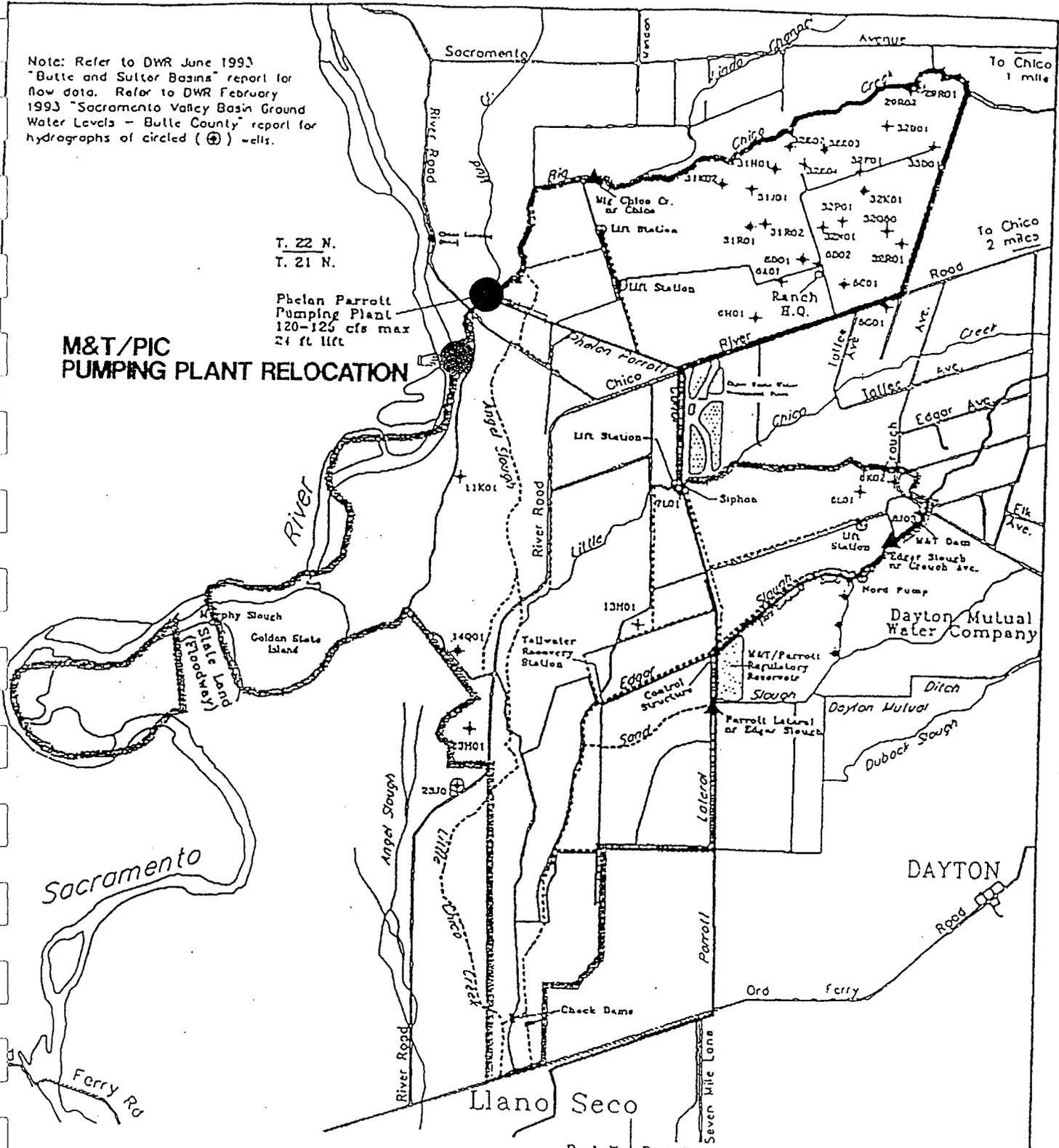
APPENDIX C PLANT LOCATION

Note: Refer to DWR June 1993 "Butte and Sutter Basins" report for flow data. Refer to DWR February 1993 "Sacramento Valley Basin Ground Water Levels - Butte County" report for hydrographs of circled (⊕) wells.

T. 22 N.
T. 21 N.

Phelan Parrott Pumping Plant
120-125 cfs max
24 ft lift

M&T/PIC PUMPING PLANT RELOCATION



LEGEND

- | | |
|-------------------------------|---------------------|
| Well (electric motor) | — Main Canals |
| Well (gearhead motor) | — Laterals |
| Well (continuously monitored) | - - - Main Drains |
| ⊕ - Partial State Well Number | — Roads |
| ⊗ Pumps, Lift Stations | — Property Boundary |
| ⊕ Caging Station | |

M & T Chico Ranch Inc.
Butte and Sutter Basins Atlas

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
NORTHWEST DISTRICT



Exhibit A

Proposed Project

U.S. Fish & Wildlife Service (FWS) and the California Department of Fish and Game (DFG), in conjunction with Ducks Unlimited and Parrott/Phelan Irrigation System (PPIS), propose construction and operation of a new water supply pumping station on the Sacramento River to replace an existing pumping station owned and operated by the M&T Chico Ranch on Big Chico Creek. M&T Chico Ranch, Parrott Investment Company (which owns the Llano Seco Rancho), FWS, and CDF&G use the pumping station for agricultural and wetland habitat management.

The old pumping station, which was constructed in the early 1900s, diverts water through a series of four unscreened pumps with a rated capacity of 135 cubic feet per second diverting water from Big Chico Creek and the Sacramento River.

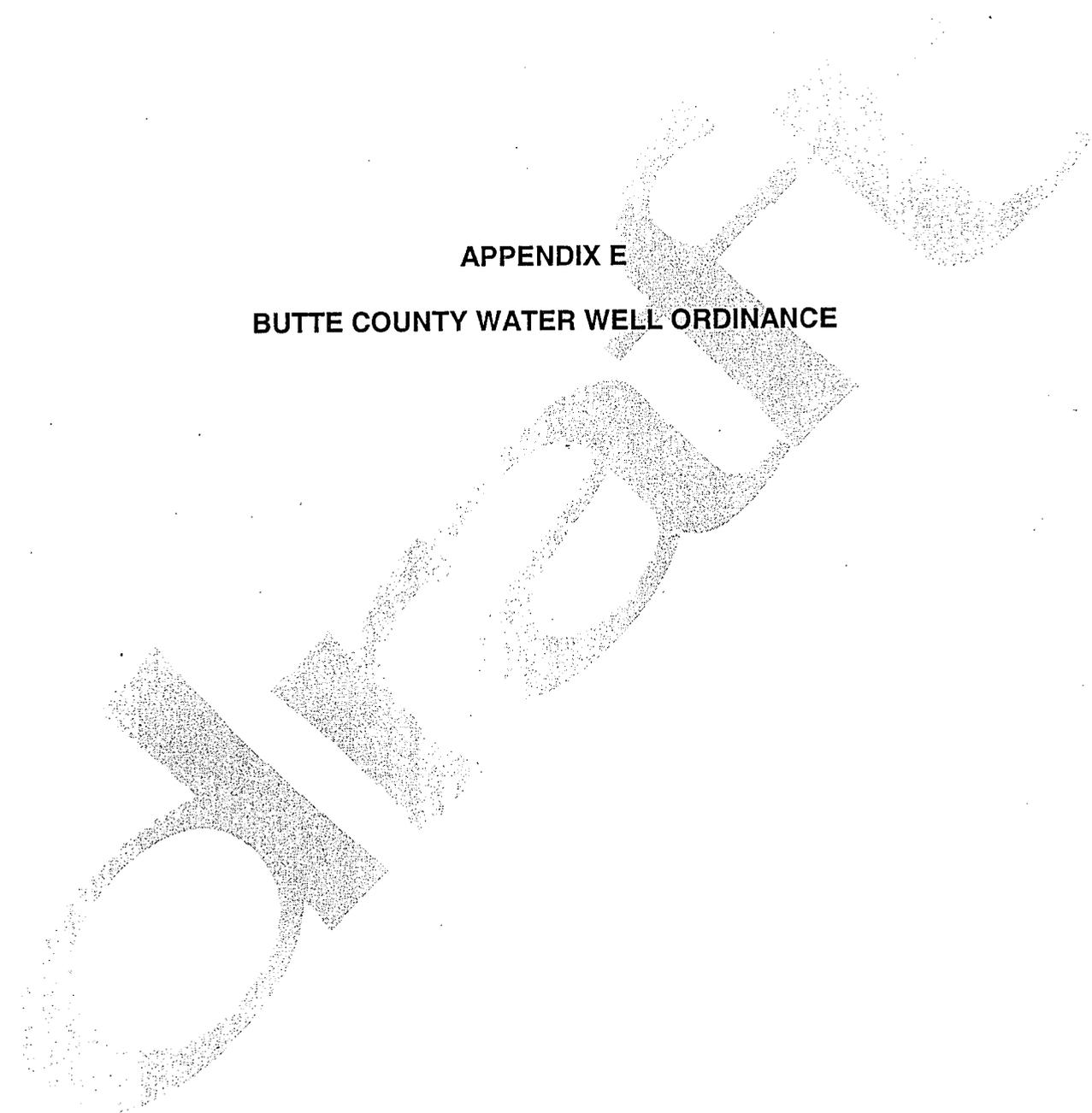
The Proposed Project is to construct and operate a screened diversion facility and pump station on the Sacramento River at river mile 192.8. The pump station would discharge into a new 72-inch diameter conveyance pipeline extending 4,388 feet east from the Sacramento River to the existing pipeline at the Phelan Canal. Water would be discharged to the Phelan Canal for distribution to M&T Chico Ranch and the Llano Seco Rancho lands for wetland management and agricultural uses. The new diversion facility, pump station, and pipeline will be owned and operated by the PPIS.

Appendix D

FUNDING SOURCES

<u>PARTNER</u>	<u>CONTRIBUTION (\$)</u>
CVPIA	2,200,000
Category III	1,550,000
Wildlife Conservation Board	500,000
Ducks Unlimited	150,000
U.S. Fish and Wildlife Service	150,000
<hr/>	
TOTAL	4,550,000

APPENDIX E
BUTTE COUNTY WATER WELL ORDINANCE



Ordinance No. _____

An Ordinance Amending Chapter 23B of the
Butte County Code, Entitled "Water Wells"

The Board of Supervisors of the County of Butte ordains as follows:

Section 1. The Water Well Ordinance, Chapter 23B of the Butte County Code, as amended to read as follows:

"Water Wells

Section 23B-1. Purposes.

It is the purpose of this Chapter to provide minimum procedures for the proper construction of water wells and for the proper destruction of abandoned wells in order to ensure that water obtained from wells within the County of Butte will be suitable for the purposes for which used and that wells constructed or abandoned pursuant to this Chapter will not cause pollution or impairment of the quality of the groundwater within the County. An additional purpose of this Chapter is to attempt to reduce potential well interference problems to existing wells and potential adverse impacts to the environment which could be caused by the construction of new wells or the repair or deepening of existing wells where a permit is required under this Chapter.

Section 23B-2. Definitions.

For the purposes of this Chapter, the following words and phrases shall have the meaning respectively ascribed to them by this section:

- (a) **Public Water Supply Well:** A water well constructed or used to supply water for domestic purposes in systems subject to the requirements of sections 4010 et seq. of the California Health and Safety Code (California State Safe Drinking Water Act), or as amended.

- (b) **Individual Well:** A well or water well meeting the definitions of wells or water wells in Chapter II, part I, general A-K (bulletin 74-81), Water Well Standards, State of California, except groundwater monitoring wells less than fifteen (15) feet in depth. This definition includes agricultural wells.
- (c) **Abandoned Well:** A well which is a public nuisance or which has not been used for a period of one (1) year and is not being properly maintained. For purposes of this definition, proper maintenance shall include but not be limited to (1) the prevention of conditions which could impair the quality of water in the well or in the water-bearing formations penetrated and (2) marking the well and keeping the surrounding area clear of brush and debris so that the well can be clearly seen. Abandoned wells shall include a well drilled to secure water but which is a "dry hole" and not to be used for water. Dry holes not cased, sealed and completed as an individual well or public water supply well shall be destroyed under permit prior to abandonment of the site by the well driller or commencement of a new drill hole. Abandoned wells shall also include drainage wells which are no longer being utilized for drainage.
- (d) **Drainage Well:** "Drainage well" shall mean any hole or well dug, drilled, bored or otherwise constructed for the purpose of disposing of storm drainage water into subsurface strata.
- (e) **Health Officer:** The Health Officer of the County of Butte or his or her authorized representative.

- (f) **Pitless Adapter:** Water-tight casing surface seal unit manufactured for the purpose of providing a leak-tight casing.
- (g) **District:** Means a district wholly or in part located within the boundaries of the county, which is a purveyor of waters for agricultural, domestic, or municipal use and which has adopted a resolution of intention to adopt a groundwater management plan for purposes of implementing the plan and establishing a groundwater management program pursuant to the provisions of Water Code Sections 10753.2, et seq. ~~This definition also includes the Butte/Sutter Basin Area Groundwater Users Corporation organized on January 21, 1992 under the non profit mutual benefit corporation law.~~
- (h) **"Groundwater":** Means all water beneath the surface of the ground, whether or not flowing through known and definite channels.
- (i) **Property owner:** Property owner and address as shown on the last Equalized Assessment Roll.
- (j) **Consolidated formation:** Hard rock-material strata of sedimentary, igneous or metamorphic rock.
- (k) **Engineered pumping capacity:** The pumping capacity of a pump in gallons per minute considering normal operating conditions and total head loss of an integrated piping/irrigation system.

Section 23B-3. Permit required.

No person, firm, association, organization, partnership, joint venture, business trust, corporation, company, Federal, State or local agency, or special district formed under the laws of this state shall, within the

unincorporated area of the County of Butte, construct, repair or deepen any public water supply well, or individual well, or destroy any abandoned well unless a written permit has first been obtained from the health officer as provided in this Chapter.

Section 23B-4. Permit application.

Applications for permits shall be made to the health officer together with the required fee established by ordinance by the Board of Supervisors of the County of Butte. If construction, repair, deepening or destruction of a well is begun prior to obtaining a permit, the fee for such permit may be doubled, but shall not relieve any person from fully complying with the provisions of this Chapter nor from any other penalties described in this Chapter. Applications shall be made on forms provided by the health officer. Applications for permits to construct, repair or deepen a well shall include the following information:

- (a) Location of the well on the property/parcels and the location and size in acreage of the contiguous properties, assessor's parcel number, township, range and section of the parcels to be served.
- (b) Name, address and contractor's license number of the person who will construct the well.
- (c) The proposed depth of the well.
- (d) Proposed use of the well.
- (e) An accurate plot plan which will show ~~within a radius of two hundred (200)~~ feet the following:

- (1) Property lines with dimensions and existing and proposed buildings.
 - (2) Sewage disposal systems, sewer lines, and any other works carrying or containing sewage within 200' of the proposed well.
 - (3) All intermittent perennial, natural or artificial bodies of water or watercourses.
 - (4) All other existing wells.
 - (5) The approximate surface drainage pattern of the property and areas subject to flooding.
 - (6) Location of the well to be constructed, repaired, or deepened.
 - (7) Wells subject to Section 23B-5b.
- (f) Proposed diameter of the well casing and type of construction for the well to be constructed, repaired, or deepened and the engineered pumping capacity of the pump to be installed or replaced.
- (g) Such additional information as reasonably required by the health officer. Applications for permits to destroy an abandoned well shall

include such information as the health officer deems necessary.

(h) The Health Officer is authorized to reduce the amount of information required to be included in a permit application for any well which comes within Section 23B-5c.

Section 23B-4a. Coordination of review of permit application by local agency having adopted a groundwater management plan; and notification of contiguous parcel owners.

(a) If a permit application is for a well located within the boundaries and/or service area of a local agency which has adopted a groundwater management plan pursuant to part 2.75 of Division 6 of the California Water Code (commencing at Section 10750), then the health officer shall give such local agency at least thirty (30) days to review and comment on the permit application before the health officer acts on the application. Provided further that whenever an application to drill a well within the boundaries or service area of a local agency is received; the health officer shall submit a copy of the application to the local agency if requested by the local agency.

(b) ~~Additionally, any~~ Any person, public or private agency, at the time of application for a permit to drill a well with a casing diameter in excess of eight inches (8") ~~or a public or private monitoring well~~ shall deliver a copy of the well application by mail to the last known address of all ~~contiguous~~ parcel owners within the area defined in Section 23B-5b. The health officer shall issue a permit not sooner than thirty (30) working days after receiving a declaration or affidavit stating compliance with this notice requirement or receiving other evidence of compliance with this Section.

(c) Any person, public or private agency, at the time of application for a permit to drill a monitoring and/or mitigation well shall deliver a copy of the well application by mail to the last known address of all contiguous parcel owners.

Section 23B-5. Well standards.

Standards for the construction, repair, reconstruction, deepening, abandonment and destruction of wells in Butte County shall be as specified within Bulletin 74-81, Water Well Standards, State of California, except where superseded by state or federal law or modified by resolution of the Board of Supervisors.

Section 23B-5a. Pumping capacity and parcel size.

The pumping capacity of the pump for a well required to have a new permit under this Chapter after 1996, shall not be greater than 50 gallons per minute per acre to reasonably serve the overlying land, including contiguous parcels of land under the same ownership as the land upon which the well is located. The total of the pumping capacities of the pumps for the new well and all existing wells (excepting wells which are exempt under Section 23B-5c(1) and Section 23B-5c(4)) located within the applicable parcels shall not exceed 50 gallons per minute per acre.

Section 23B-5b. Well spacing requirements.

After 1996, any well required to have a new permit under this Chapter with a pump having an engineered pumping capacity stated below shall be located not closer from an existing well than as indicated on the graph entitled, "Well Spacing Requirement" and dated March 1, 1995, which graph is incorporated herein by reference, except that one well may be located within a parcel so long as the well is in compliance with Section 23B-5a. Where a new well complies with Section 23B-5a but cannot comply with this

Section 23B-5b, the Health Officer shall require that the well's location comply with the well spacing requirement to the extent reasonably possible. All wells with an engineered pumping capacity of greater than 5,000 gallons per minute must apply for a variance under this Chapter. The following table shows examples of the engineered pumping capacity to well spacing requirement:

<u>Engineered Pumping Capacity</u>	<u>Well Spacing Requirement</u>
<u>1,000 gallons per minute</u>	<u>450 feet</u>
<u>2,000 gallons per minute</u>	<u>1,150 feet</u>
<u>3,000 gallons per minute</u>	<u>1,700 feet</u>
<u>4,000 gallons per minute</u>	<u>2,200 feet</u>
<u>5,000 gallons per minute</u>	<u>2,600 feet</u>
<u>Greater than 5,000 gallons per minute</u>	<u>Variance shall be required</u>

Section 23B-5c. Exempt wells.

The following wells shall not be subject to Sections 23B-5a and 23B-5b, except as noted herein:

- (1) A well with an eight-inch or smaller diameter well casing.
- (2) The repair or deepening of an existing well which requires a permit under this ordinance if the engineered pumping capacity of the pump is not increased.
- (3) Replacement of a well that is destroyed in accordance with this Chapter with a pump that has the same engineered pumping capacity as

the pump for the well that is destroyed and within 100 feet of its location.

(4) Limited purpose wells, including:

(A) Frost protection well where the well shall only be operated during the crop frost seasons. These wells shall be subject to Section 23B-5b and not Section 23B-5a.

(B) Well which is only used for fire suppression.

(C) Monitoring and mitigation wells.

(5) Public water supply wells located within the public water supply agency's service area, except that the Section 23B-5b well spacing requirements shall apply to new public water supply wells as they relate to existing wells located outside of the public water supply agency's service area.

Section 23B-6. Persons to whom permits shall be granted.

Permits shall be granted pursuant to this Chapter only to persons licensed to drill water wells, pursuant to the provisions of Business and Professions Code section 7000 et seq., or to the owner of the property or authorized representative.

Section 23B-6a. Persons permitted to drill a well.

All wells shall be drilled only by a person licensed to drill water wells pursuant to the provisions of Business and Professions Code section 7000 et seq.

Section 23B-7. Permit valid for one year.

Permits issued pursuant to this Chapter shall be valid for one (1) year from date of issuance and shall automatically become void one (1) year from the date of issuance unless renewed prior to the expiration date. One (1) renewal may be granted by the health officer for a fee of half the original application fee.

Section 23B-8. Filing of well driller's report.

Upon completion of a well, the owner or licensed well driller shall file a copy of a well driller's report with the health officer. Said report shall be filled out completely, signed by the well driller and shall be in the same form and content as the California State Department of Water Resources Well Driller's Report, and shall include such other information as will enable the health officer to determine that the well was installed in compliance with the standards required by this Chapter and required well standards. This provision shall not be deemed to release any person from the requirement to file said report with the State Department of Water Resources. No work shall be deemed to have been completed until the well driller's report has been received by the health officer.

Section 23B-8a. Well registration.

~~Well owners within the county may register their wells drilled at a time when permits were not required by completing and filing with the health officer a well registration form prescribed by the county. The well registration information will assist the county in administering this Chapter.~~

Owners of existing wells within the county may register their wells by completing and filing with the Health Officer a well registration form prescribed by the county. The well registration information will assist the County in administering the Chapter and, in

cooperation with water agencies within the county, in developing groundwater management plans.

Section 23B-9. Inspections.

- (a) The health officer or his designated representatives are hereby empowered to enter upon private property in order to make inspections for the purpose of enforcing the provisions of this Chapter, as it relates to well construction. A final inspection of the work performed on any well pursuant to this Chapter shall be made by the health officer unless such inspection is waived by him. No permittee shall be deemed to have complied with this chapter or his permit until such inspection has been either made and the installation approved, or waived.
- (b) The Butte County Health Department, Division of Environmental Health, shall be notified a minimum of twenty-four (24) hours prior to installing or placing a sanitary seal. Driller's who anticipate completing a well in less than a day may notify the health officer twenty-four (24) hours prior to commencement of drilling and provide the anticipated time to commence the sanitary seal. If the health officer fails to appear at the well site at the time designated for sealing, the well may be sealed without the presence of the health officer.

Section 23B-9a. Drainage wells prohibited.

The installation or construction of drainage wells within the unincorporated area of the County of Butte is prohibited. Abandoned existing drainage wells shall be destroyed under a well permit in a manner approved by the health officer. The health officer may approve subsurface drainage trenches meeting the location and depth requirements for individual sewage disposal

leaching fields for the temporary disposal of drainage where no other drainage method is feasible. Permits for other types of recharge or injection wells shall not be issued by the health officer without written approval of the California State Regional Water Quality Control Board.

Section 23B-9b. Well sealing.

In addition to well sealing requirements specified within State Well Standards Bulletin 74-81, all wells ⁻⁶⁰⁰⁰ ~~with casing diameters greater than eight (8) inches~~ shall be sealed to minimize the risk of introducing shallow water contamination into a deep aquifer. The sanitary seal shall be of sufficient depth to exclude water encountered above the fifty (50) foot depth. Unless otherwise specified by the Health Officer the ~~maximum required sealing depth shall be fifty (50) feet.~~ seal shall be extended five (5) feet into the first consolidated formation encountered below fifteen (15) feet to a maximum required sealing depth of fifty (50) feet.

Section 23B-9c. Flood protection.

Whenever possible, wells shall be located outside of any area subject to flooding. If it is not possible to locate a well outside of a flood area, the well casing shall extend ~~one (1) foot~~ three (3) feet or more above the one hundred (100) year flood elevation. Within "areas of special flood hazard," as defined in Section 26-29 of this Code, for which flood elevations have been established, the casing shall terminate ~~one (1) foot~~ three (3) feet or more above the established one hundred (100) year flood elevation. The Health Officer may accept an approved water-tight "pitless adapter" as a means to provide flood protection for an individual well to serve a single family residence.

Section 23B-9d. Well casing.

In addition to the well casing requirements of State Well Bulletin 74-81; unless otherwise approved by the Health Officer, the minimum thickness of steel casing shall be 3/16 inch.

Section 23B-10. Violations; penalties.

Any construction, repair or reconstruction of any well or any destruction of any abandoned well in violation of the provisions of this chapter shall constitute a misdemeanor punishable as prescribed in section 1-7 of this Code; provided, however, that nothing herein shall be deemed to abrogate or annul the right to enjoin or abate such violations by civil action.

Section 23B-11. County action not guarantee.

This Chapter shall not be construed imposing upon the County any liability or responsibility for damage resulting from defective construction, repair or reconstruction of any well or any destruction of any abandoned well or for damage to or interference with wells on adjoining or other properties. Further, neither the issuance of a permit pursuant to this Chapter, final inspection of work performed on any well pursuant to this Chapter nor the waiver of such final inspection shall be, nor construed, to be, a guarantee by the County of Butte that suitable water in sufficient quantity is available from any well.

Section 23B-12. Water quality requirement.

Any well which produces water with a water quality greater than 2,500 parts per million of total dissolved solids shall be destroyed in accordance with this Chapter unless the well owner can prove to the satisfaction of the Health Officer that the well can be sealed to prevent the lower quality water from entering the well and that result is actually achieved.

Section 23B-13. Minimum well depth of new individual wells for domestic purposes.

It shall be the responsibility of the well owner to insure that a new individual well for domestic purposes will operate properly assuming a repeat of the groundwater conditions experienced during the period 1987 through 1994 in the area in which the new well is located."

Section 23B-14. Variances.

Upon application therefor and after notice is given as required under this Chapter, the Health Officer may issue a variance permit and shall prescribe thereon such conditions as, in the Health Officer's judgment, are necessary to carry out the purposes of this Chapter. If the Health Officer needs the advice of an expert geologist or groundwater hydrologist in order to make a decision on the variance application, the Health Officer may retain such expert and the costs shall be borne by the applicant. The Health Officer shall inform the applicant of the not-to-exceed cost of such expert advice before the cost is incurred, and the applicant may withdraw the variance application before any such costs are incurred. Following the issuance of a variance, the Health Officer shall not issue a well permit for a period of fifteen (15) days.

Section 23B-15. Appeal.

- (a) Any person whose application for a permit or for an approval has been revoked or denied, may, within thirty (30) days after the date of such denial or revocation, appeal therefrom in writing, accompanied with the appropriate appeal fees, to the Board of Supervisors. Upon the filing of a sufficient and proper appeal and payment of the fees provided for in this Chapter, the Clerk of the Board shall fix a time and place for a

public hearing. The Board shall affirm or overrule the denial or revocation. This section does not authorize appeals to the Board from any action of the Health Officer authorized or required by state law or regulation.

(b) Any person, may, within fifteen (15) days after the date of the issuance of a variance under this Chapter, appeal therefrom in writing, accompanied with the appropriate appeal fees, to the Board of Supervisors. Upon the filing of a sufficient and proper appeal and payment of the fees provided for in this Chapter, the Clerk of the Board shall fix a time and place for a public hearing. The Board shall affirm or overrule the issuance of a variance. This section does not authorize appeals to the Board from any action of the Health Officer authorized or required by state law or regulation.

(c) If the Board needs the advice of an expert geologist or groundwater hydrologist in order to make a decision on the appeal, the Board may retain such expert advice, and the costs shall be borne by the appellant. The Board shall inform the appellant of the not-to-exceed cost of such ~~expert~~ advice before the cost is incurred and the appellant may withdraw the appeal before any such costs are incurred. If the Board needs to retain an expert, then the hearing on the appeal may be continued for up to sixty (60) days so as to allow the expert time to investigate and to write a report on the results of that investigation. The Report shall be a public document and a

copy of the report shall be given to the appellant.

- (d) At the hearing of an appeal to the Board of Supervisors, any interested party may present oral or written evidence. Following the hearing, the Board shall render a decision upon the appeal and may sustain, modify, or reverse any action of the Health Officer. The decision of the Board shall be final.

Section 23B-16. Fees and Notices.

- (a) Permit Processing Fee. A processing fee shall be paid together with and in addition to any other permit application fee payable pursuant to Section 23B-4 and Chapter 43 of this Code, as to any application to construct, repair or deepen any well with a well casing larger than 8 inches.

- (b) Variance and Appeal Fees. Any person filing an application for a variance permit or an appeal shall pay a fee equal to the actual cost for county employees' time in reviewing and otherwise processing, the application and for the county's costs of publishing hearing notices. The fees will be payable as follows:

(1) The application shall be accompanied by an initial fee deposit paid to the Health Officer.

(2) When the initial deposited funds are depleted to an amount equal to twenty-five (25) percent of the original

deposit, no additional processing of the application will occur until the applicant or appellant deposits with the Health Officer sufficient funds to restore a balance equal to the amount required by Chapter 43 of this Code, unless a lesser amount is approved by the Health Officer. In the event the applicant or appellant does not provide sufficient funds to continue processing the application or appeal, the application or appeal will be denied.

(3) All deposited funds shall be maintained in a separate budget control account.

(4) After final action on the application or appeal, any funds remaining in the account shall be returned to the applicant or appellant. If the actual cost for county employees' time and publishing are less than the money deposited, the remaining amount shall be returned. If the costs are greater than the money deposited, the applicant or appellant shall pay the additional amount. In the event that payment is not received for the additional amount within thirty (30) days' notice by the Health Officer or the Clerk of the Board of Supervisors, as applicable, by first class mail, the matter

will be immediately referred to Central Collections. [Source: Butte County Code Section 3-44.1]

(c) Notices.

- (1) Variances. A notice of application for a variance shall be mailed to the property owners located within the area specified under Section 23B-5b, including the owners of all wells registered with the County pursuant to Section 23B-8a or identified by the applicant in the application. Such notice shall be mailed at least fifteen (15) days before the Health Officer shall take action on the variance.
- (2) Appeals. A notice of hearing on an appeal shall be both published in a newspaper of general circulation in accordance with Government Code Sections 6060 and 6061 and be mailed to the owners of all property located within the area specified under Section 23B-5b, including the owners of all wells registered with the County pursuant to Section 23B-8a or identified by the applicant in the application.
- (3) The notice shall be mailed to the property owners at their last-known addresses using the latest equalized assessment roll of the County of Butte or

from the Section 23B-8a well registration roll. The notice shall indicate the time, date and place of the hearing and the location of the subject well property. Notice is not required to be given to property owners who are served by a public water supply well and notice shall instead be given to their public water supplier. Failure of any property owner to receive such a notice shall not affect in any manner the action taken by the Board of Supervisors.

Section 2. Severability.

If any part of this ordinance shall be held void by a court of competent jurisdiction, such part shall be deemed severable, and the invalidity thereof shall not affect the remaining parts of this ordinance.

Section 3. CEQA Findings.

The Board finds, pursuant to Title 14 of the California Code of Regulations ("CCR"), Section 15378, that adoption of this ordinance is exempt from the requirements of the California Environmental Quality Act (CEQA) for the following reasons, each of which is sufficient in and of itself to support this findings:

A. ~~Adoption of the ordinance~~ is not a "Project" under CEQA, in that it does not have a potential for resulting in a detrimental physical change in the environment, directly or ultimately, as provided in CCR Section 15378(a);

B. It can be seen with certainty that there is no possibility that adoption of this ordinance may have a significant effect upon the environment pursuant to CCR Section 15061(b)(3); and

C. Adoption of this ordinance is an action by a regulatory agency that will maintain, enhance, and protect the natural groundwater resource and the environment of the County and the regulatory process in the ordinance involves procedures for the protection of the environment and is therefore categorically exempt pursuant to CCR Sections 15307 and 15308.

Section 4. Effective Date and Publication.

This Ordinance shall be and it is hereby declared to be in full force and effect from and after thirty (30) days after the date of its passage; and before the expiration of fifteen (15) days after its passage, this Ordinance shall be published once with the names of the members of the Board of Supervisors voting for and against it in the _____, a newspaper published in the County of Butte, State of California.

PASSED AND ADOPTED by the Board of Supervisors of the County of Butte, State of California, on the _____ day of _____, 1995, by the following vote:

AYES:

NOES:

ABSENT:

NOT VOTING:

ED McLAUGHLIN, Chair of the
Butte County Board of Supervisors

ATTEST:

JOHN S. BLACKLOCK
Officer and Clerk of the Board

By _____

APPENDIX F

**MEASURE G, AN ORDINANCE TO PROTECT THE GROUNDWATER RESOURCES
IN BUTTE COUNTY**

AN ORDINANCE TO PROTECT THE GROUNDWATER RESOURCES IN
BUTTE COUNTY

1.01 PURPOSES

The People of the County hereby find and declare:

- (a) The groundwater underlying Butte County provides the people and lands of Butte County with water for agricultural, domestic, municipal, and other purposes.
- (b) The groundwater underlying Butte County is a significant water resource which must be reasonably and beneficially used and conserved for the benefit of the overlying land by avoiding extractions which harm the Butte Basin aquifer, causing exceedence of the safe yield or a condition of overdraft.
- (c) It is essential for the protection of the health, welfare, and safety of the residents of the County, and the public benefit of the State, that the groundwater resources of Butte County be protected from harm resulting from both the extraction of groundwater for use on lands outside the County and the substitution of groundwater for surface water transferred outside the County.
- (d) The County seeks to foster prudent water management practices to avoid significant environmental, social, and economic impacts. It is therefore essential for the protection of the County's important groundwater resources that the County require a permit to extract groundwater for use outside the County and for the substitution of groundwater for surface water that has been used in the County and is now voluntarily transferred outside the County, to protect against groundwater overdraft and to insure that the safe yield of the groundwater aquifers and subbasins are not exceeded. This chapter is not intended to regulate groundwater in any other way.
- (e) In adopting this chapter, the County in no way intends to limit public entities management of groundwater in accordance with the Groundwater Management Act and any other applicable laws.

2.01 DEFINITIONS

The definitions set out in this section shall apply to this chapter.

- (a) "Aquifer" means a geologic formation that stores, transmits and yields significant quantities of water to wells and springs.
- (b) "Association" means the Butte Basin Water Users Association.
- (c) "Board" means the Board of Supervisors of Butte County.

- (d) "Commission" means the Butte County Water Commission, which shall be a nine (9) person Commission appointed by the Board. The Commission shall include one member from each Board district and four members at large of which two (2) are landowners of property served by district water and two (2) are landowners served by private wells.
- (e) "County" means the County of Butte.
- (f) "District" means a district wholly or in part located within the boundaries of the County, which is a purveyor of water for agricultural, domestic, or municipal use.
- (g) "Department" shall mean the Butte County Health Department.
- (h) "Groundwater" means all the water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water, but does not include water which flows in known and definite channels.
- (i) "Groundwater Management Act" means Water Code Section 10750 et seq.
- (j) "Hydraulic gradient" means the slope of the water table.
- (k) "Hydrology" means the origin, distribution, and circulation of water through precipitation stream flow, infiltration, groundwater storage, and evaporation.
- (l) "Overdraft" means the condition of an aquifer where the amount of water withdrawn by pumping exceeds the amount of water replenishing the aquifer over the water year and also the point at which extractions from the aquifer exceed its safe yield plus and temporary surplus.
- (m) "Percolation" means the movement of water through the soil to the groundwater table.
- (n) "Permeability" means the capability of the soil or another geologic formation to transmit water.
- (o) "Piezometric surface" means the surface to which the water in a confined aquifer will rise.
- (p) "Porosity" means voids or open spaces in alluvium and rocks that can be filled with water.
- (q) "Recharge" means flow to groundwater storage from precipitation, irrigation, infiltration from streams, spreading basins and other sources of water.
- (r) "Safe Yield" means the maximum quantity of water which can be withdrawn annually from an aquifer under a given set of conditions without causing overdraft or adverse water quality conditions.

- (s) "Saline Intrusion" means the movement of salt water into fresh water aquifers.
- (t) "Specific Capacity" means the volume of water pumped from a well in gallons per minute per foot of draw down.
- (u) "Spreading Water" means discharging native or imported water to a permeable area for the purpose of allowing it to percolate to the zone of saturation. Spreading, artificial recharge and replenishment all refer to operations used to place water in a groundwater table.
- (v) "Subbasin" means one of the four subbasins within the County, including the East, Butte Palermo, Vina, and West Butte subbasins defined by the California Department of Water Resources.
- (w) "Technical Advisory Committee" means a five (5) person committee nominated by the Commission and appointed by the Board. They each must have substantial expertise in water management and hydrology.
- (x) "Transmissivity" means the rate of flow of water through the aquifer.
- (y) "Water Table" means the surface or level where groundwater is encountered in a well in an unconfined aquifer.
- (z) "Water Year" means the year beginning February 1 and ending the last day of the following January.
- (aa) "Zone of Saturation" means the area below the water table in which the soil is completely saturated with groundwater.

3.01 GROUNDWATER PLANNING PROCESS

The Association, unless otherwise designated by the Water Commission, shall present the reports described in this section to the Department by January 15 of each year. These reports shall guide groundwater planning within County and shall be considered in accordance with section 4.05.

- (a) A groundwater status report based upon the data gathered and analyzed pursuant to section 3.02.
- (b) Using groundwater data for at least the prior twenty (20) years, a report that analyzes the amount of groundwater pumping that can occur during the water year within each County subbasin without exceeding the safe yield for each subbasin.

3.02 GROUNDWATER MONITORING

- (a) The Water Commission through the Department, in cooperation with the Technical Advisory Committee, the Association, the California Department of Water Resources and the Regional Water Quality Control Board, shall develop and coordinate a county-wide groundwater monitoring program.
- (b) Specific monitoring wells shall be identified. Permission to enter tpropertytry on which each well is located and to take groundwater level measurement shall be obtained voluntarily from the well owner. If permission cannot be obtained, then another well shall be selected.
- (c) Groundwater level measurements shall be taken from all designated monitoring well at least four (4) times per year, during the months of March, July, August, and November.
- (d) Each district and city within the county shall be requested to submit copies of all its groundwater monitoring reports to the Department as such reports are completed but no later than December 1 of each year. The Department shall also encourage individuals to voluntarily provide any available groundwater data.

4.01 PERMIT REQUIRED FOR GROUNDWATER EXTRACTION FOR USE OUTSIDE OF THE COUNTY

It shall be unlawful to extract groundwater underlying County for use of that groundwater so extracted, outside County without first obtaining a permit as provided in this chapter. A permit is not required pursuant to this section if the groundwater is used within the boundaries of either a district or on a contiguous parcel of any property owner which is in part located within County and in part in another county, where such extraction quantities and use are consistent with historical practices of the district or the property owner. The groundwater extractor shall have the burden of supporting and assertion of an historical practice with competent evidence.

4.02 PERMIT REQUIRED FOR GROUNDWATER SUBSTITUTE PUMPING

It shall be unlawful to extract groundwater underlying County for use on a parcel or parcels of land within the County in substitution for surface water which would otherwise be used to serve the parcel or parcels and which surface water is purposed to be transferred for use outside County, without first obtaining a permit as provided in this chapter. A permit is not required pursuant to this section if changed cropping patterns render the use of the surface water infeasible or if the transferred surface water is used within the boundaries of either a district or on a contiguous parcel of any property owner which is in part located within County and in part in another county, where such quantity and use are consistent with historical practices of the district or the property owner. The transferor shall have the burden of supporting an assertion of infeasibility or as historical practice with competent evidence. No permit is required if surface water rights have been permanently relinquished by the property owner.

4.03 EXEMPTIONS

This chapter shall not apply to the temporary extraction of groundwater to prevent the flooding of lands or to prevent the saturation of the root zone of farm land.

4.04 APPLICATION FOR PERMIT

An application for a permit pursuant to this chapter shall be filed with the Department on forms provided by the Department and shall contain all information required by the Department. The Department shall require the following information in an application for a permit under section 4.02.

- (a) Name, address, telephone number, and fax number (if any) of the applicant.
- (b) The amount of surface water available to the land and the amount proposed to be transferred, the transfer period, the physical source of the surface water to be transferred, the applicable surface water right held by the applicant, and the name, address, telephone number, and fax (if any) of the proposed transferee.
- (c) A list of all parcels of land where surface water deliveries are to be reduced.
- (d) A list of wells, including the maximum engineered pumping capacity of each well's pump and motor, which are proposed to participate in the groundwater substitute pumping program and their location.
- (e) A list of all wells located within the well spacing requirements of the wells listed under subsection (d) of this section along with certification that the owners of such wells have received notice of the application. The well spacing requirements are set forth in Section 23B-5b of this code.
- (f) A map showing the location of all parcels and wells identified under subsections (c), (d), and (e) of this section.
- (g) A groundwater hydrology report paid for or otherwise provided by the applicant identifying adverse impacts on wells listed in subsection (e) and any other agricultural well likely to experience significant adverse impacts. The report shall be prepared by a qualified hydrologist or licensed professional civil or agricultural engineer.
- (h) A description of the proposed monitoring program and the pumping curtailment??
- (I) A description of the proposed mitigation program for and identified third party impacts which may specify a dollar amount held in a trust account to satisfy potential third party claims.
- (j) Such additional information as required by the Department.

Concurrently, a request for environmental review shall be filed as required by applicable County CEQA guidelines. The application for a permit and request for environmental review shall be accompanied by the required fees established by the Board not less than every two (2) years.

4.05 PROCEDURES FOR PROCESSING

- (a) Within ten (10) calendar days of filing of the permit application, the Department shall provide public notice by publication in a newspaper of general circulation in Butte County, and posting at the courthouse at Oroville and the Department office in Chico that an application has been filed, shall send a copy of the notice to all districts and cities within the County and to any interested party who has made a written request to the Department for such notice within the last 24 calendar months. The Department shall review the application to determine whether it is complete for purposes of proceeding under the County guidelines adopted pursuant to the California Environmental Quality Act requirements.
- (b) The Department shall review the most current reports provided pursuant to section 3.01. The Department shall review the matter of the application with the technical Advisory Committee and may also review the matter of the application with the affected County departments, with the staff of the State Department of Water Resources, with the staff of the Regional Water Quality Control Board-Central Valley Region, and with any interested district within whose boundary the proposed activity will occur. If the applicant is applying to pump groundwater from within the boundaries of a district or city which has adopted a groundwater management plan pursuant to the Groundwater Management Act, the Department shall consider a groundwater management plan or any other relevant information provided by the district or city. Any interested person or agency may provide comments relevant to the matter of the extraction of groundwater. Comments shall be submitted within thirty (30) days of the date of mailing the notice of filing the permit application.
- (c) The environmental review shall be undertaken in accordance with the California Environmental Quality Act and County guidelines. All costs of the environmental review shall be the responsibility of the applicant.
- (d) Upon completion of the environmental review, the Department shall submit the following documents to the Commission: the application, all comments received, the environmental documentation, the most current reports submitted pursuant to section 3.01, the retained expert's report (if applicable) and the Department's written report.

4.06 PUBLIC REVIEW CONCERNING ISSUANCE OF PERMIT

- (a) Upon receipt of the documents described in 4.05 (d), the Commission shall immediately set a public review on the issuance of the permit which shall be noticed pursuant to Government Code Section 6061 and may not be held within fifteen (15) days nor more than thirty (30) days of the time that the Commission receives the report from the Department.
- (b) Formal rules of evidence shall not apply to the public review of the application, but the Commission may establish such rules as will enable the expeditious presentation of the matter and relevant information thereto. At the commission review, the applicant shall be entitled to present any oral or documentary evidence relevant to the application, and the applicant shall have the burden of proof of establishing the facts necessary for the Commission to make required findings. The Commission may request any additional information it deems necessary for its decision. The Commission shall also bear relevant evidence presented by other interested persons and entities, the Department, other County staff, the Association, and the public. The Commission shall consider all affected aquifers including, but not limited to, the hydraulic gradient, hydrology, percolation, permeability, piezometric surface, porosity, recharge, safe yield, salt water intrusion, specific capacity, spreading water, transmissivity, water table and zone of saturation.

4.07 GRANTING OF PERMIT

A permit shall be granted pursuant to sections 4.01 and 4.02 only if the Commission finds and determines that the extraction will not:

- (a) cause or increase an overdraft of the groundwater underlying the County;
- (b) bring about or increase salt water intrusion;
- (c) exceed the safe yield of the aquifer or subbasins underlying the County;
- (d) result in uncompensated injury to overlying groundwater users or other water users;
- (e) cause subsidence.

In granting a permit, the Commission shall impose appropriate conditions upon the permit to satisfy the above findings, and may impose other conditions that it deems necessary for the health, safety, and welfare of the people of the County. Conditions in the permit may include but are not limited to requiring metering of the wells under the permit, both short-term and annual pumping limits, prescribed groundwater levels at which groundwater pumping must cease, and additional requirements for observation and/or monitoring wells.

In denying a permit, the Commission shall make specific findings in any of the subsections (a) through (e) to support its decision.

The decision of the Commission relating to section 4.01 shall be made on an affirmative vote of six (6) members of the Commission and relating to section 4.02 shall be made upon an affirmative vote of a majority of the quorum present. Such decisions may be appealed in accordance with section 4.08 or 4.09.

4.08 APPEAL OF GRANTING OR DENIAL OF A PERMIT

The applicant or any interested party or public entity may appeal the decision of the Commission by filing a written request with the Clerk of the Board within fifteen (15) days of issuance of the decision. The Clerk shall set a time for review by the Board within twenty (20) days of receipt of the request for appeal. Notice of appeal shall be given to the Commission, the Permittee, Appellant, as well as to the districts and cities within the County, and to interested parties who have requested notice of such appeal within the last 24 months. The Board shall hear the appeal as to those disputed matters which were heard by the Commission and which are specifically set out in the appeal request. The standard of review shall require that substantial evidence be presented to prevail on an issue. The appeal before the Board shall not be conducted with formal rules of evidence but under such rules as set by the Board for the expeditious presentation of the matter and relevant information pertaining thereto by the appellant and by those opposed to the reversal of the Commission decision. The decision of a majority of the Board shall be the final decision in the matter.

4.09 CHALLENGE TO APPROVED PERMIT

- (a) Any interested party or public entity may challenge the continuation of the permit during the term of the permit when any of the following information exists:
- 1) there is a violation of the conditions of the permit;
 - 2) the permit was not issued in accordance with the procedural requirements of this chapter;
 - 3) extraction of groundwater pursuant to the permit:
 - a) causes or increases an overdraft in the basin, or
 - b) brings about or increases salt water intrusion, or
 - c) exceeds the safe yield of the subbasin(s), or
 - d) results in uncompensated injury to overlying groundwater users or other water users, or
 - e) causes subsidence.
- (b) A challenge pursuant to this section is commenced by filing a written request with the Department which alleges any one of the above situations and generally described the supporting facts for such allegation. If the Department determines that the supporting facts make a prima facie showing of one of the above categories, the Department shall within ten (10) days of receipt of such challenge,

give notice of the challenge to the Commission, Permittee, Appellant, to any interested party who filed a written request for such notice within the past 24 months, and also to districts and cities within the County. A Commission review shall be held on the matter following the procedure set out in Section 4.07. The Commission's decision may be to deny the challenge, grant the challenge and terminate the permit, or to establish modified conditions to the permit.

- (c) The standard review shall be substantial evidence.

4.10 DURATION OF PERMIT

All permits shall be valid for a three (3) year term unless the Commission finds that a shorter term is required by the findings in section 4.07 (a) through (e). For purpose of calculation, the water year in which the permit is granted shall not be counted in determining the three year time period if less than four months remains in the then water year. Provided, however, nothing contained in this chapter nor in the conditions of the permit be construed to give permittee an exclusive right to groundwater.

4.11 LIMITATION OF PERMIT

The permit in this chapter is not to be construed as a grant of any right or entitlement but rather the permit evidences that the healthy, welfare, and safety of the residents of the County will not be harmed by the extraction of groundwater for use outside the County or the substitution of groundwater for surface water that has been transferred outside the County. The permit in no way exempts, superseded, or replaces any other provisions of federal, state, and local laws and regulations including but not limited to Water Code Section 1220, the Groundwater Management Act, and any actions provided under California groundwater law, well drilling and maintenance in accordance with Chapter 23B of the Butte County Code, or building permit requirements.

5.01 INSPECTION

The Department, with good cause, may at any and all reasonable times enter any and all places or property, enclosures and structures, where a well is located, for the purpose of making examinations and investigations to determine whether any provision of this chapter is being violated.

6.01 CIVIL PENALTY

The County may elect to proceed with a civil action against a violator, including seeking injunctive relief. Any person who or entity which violates this chapter shall be subject to fines of up to \$5,000 per separate violation. A person or entity shall be deemed to have committed separate violations for each and every day or portion thereof during which any such violation is

committed, continued or permitted as well as for each and every separate groundwater well with which any such violation is committed, continued, or permitted.

7.01 REPEAL

Chapter 33 of the Butte County Code is hereby repealed.

8.01 SEVERABILITY

If any section, subsection, sentence, clause, or phrase of this chapter, as applied to any entity or person, is for any reason held to be illegal, invalid, unconstitutional, or outside the jurisdiction and/or the police powers of the County, as determined by any court of competent jurisdiction, such decision shall not affect the validity of the chapter as to other entities or persons. If any section, subsection, sentence, clause, or phrase of this chapter is for any reason held illegal, invalid or unconstitutional by the decision of any court of competent jurisdiction, such decision shall not affect the validity of the remaining portions hereof. The People hereby declare that they would have passed this chapter and each section, subsection, sentence, clauses, or phrases thereof, irrespective of the fact that any one or more sections, subsections, sentences, clauses, or phrases be declared illegal, invalid, unconstitutional, or outside the jurisdiction and/or police powers of the County as to certain entities or persons.

9.01 AMENDMENT

The Board may amend this chapter or any of its provisions following a properly noticed public hearing.