MEMORANDUM

TO: Ed Craddock, Director

FROM: Kristen Hard, Manager – Program Development

SUBJECT: 2005 Groundwater Quality Monitoring Program

DATE: August 30, 2005

INTRODUCTION & BACKGROUND

The Butte County Department of Water and Resource Conservation (DW&RC), in conjunction with California Department of Water Resources (DWR) and California State University – Chico (CSUC), recently conducted groundwater quality monitoring of 10 wells within the county. Temperature, pH, Total Dissolved Solids, and Electrical Conductivity were measured in early August 2005 from private wells located within our groundwater basin. The DW&RC has performed this water quality sampling and analyses since the summer of 2002 as a result of Measure G, which was passed by Butte County voters in the late 1990s. With the passage of Measure G the County is mandated to perform certain duties regarding groundwater monitoring.

METHODOLOGY AND ANALYSIS

For this particular study, staff from DW&RC and CSUC collected groundwater samples and utilized field instruments to directly take measurements. In accord with the 2002, 2003, and 2004 program, no samples were collected or analyzed in the laboratory. The sites we visited were on private land and the wells were typically used for agricultural purposes (irrigating orchards, rice, or pasture). We had a broad sampling grid spanning from north of the Chico Urban Area (Vina sub-unit), west towards the Sacramento River (M & T sub-unit), east towards the foothills (Butte Valley-Pentz sub-unit), and south towards Gridley (Biggs-West Gridley sub-unit).

As in previous years, we are fortunate to have the support and permission from the local property owners who allowed access to their wells. We have provided them with the preliminary results from this year's monitoring for their general knowledge.

The data collected this summer is comparable to data collected in the three preceding years. To date, temperature has been consistent in all wells and has stayed within 3°C. For example, the observed water temperatures compiled this summer from our wells was approximately 20 ^{o}C (68 ^{o}F). Temperature is an important parameter because it affects chemical reactions that may occur in groundwater.
Other parameters such as pH remained stable and rarely deviated more than a single pH unit. One parcel (almond orchard) had recently applied soil amendment to alter the soil pH but even that application did not significantly change the groundwater pH.

Total dissolved solids measures water quality suitability for public, industrial, and agricultural uses and electrical conductivity measures the ability of a solution to conduct an electrical current. Readings for total dissolved solids and electrical conductivity varied more than pH and temperature. However, the readings we observed were well within the secondary water quality thresholds established by State and Federal regulatory agencies.

The US Environmental Protection Agency (US EPA) establishes drinking water quality standards using two categories; Primary Standards and Secondary Standards. Primary Standards are based on health considerations and Secondary Standards are based on taste, odor, color, corrosivity, foaming, and staining properties of water. Examples of secondary water quality thresholds are summarized in Table 1 below:

Table 1. US EPA Secondary Standards for several parameters

Parameter	Secondary Standard or Secondary WQ Threshold	Range of Observed Readings	Notes re: Butte County Study
pH	6.5 to 8.5	6.22-8.1	Two wells measured in 2005 fell below 6.5. All other observations are within range of secondary water quality thresholds.
Total Dissolved Solids (TDS)	< 500 ppm – drinking water < 450 ppm – ag water	67 to 340	Within range of secondary water quality thresholds
Electrical Conductivity (EC)	< 900 uS – drinking water < 700 uS – ag water	132 to 678	Within range of secondary water quality thresholds

Water quality data collected from the specific wells are presented in tables on the attached pages.

CONCLUSION

This is the fourth season the DW&RC collected groundwater quality information. At this time we do not have sufficient information to make valid assumptions regarding any trends in water quality changes. Overall, the results of the water quality sampling indicate that groundwater in the basin is of high-quality and is in good health. This data will help the DW&RC to continue to evaluate any future degradation of the basin.

Further information on water quality standards for different constituents can be found at www.swrcb.ca.gov or in the *Compilation of Water Quality Goals*, published by the State Water Resources Control Board. Otherwise, if you have questions please contact Kristen at 538-6265.

Attachments: 6 pages (Figures 1 through 21, Tables 2 through 5)

Figure 1. Map of Butte County Groundwater Quality Monitoring Locations

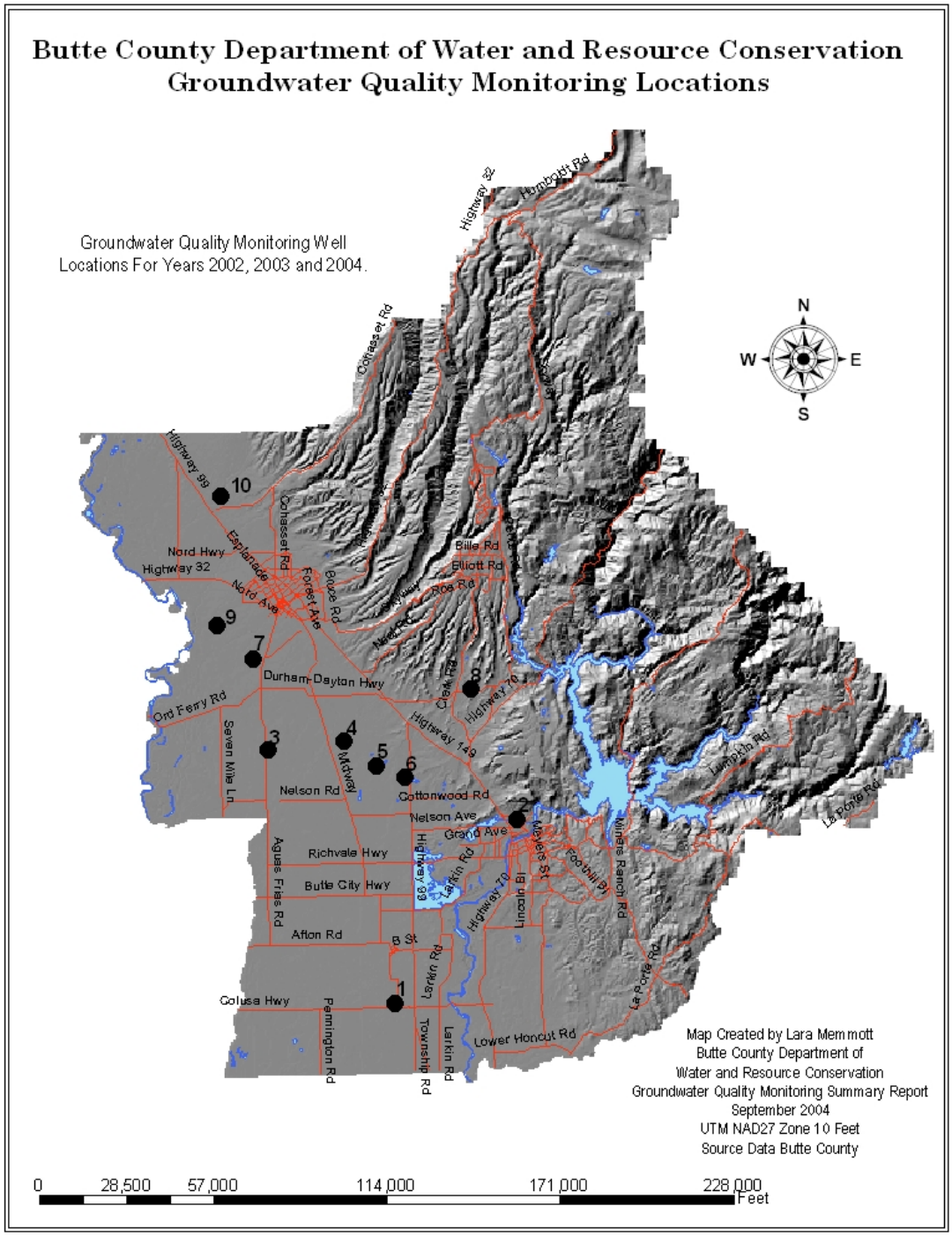

Table 2. Groundwater Temperature for 2002, 2003, 2004, and 2005 (Butte County DW&RC)

Well Number on Fig. 1	Sub-area	State Well Number	2002 Temp ^{o}C	2003 Temp ^{o}C	2004 Temp ^{o}C	2005 Temp ^{o}C
1	Biggs-West Gridley	18NO2E35R01M	18.5	18.5	18.1	20.5
2	Thermalito	19NO4E06E02M	18.3	17.9	17.1	17.1
3	West.Canal (west)	20N01E15D01M	19	18.1	19.8	20.8
4	Esquon	20N02E09M02M	19.7	18.9	19.6	20.1
5	West.Canal (east)	20N02E15RO1M	18.4	18.2	19.9	20.5
6	Cherokee	20N02E24QO1M	22.4	21.9	21.2	21.4
7	Durham Dayton	21N01E15EO2M	18.8	19.9	21.8	20.4
8	Butte Valley – Pentz	21N03E26EO1M	27	26.4	26.7	23.2
9	M & T	22N01E15DO2M	17.6	18.2	17.8	19.2
10	Vina	23N01E29LO3M	19.6	20.3	19.2	19.2

Table 3. Groundwater pH for 2002, 2003, 2004, and 2005 (Butte County DW&RC)

Well Number on Fig. 1	Sub-area	State Well Number	2002 pH	2003 pH	2004 pH	2005 pH
1	Biggs- West Gridley	18NO2E35R01M	7.6	7.5	7.5	7.04
2	Thermalito	19NO4E06E02M	7	6.5	7.06	7.13
3	West.Canal (west)	20N01E15D01M	7.8	8.1	7.1	6.86
4	Esquon	20N02E09M02M	7.3	7.5	7.15	7.39
5	West.Canal (east)	20N02E15RO1M	7	6.6	6.8	6.86
6	Cherokee	20N02E24QO1M	7.5	7.5	7.14	7.37
7	Durham Dayton	21N01E15EO2M	7.7	7.2	7.6	7.65
8	Butte Valley – Pentz	21N03E26EO1M	7.1	6.9	7.29	6.24
9	M & T	22N01E15DO2M	7.2	7.5	6.9	7.83
10	Vina	23N01E29LO3M	7.5	7.6	6.9	6.22

Table 4. Groundwater TDS for 2002, 2003, 2004, and 2005 (Butte County DW&RC)

Well Number on Fig. 1	Sub-area	State Well Number	2002 TDS (ppm)	2003 TDS (ppm)	2004 TDS (ppm)	2005 TDS (ppm)
1	Biggs- West Gridley	18NO2E35R01M	172	184	163	180
2	Thermalito	19NO4E06E02M	67	82	73	75
3	West.Canal (west)	20N01E15D01M	232	123	206	250
4	Esquon	20N02E09M02M	194	265	235	278
5	West.Canal (east)	20N02E15RO1M	223	172	203	262
6	Cherokee	20N02E24QO1M	111	115	109	132

7	Durham Dayton	21N01E15EO2M	161	175	130	169
8	Butte Valley – Pentz	21N03E26EO1M	100	93	105	120
9	M & T	22N01E15DO2M	209	279	340	251
10	Vina	23N01E29LO3M	96	109	90	107

Table 5. Groundwater Electrical Conductivity for 2002, 2003, 2004, and 2005 (Butte County DW&RC)

Well Number on Fig. 1	Sub-area	State Well Number	2002 EC (uS)	2003 EC (uS)	2004 EC (uS)	2005 EC (uS)
1	Biggs- West Gridley	18NO2E35R01M	346	370	323	361
2	Thermalito	19NO4E06E02M	132	164	149	150
3	West.Canal (west)	20N01E15D01M	464	248	407	501
4	Esquon	20N02E09M02M	388	526	470	557
5	West.Canal (east)	20N02E15RO1M	447	344	400	524
6	Cherokee	20N02E24QO1M	222	232	215	266
7	Durham Dayton	21N01E15EO2M	315	348	259	340
8	Butte Valley – Pentz	21N03E26EO1M	195	186	211	240
9	M & T	22N01E15DO2M	418	551	678	504
10	Vina	23N01E29LO3M	197	225	180	216

Biggs-West Gridley

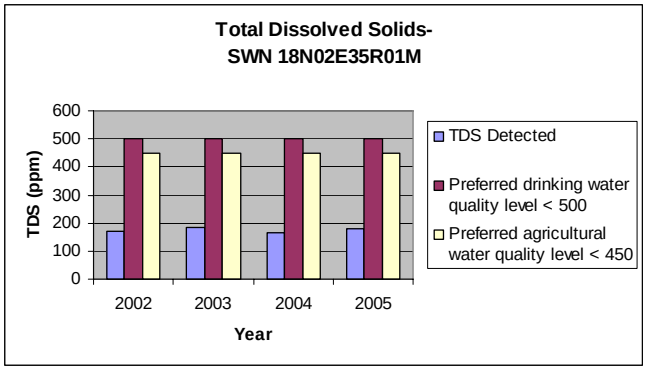

Figure 2. Biggs-West Gridley well monitored by DW&RC

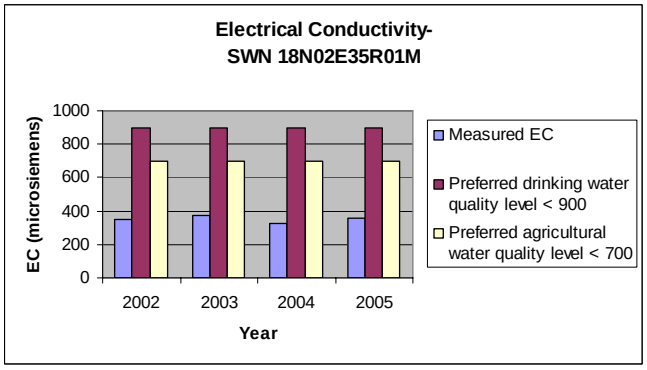

Figure 3. Biggs-West Gridley well monitored by DW&RC

Thermalito

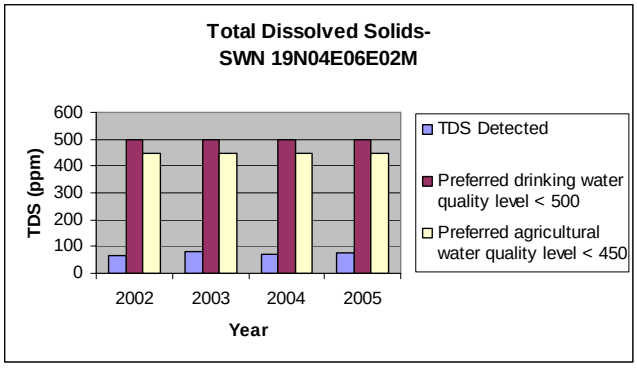

Figure 4. Thermalito well monitored by DW&RC

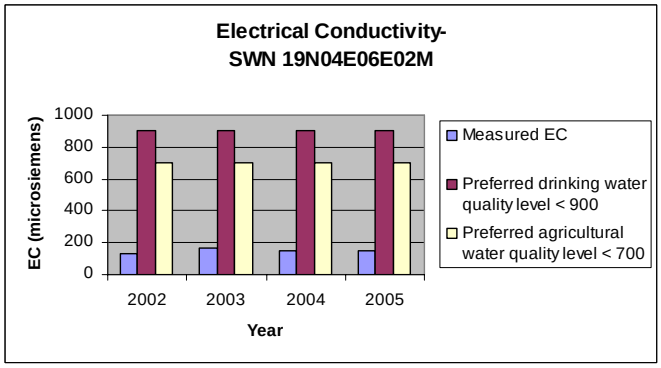

Figure 5. Thermalito well monitored by DW&RC

Western Canal (west)

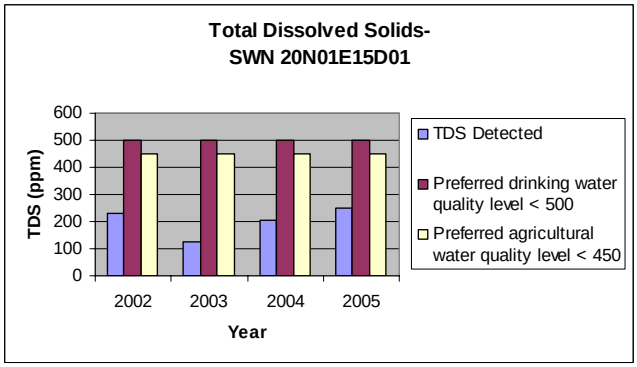

Figure 6. Western Canal (west) well monitored by DW&RC

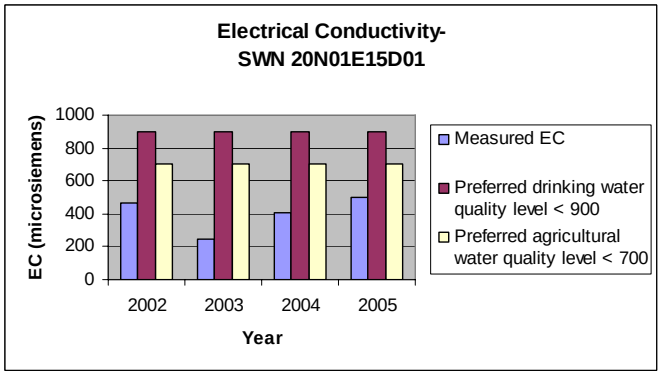

Figure 7. Western Canal (west) well monitored by DW&RC

Esquon

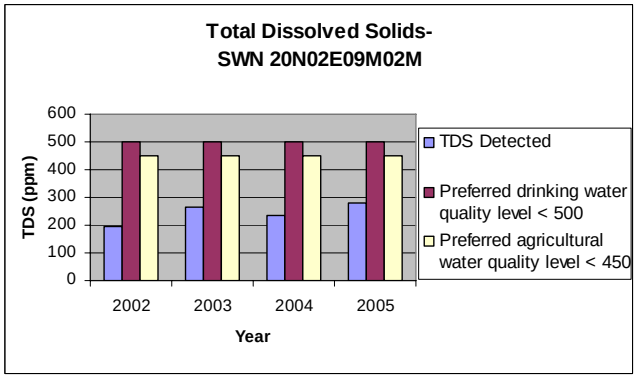

Figure 8. Esquon well monitored by DW&RC

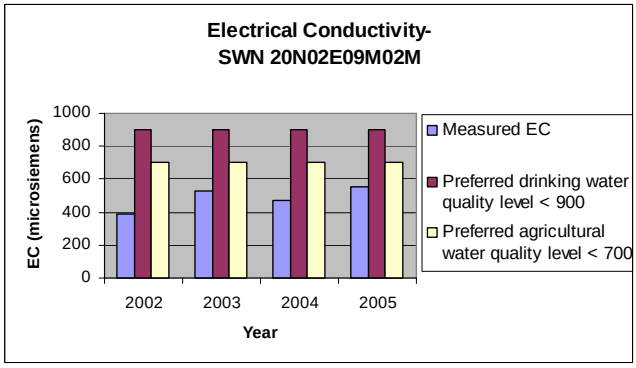

Figure 9. Esquon well monitored by DW&RC

Western Canal (east)

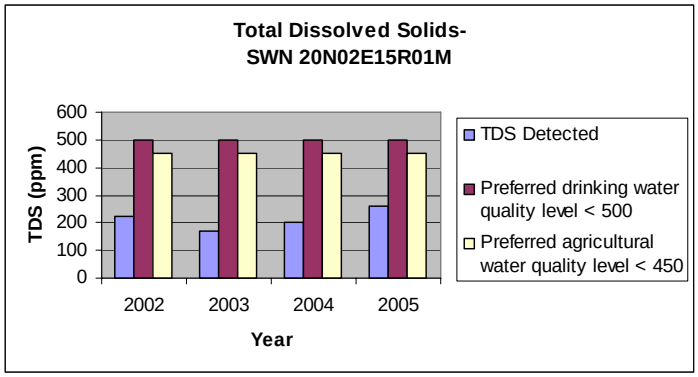

Figure 10. Western Canal (east) well monitored by DW&RC

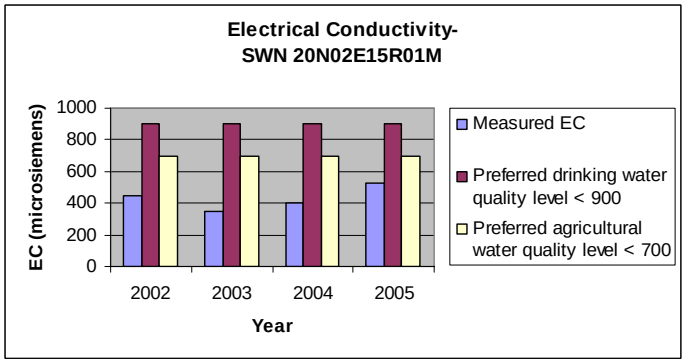

Figure 11. Western Canal (east) well monitored by DW&RC

Cherokee

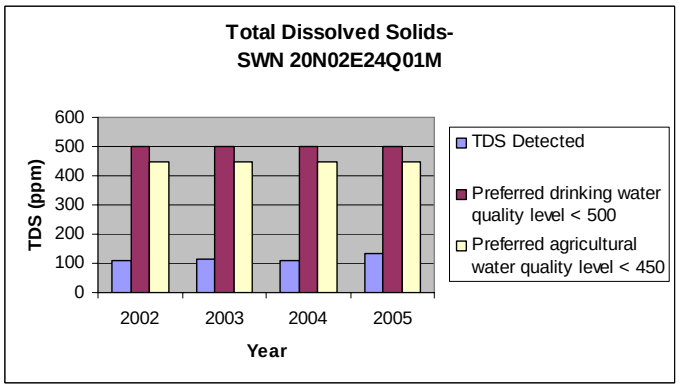

Figure 12. Cherokee well monitored by DW&RC

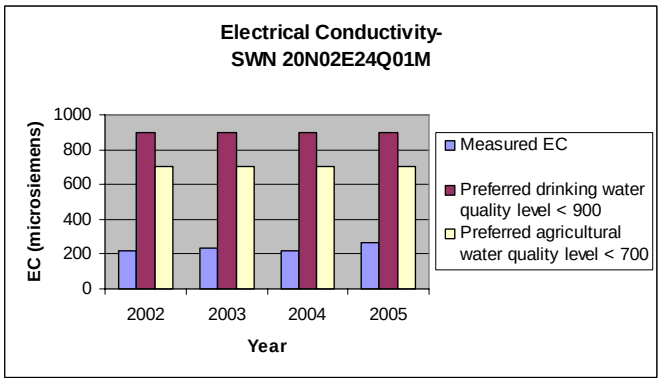

Figure 13. Cherokee well monitored by DW&RC

Durham-Dayton

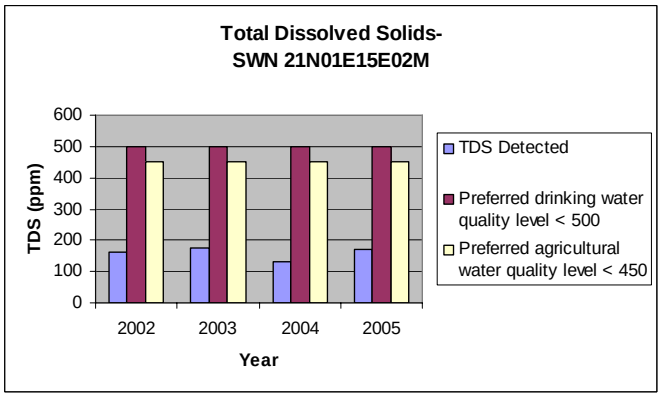

Figure 14. Durham Dayton well monitored by DW&RC

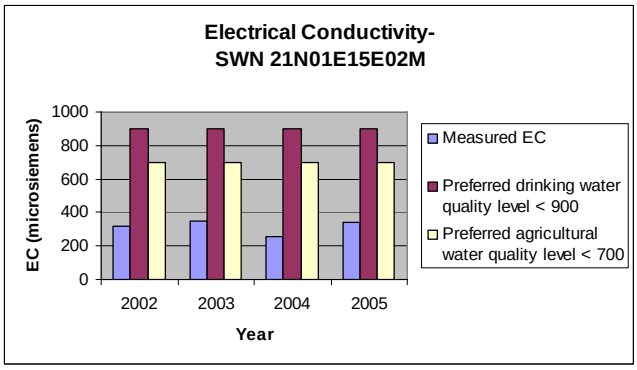

Figure 15. Durham Dayton well monitored by DW&RC

Pentz

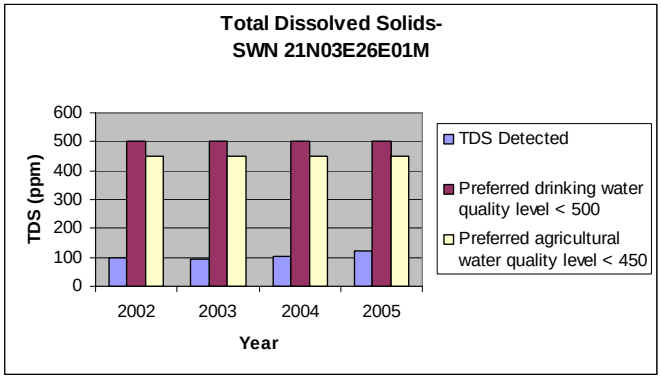

Figure 16. Pentz well monitored by DW&RC

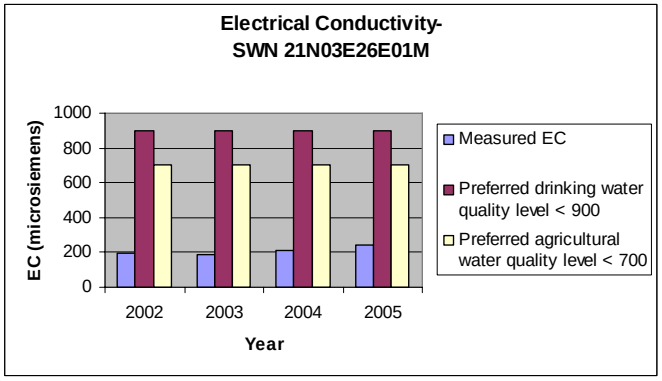

Figure 17. Pentz well monitored by DW&RC

M&T

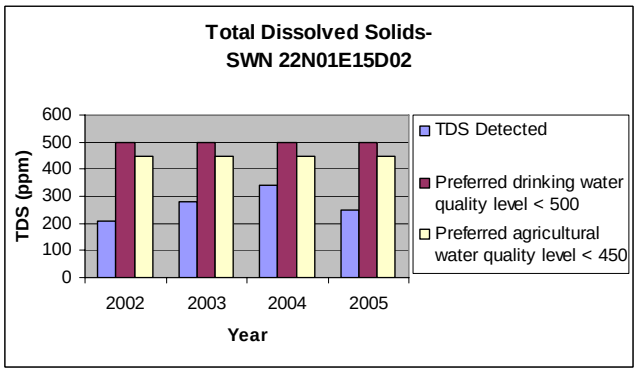

Figure 18. M&T well monitored by DW&RC

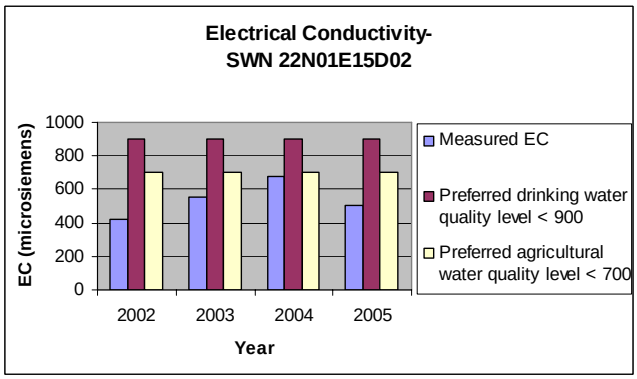

Figure 19. M&T well monitored by DW&RC

Vina

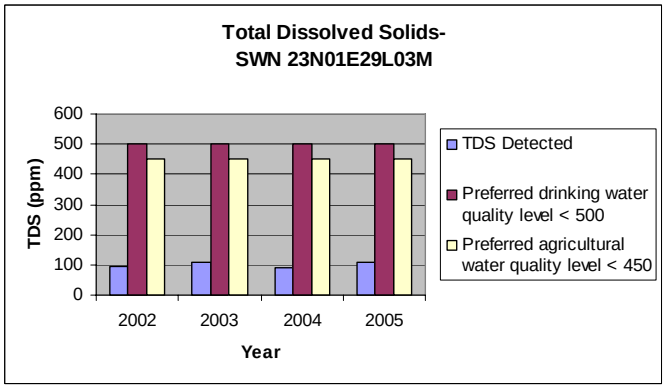

Figure 20. Vina well monitored by DW&RC

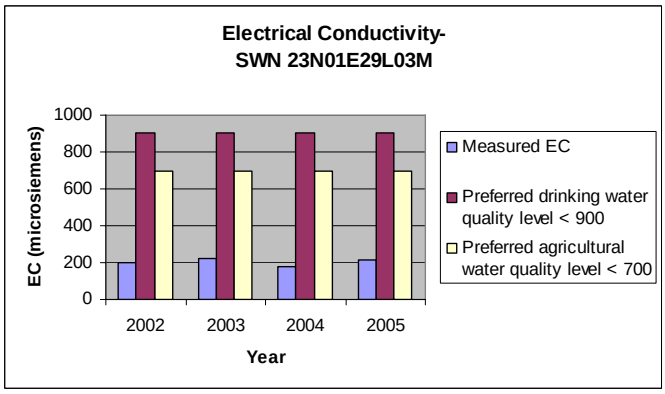

Figure 21. Vina well monitored by DW&RC