

**Basin Management Objective
Butte County
Sub-Inventory Unit – M & T RANCH**

Butte County Water Advisory Committee Member – Lee Heringer

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Description of the M&T Sub-Inventory Unit –

The M&T Sub-Inventory Unit (SIU) covers an area of about 8,200 acres in the northwestern portion of the West Butte Inventory Unit. It is bordered by Big Chico Creek to the north, the Llano Seco and Durham Dayton SIUs to the south and east, and the Sacramento River and Angel Slough SIU to the west. The M&T SIU corresponds roughly to the water serviced area of the M&T Chico Ranch. Agricultural land use includes orchards, rice, and row crops supported by groundwater and surface water. In a normal year, about 27% of the M&T SIU is in summer agricultural production supported by groundwater.

The M&T Ranch, located within the SIU, gets its surface water from two different sources. The Ranch diverts water out of Butte Creek east of Chico and allows it to flow down Edgar Slough/Comanche Creek where it runs through south Chico and then west to the Ranch. Once it reaches the Ranch, it then flows south to the Llano Seco Ranch. The Butte Creek diversion supplies water to the M&T Ranch, the Llano Seco Ranch and Dayton Mutual. The diverted Butte Creek water, according to the California Department of Water Resources, helps recharge the groundwater in south Chico, the Hegan Road area, and the Stanley Avenue/Rodgers Road area. The M&T Ranch and the Llano Seco Ranch also jointly own a pumping plant on the Sacramento River, west of Chico. This surface water source helps supply the irrigation water needs for orchards, row crops, rice and federal, state and private wetlands. This river water also helps recharge the groundwater in the Ord Ferry Road, Seven Mile Lane and Dayton West Road area. The northeast part of the ranch, just south of Big Chico Creek, is primarily orchards and is supplied solely by groundwater. Our groundwater and surface water supplies are all an integral part of the M&T Ranch and provide us with vital irrigation water supplies.

Management Objective –

To maintain the groundwater surface elevation during the peak summer irrigation season (July and August) in all aquifer systems at a level that will assure an adequate and affordable irrigation groundwater supply. It is the intent of this management objective to assure a sustainable agricultural supply of good quality water now and into the future, and to assure the water supply can be utilized without injuring groundwater quality or inducing land subsidence. The management objective is also to assure an adequate groundwater supply of adequate quality from the alluvial aquifer system for all domestic users in the sub-inventory unit.

Geologic Formations Identified In Sub-Inventory Unit –

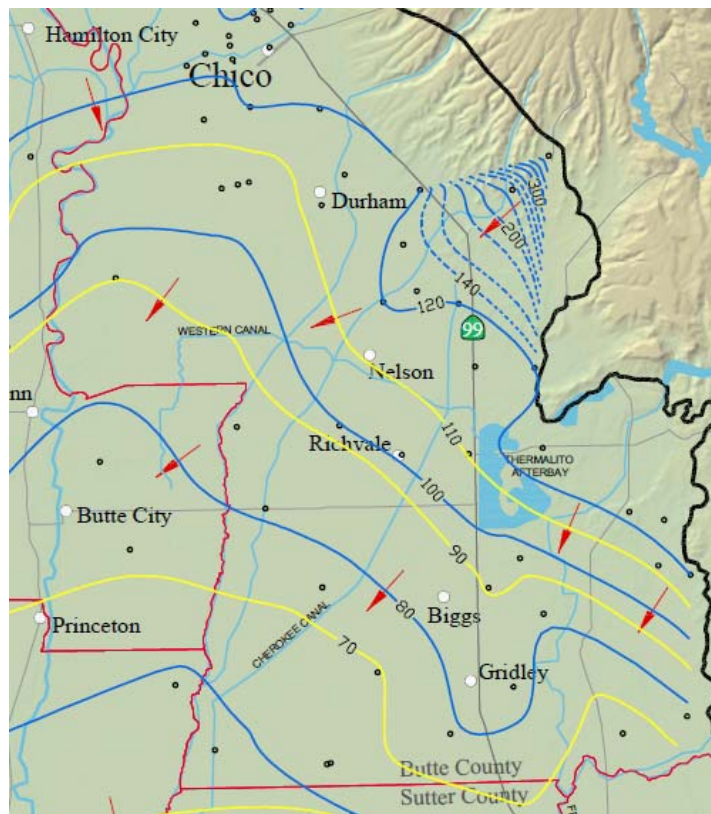
Geologic formations in the M&T SIU, from youngest (shallowest) to oldest (deepest) include:
Quaternary Alluvium
Basin Deposits
Modesto Formation
Tuscan Unit C (Upper Tuscan)

Fresh Water-bearing Units. In the Sacramento Valley Region of Butte County, fresh groundwater-bearing units include, from youngest (shallowest) to oldest (deepest), the Modesto, Riverbank, Laguna, Tehama and Tuscan Formations. Those included in the M&T SIU are:

- Modesto Formation
- Tuscan Unit C (Upper Tuscan)

Groundwater Flow in the M & T Sub-Inventory Unit –

The below figure is a cropped segment of a map prepared by DWR Northern District. It shows the groundwater elevation contours in your sub-inventory unit with arrows indicating the direction of groundwater movement. This graphic indicates that the regional pattern of spring groundwater movement in the M&T SIU is in a south-to-southwesterly direction toward the Sacramento River and Angel Slough.



Arrows show the direction of groundwater movement.

2009 Groundwater contours were constructed using groundwater level measurements taken by the Department of Water Resources and Local Cooperators between March 1st and March 20th, 2009. Groundwater contours are based on groundwater level measurements taken from wells constructed within the middle portion of the aquifer system (100 to 400 feet

deep). This portion of the aquifer supplies approximately 70% of all domestic, agricultural and municipal wells. Blue contour lines represent 20 foot intervals and yellow contour lines represent 10 foot intervals. Full size contour maps are included in the annual Groundwater Status Report posted on the Department of Water and Resource Conservation website.

**BMO Key Wells Selected for Groundwater Level Monitoring –
SPRING**

Well ID	Aquifer System	Well Type	Stage 1 & 2 Alerts Spring Avg. Elev. (ft)	Stage 3 Alerts Lowest Recorded Elev. (ft)
21N01W24B01M	Lower Tuscan (B)	Monitoring	115.7	106.4
22N01E29R01M	Upper Tuscan (C)	Irrigation	137.9	133.9
22N01E32E04M	Modesto Formation	Domestic	129.0	119.0

BMO Key Wells Selected for Groundwater Quality Monitoring–

Groundwater Temperature - 2002 through 2009

State Well Number	2002 Temp °C	2003 Temp °C	2004 Temp °C	2005 Temp °C	2006 Temp °C	2007 Temp °C	2008 Temp °C	2009 Temp °C
22N01E15DO2M	17.6	18.2	17.8	19.2	18.6	18.0	17.7	18.6

Groundwater pH - 2002 through 2009

State Well Number	2002 pH	2003 pH	2004 pH	2005 pH	2006 pH	2007 pH	2008 pH	2009 pH
22N01E15DO2M	7.2	7.5	6.9	7.8	7.9	7.6	7.7	7.6

Groundwater EC - 2002 through 2009

State Well Number	2002 EC	2003 EC	2004 EC	2005 EC	2006 EC	2007 EC	2008 EC	2009 EC
22N01E15DO2M	418.0	551.0	678.0	504.0	465.0	451.0	667.0	445.0

BMO Key Well(s) Selected for Land Subsidence Monitoring–

Land Subsidence is continuously monitored by the Department of Water Resources and Butte County Department of Water and Resource Conservation from State Well number 21N01W24B01M, which is within this Sub-InVENTORY Unit.

Butte County staff participated in the Sacramento Valley Height Modernization Project during March 2008 as a means to enhance the subsidence monitoring program in the county and the region. This cooperative project between the Department of Water Resources (DWR), the Bureau of Reclamation and local County agencies helped to establish baseline ground elevations in Butte County and other portions of the valley. Land elevations were measured using Global Positioning System (GPS) survey equipment and survey monuments located on an approximate three to five mile grid. Re-observations are to be done in approximately three years, and will give measurements to compare against the baseline data in order to determine whether or not any subsidence has occurred.

BMO Alert Stage Definitions and Compliance Methodologies–

The M & T Ranch Sub-Inventory Unit will use the following guidelines in the management of the groundwater resources. The groundwater level and land subsidence management objectives are intended to trigger predetermined voluntary Ground Water Management Actions, as defined in the accompanying cover report, to remedy declining ground water levels that are not recovering to compliance levels for each index well.

Groundwater Levels –

The Butte Basin Groundwater model uses the historical hydrology (e.g. precipitation pattern, stream inflows) from October 1970 through October 1999 in the base case simulation. Using historical hydrology allows for the assessment of water resources conditions based on a known range of hydrology, from wet to critical. Each hydrograph for the BMO process shows the static groundwater elevation measurements from the time period of 1970 to 2006, or as many recent years of data available for each selected key wells. The measurements taken during this 36 year window reflect periods of drought and recovery, as well as wet years. These methodologies will apply for both Spring and Fall analysis.

- A. For wells that have a period of record dating back to at least 1970, the subcommittee suggests that the range of measurements from the first year through 2006 be used in calculating Alert Stages 1 and 2 and the Historic Low will be used as the Alert Stage 3. Once the range is defined for each well, 20% of that range will be calculated and added to the Historic Low to establish Alert Stages 1 and 2. The measurements plotted after 2006 are for reference purposes only, and are not included in the calculation of the range.
- B. In the instances where the period of record does not date back to 1970, the Historic Low before 2006 will be used for Alert Stages 1 and 2, and the Historical Low minus the range of measurements shall be used for Alert Stage 3. The measurements plotted after 2006 are for reference purposes only, and are not included in the calculation of the range.

Groundwater Quality –

Any change that exceeds a 20 percent change from Butte County's 2009 water quality assessment will be cause for review and investigation by the Technical Advisory Committee.

Land Subsidence –

Maximum annual inelastic land subsidence shall not exceed 0.01 feet per year.

Stage 1: is reached when the annual elastic subsidence exceeds the average annual elastic subsidence measured over the period of record of the extensometer.

Stage 2: is reached when the annual elastic subsidence exceeds the maximum recorded elastic subsidence over the period of record for the extensometer.

Stage 3: is when inelastic subsidence is detected. Inelastic subsidence shall be detected by comparing reading from the extensometer taken on March 1 of each year against previous March 1 measurements.

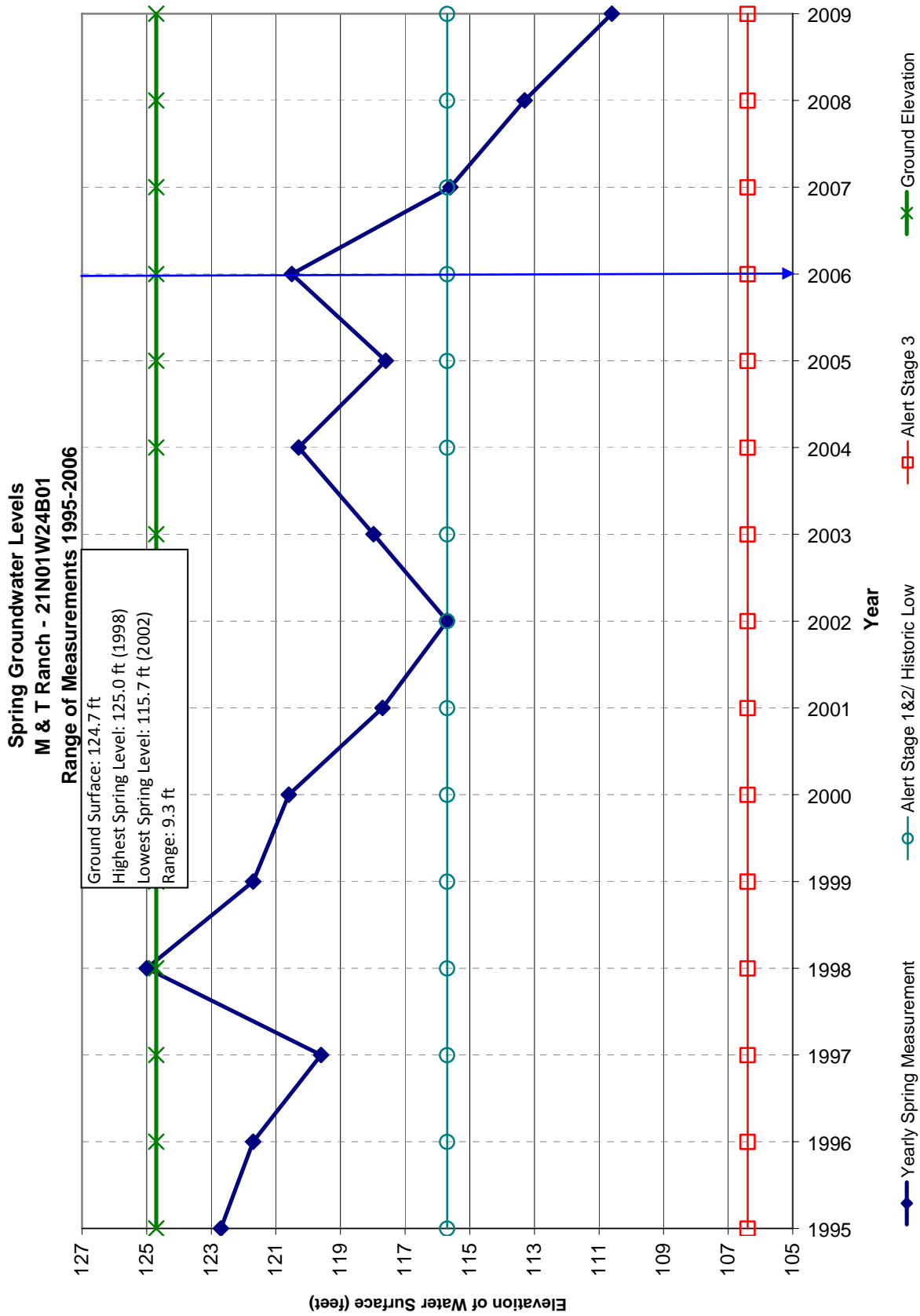
Future Monitoring Recommendations –

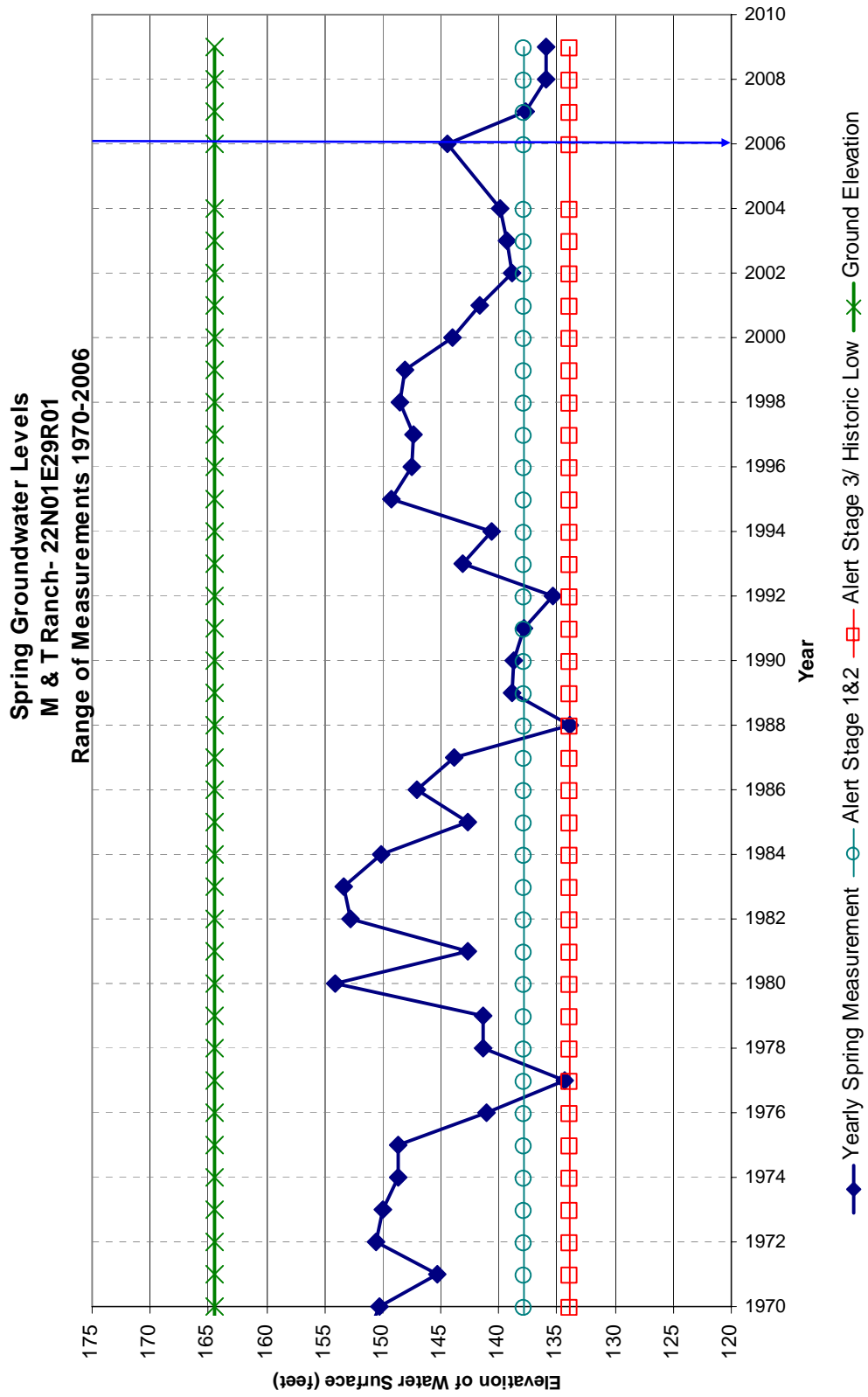
Efforts will be made to identify several domestic wells that could be added to the existing monitoring well network in the sub-inventory unit to allow development of management objectives for the alluvial aquifer system.

Supporting Data –

Hydrographs depicting yearly spring level measurements, including 2009 data, with established alert levels for calendar year 2010.

Summary charts of water quality monitoring.





Spring Groundwater Levels
M & T Ranch- 22N01E32E04
Range of Measurements 1993-2006

