

**Basin Management Objective  
Butte County  
Sub-Inventory Unit – BUTTE  
Butte Water District**

**Butte County Water Advisory Committee Member – Mark Orme**

**Contact Information**

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**Description of the Butte Sub-inventory Unit –**

The Butte Sub-inventory Unit (SIU) covers an area of about 21,400 acres. It is bordered by the Biggs/West Gridley and Thermalito SIUs to the north and west, the North Yuba Inventory Unit to the east, and Sutter County to the south. The Butte SIU corresponds roughly to the service area for the Butte Water District. Land use within the sub-inventory unit is mainly agricultural, but also includes most of the urban area for the cities of Biggs and Gridley. Agricultural production consists mainly of orchard crops with smaller areas of rice and field crops. A mixture of surface water and groundwater supports agricultural production. In a normal year, about 29% of the Butte SIU is in summer agricultural production supported by groundwater. Groundwater is also used as the municipal water source for much of the urban area surrounding the cities of Biggs and Gridley.

**Management Objective –**

To maintain the groundwater surface elevation at a level that will assure an adequate and affordable irrigation water supply from the Alluvial, Sutter Buttes Rampart, Lower and Upper Tuscan Formations aquifer systems. It is the intent of this management objective to assure a sustainable agricultural groundwater supply of good quality now and into the future, and to assure the water supply can be utilized to the maximum extent possible without injuring groundwater quality or inducing land subsidence. The intent of this management objective is also to assure an adequate supply of groundwater from the alluvial aquifer system of suitable quality for all domestic groundwater users in the Sub-Inventory Unit.

**Geologic Formations Identified In Sub-Inventory Unit –**

Geologic formations in the Butte SIU, from youngest (shallowest) to oldest (deepest), include:

- Quaternary Alluvium
- Modesto Formation
- Riverbank Formation
- Laguna Formation

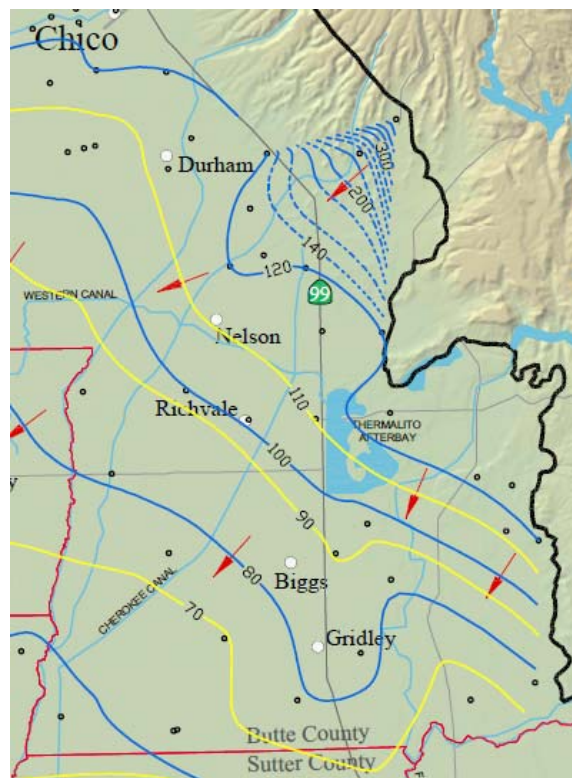
## Tuscan Unit B (Lower Tuscan)

**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 Butte SIU are:

- Quaternary Alluvium
- Modesto Formation
- Riverbank Formation
- Laguna Formation
- Tuscan Unit B (Lower Tuscan)

## Groundwater Flow in the Butte 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 Butte SIU is in a southerly direction. Locally, groundwater mounding, due to recharge from the Thermalito Afterbay, causes groundwater to move in a southeasterly direction toward the Feather River and in a southwesterly directions toward the Biggs/West Gridley SIU. The average groundwater gradient in the Butte SIU is about 4 feet per mile.



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 Spring Wells Selected for Groundwater Level Monitoring –**

Well ID	Aquifer System	Well Type	Stage 1 & 2Alerts**		Stage 3Alerts**	
			Elev. (ft)	Depth (ft)	Elev. (ft)	Depth (ft)
17N02E14A01M	Modesto Formation	Irrigation	75.7	3.8	74.2	5.3
17N02E14H01M	Basin Deposits	Domestic	76.7	9.0	73.9	11.8
17N03E16N01M	Riverbank Formation	Domestic	72.0	13.5	69.9	15.6

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

Well ID	Aquifer System	Well Type	Stage 1 & 2Alerts**		Stage 3Alerts**	
			Elev. (ft)	Depth (ft)	Elev. (ft)	Depth (ft)
17N02E14A01M	Modesto Formation	Irrigation	70.1	9.4	67.5	12.0
17N02E14H01M	Basin Deposits	Domestic	63.7	22.0	52.0	33.7
17N03E16N01M	Riverbank Formation	Domestic	71.7	13.8	70.9	14.6

**BMO Key Wells Selected for Groundwater Quality Monitoring–**

Stakeholders in the Butte SIU will work with staff to locate additional wells, either irrigation or domestic, with sufficient historical construction information to include in the water quality monitoring network, and possibly initiate data collection in August 2009.

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

Land Subsidence is continuously monitored by the Department of Water Resources and Butte County Water and Resource Conservation at the closest extensometers in the Western Canal Water District and M&T Ranch sub-inventory units.

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 Butte 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 the index well.

### **Groundwater Level –**

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 Monitoring–**

Stakeholders in the Butte SIU will work with staff to locate additional wells, either irrigation or domestic, with sufficient historical construction information to include in the water quality monitoring network, and possibly initiate data collection in August 2009.

**Land Subsidence –**

Land Subsidence will be monitored at the closest extensometers located in the M&T and Western Canal sub inventory units. 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.

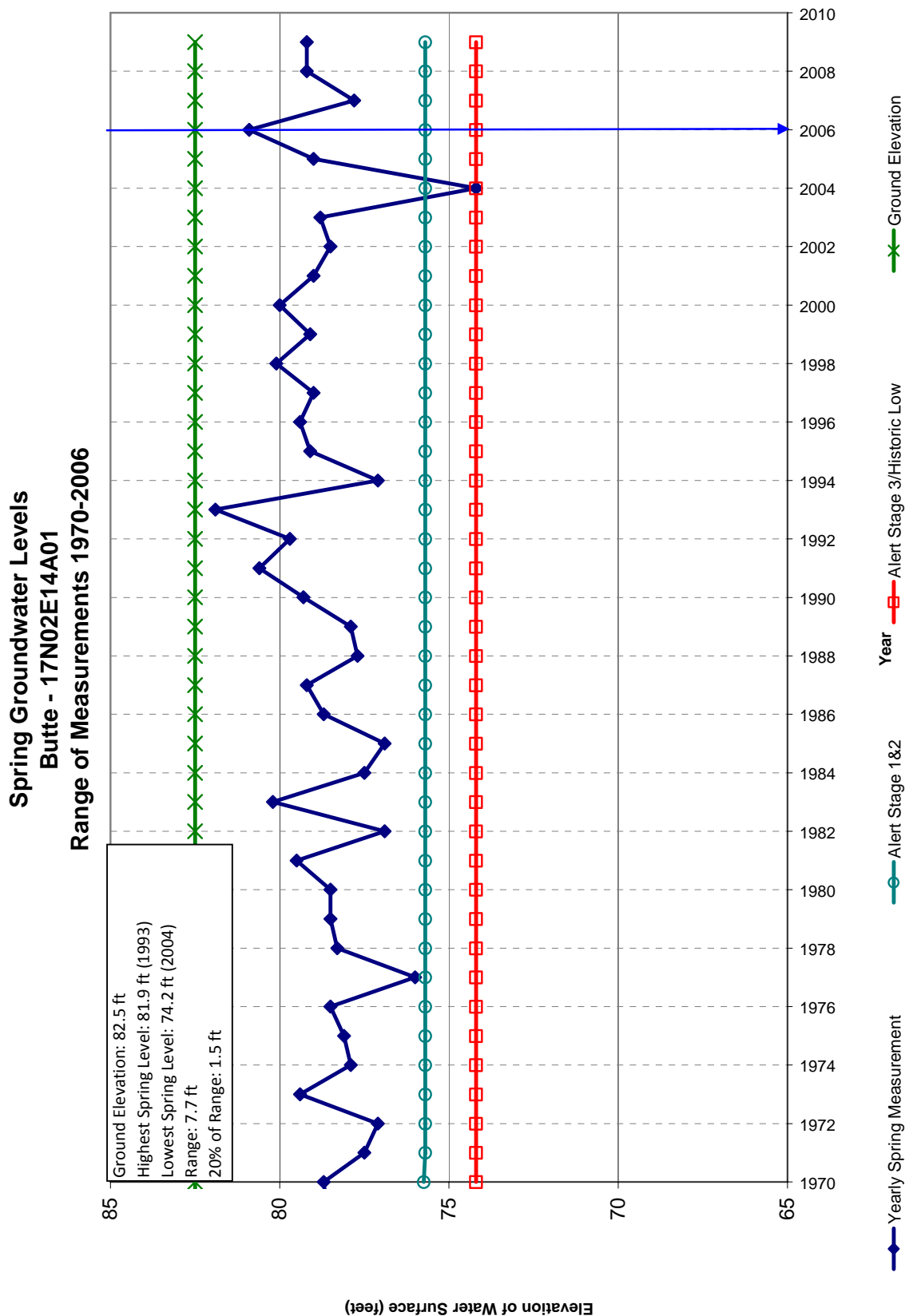
**Future Monitoring Recommendations –**

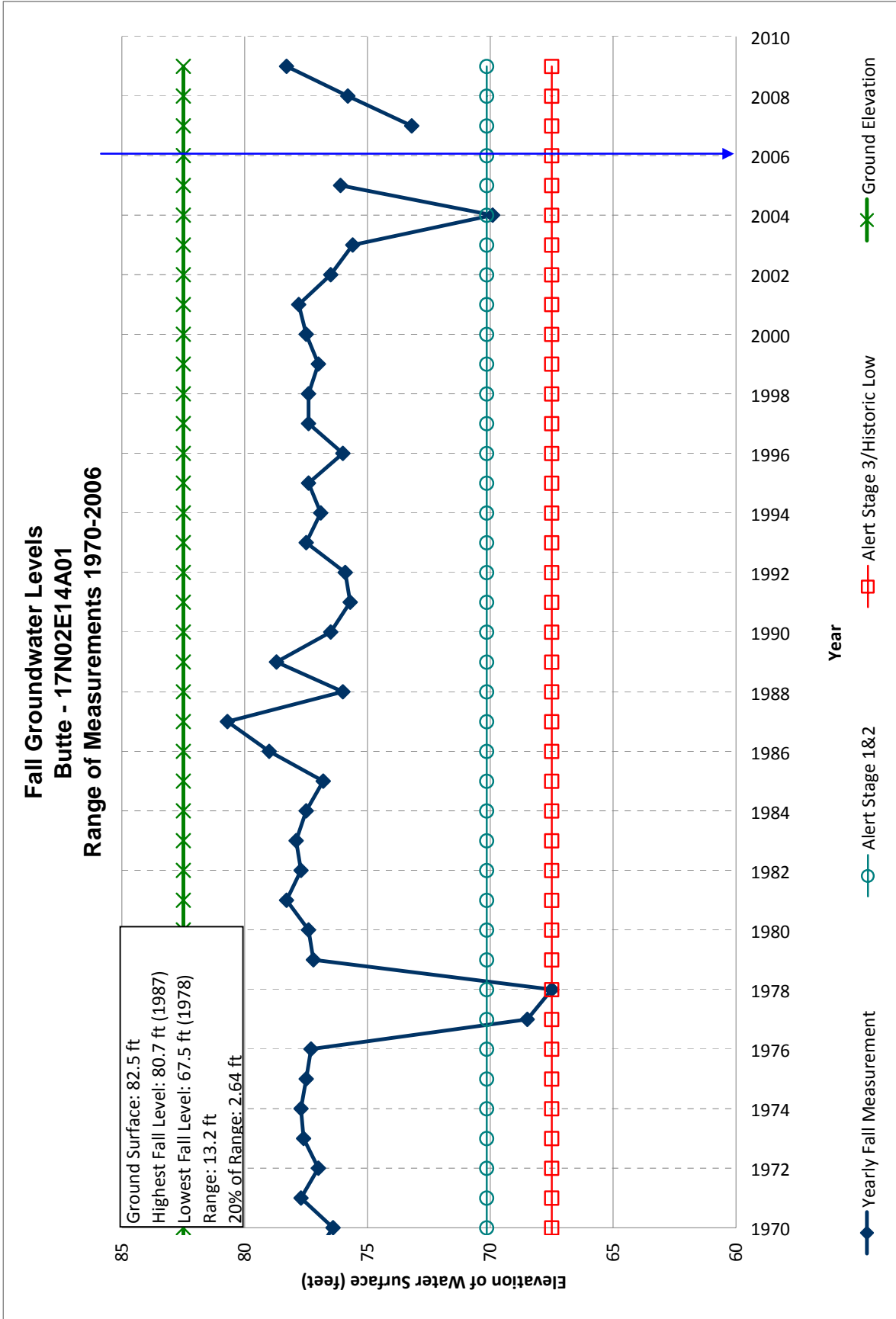
Staff will work to review well logs from key DWR monitoring wells to determine which aquifers are being monitored. The monitoring network will be reevaluated and adjusted as necessary, so if at all possible, monitoring groundwater levels in each aquifer at key locations can begin. If possible, data collection will be initiated for the development of groundwater quality management objectives in 2010.

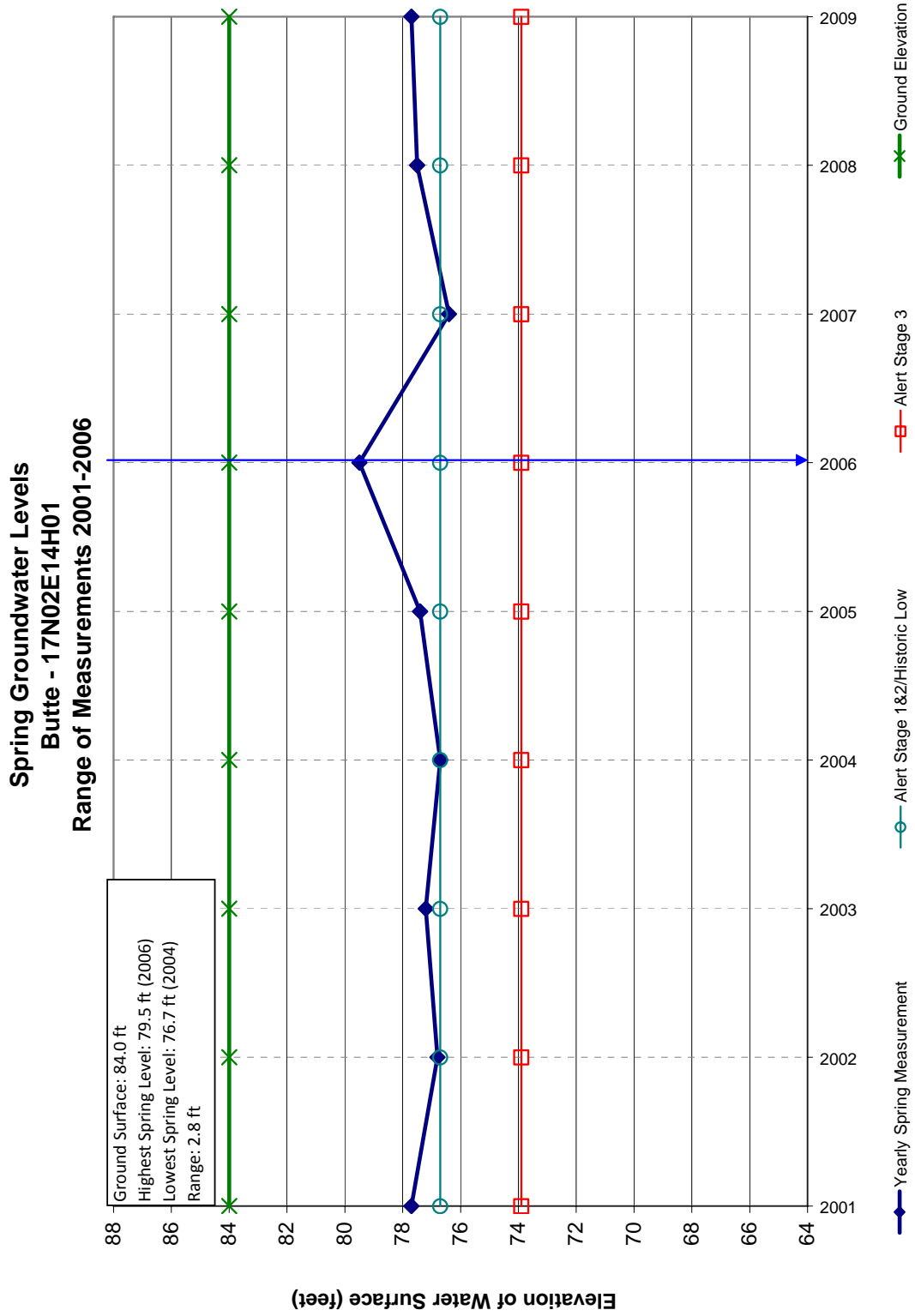
Explore avenues to install an extensometer within the District to monitor for subsidence.

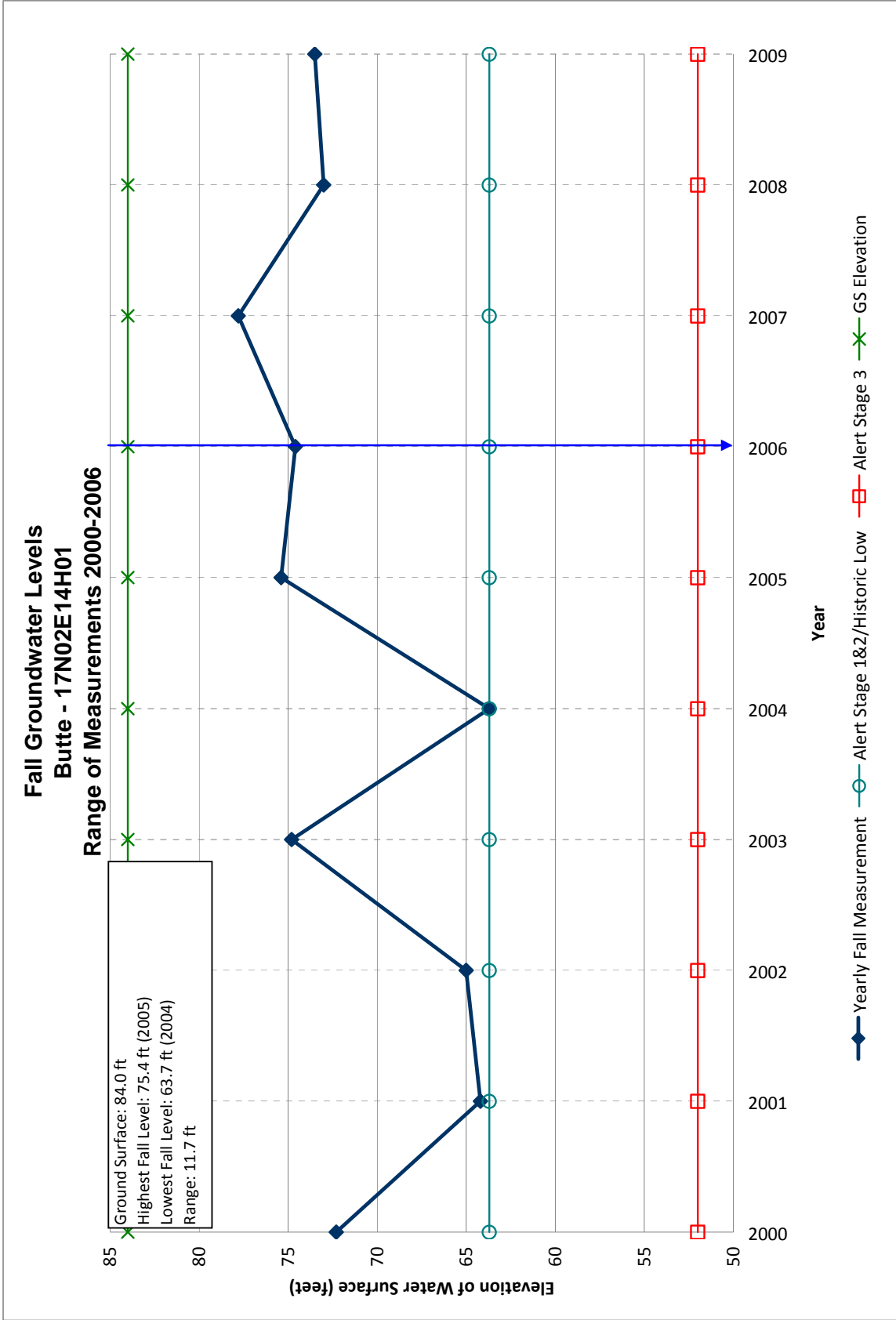
**Supporting Data –**

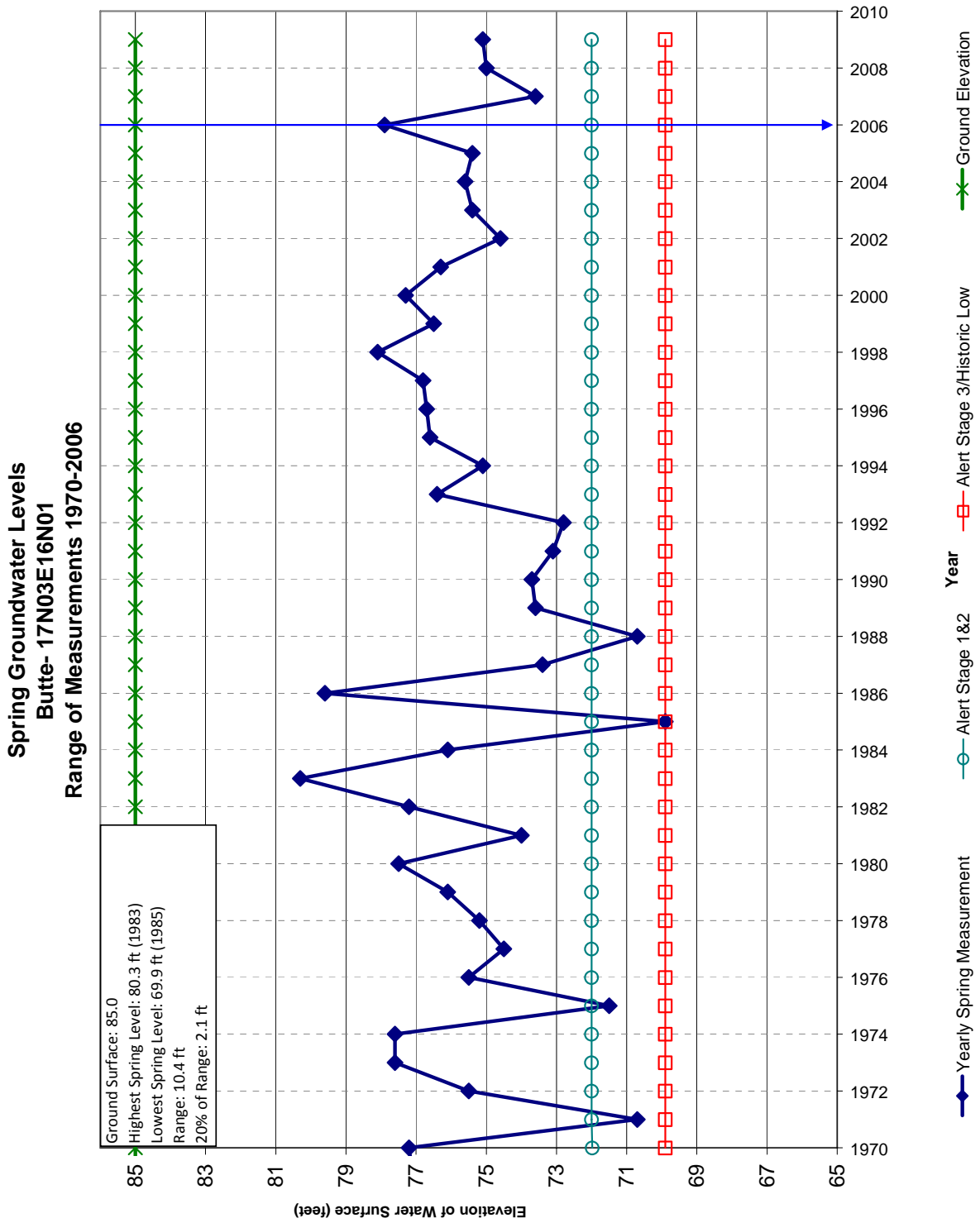
Hydrographs depicting yearly spring level measurements, including 2009 data, with established alert levels for calendar year 2010.

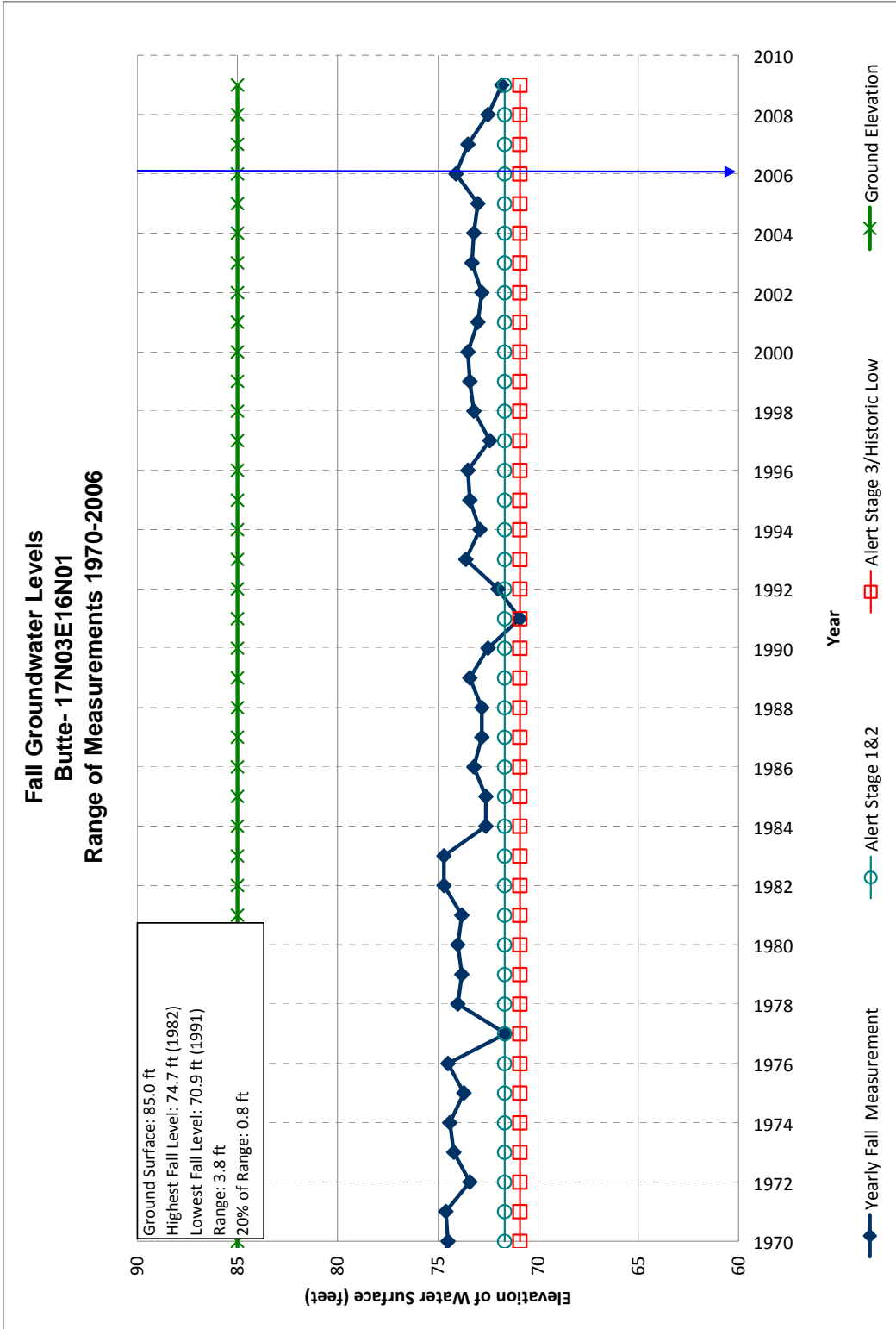


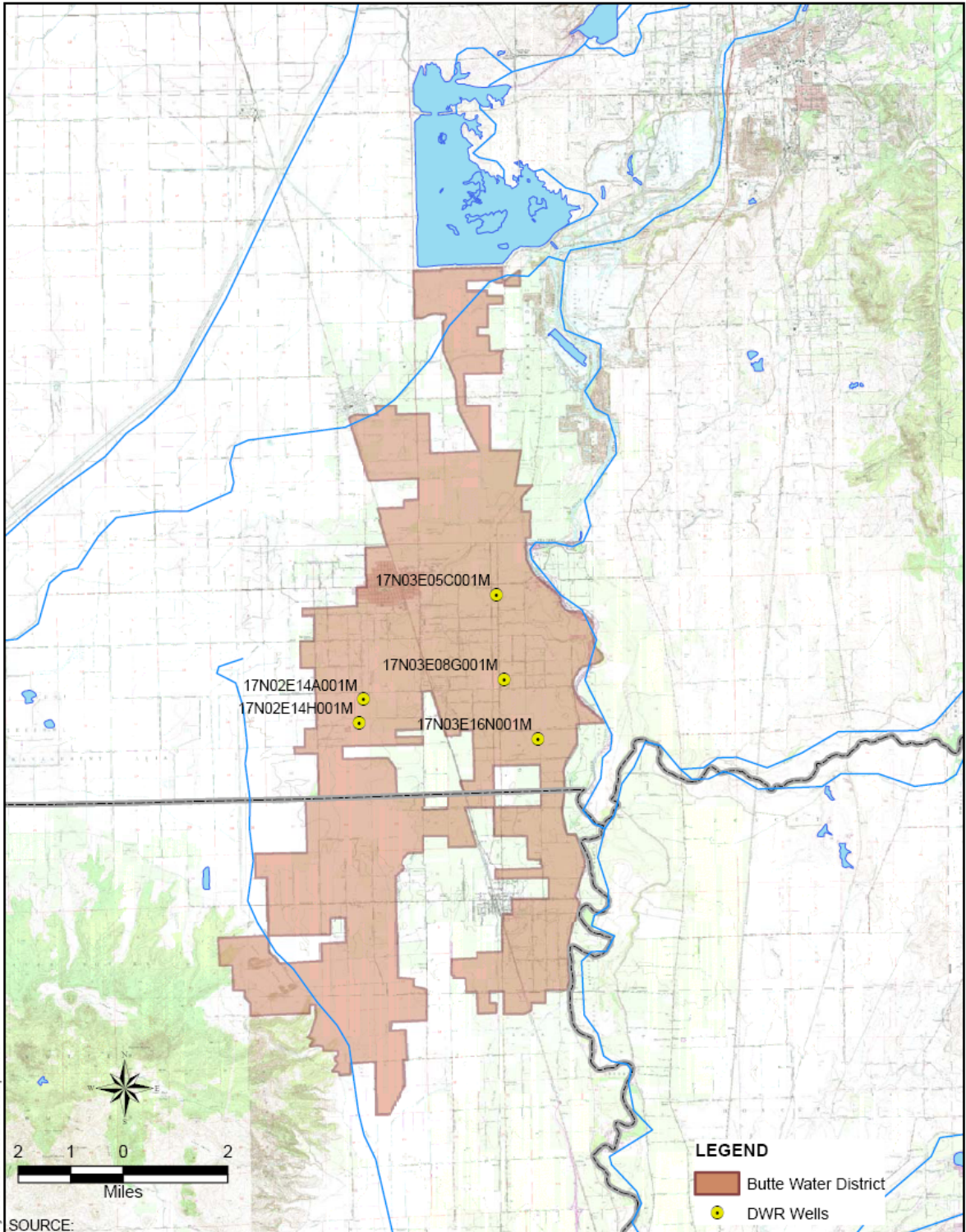












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Butte Water District	 Bookman-Edmonston A Division of GEI Consultants	BASEMAP
Butte County, California		APRIL 2006 <span style="float: right;">FIGURE 1</span>

**Butte Water District Base map**