Water and Resource Conservation Paul Gosselin, Director

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bcwater@buttecounty.net

BUTTE COUNTY
TECHNICAL ADVISORY COMMITTEE

MEETING DATE: Thursday, November 21, 2019
TIME: 2:00 p.m. – 4:00 p.m.
PLACE: Tahoe Room
202 Mira Loma Dr. Oroville, CA

AGENDA ITEMS

1. Introductions and TAC Roll Call

2. * Approval of minutes for the June 6, 2019 meeting (Chair Connell)

3. Review and comment on 2019 monitoring and BMOs (Chair Connell)
   a. * Groundwater levels (Summer data)
   b. * Water quality trend monitoring results

4. Sustainable Groundwater Management Act Updates (Staff, Water and Resource Conservation)
   a. Vina, Butte and Wyandotte Creek Subbasin updates
   b. Groundwater Sustainability Plans Basin Setting Work
   c. Completion of Groundwater Sustainability Plans Request for Proposals

5. Update on special projects (Staff, Water and Resource Conservation)
   a. Airborne Electromagnetic Method Project
   b. Northern Sacramento Valley IRWM Prop1 Implementation Grant Program Proposal

6. Departmental updates (Staff, Water and Resource Conservation)

7. TAC members wishing to address items not listed on the agenda. (The Technical Advisory Committee is prohibited by state law from taking action on any item presented if it is not listed on the agenda).

8. Public Comment: Any person wanting to address the Technical Advisory Committee on any item NOT ON TODAY'S AGENDA may do so at this time. The Technical Advisory Committee will not be making decisions or determinations on items brought up during Public Comment.

9. Future Meeting topics, dates and locations: January 9, 2020 and March TBD 2020

* Indicates attached items

TAC Agenda Item #2

MINUTES OF THE BUTTE COUNTY WATER COMMISSION TECHNICAL ADVISORY COMMITTEE

June 6, 2019
2:00 PM
Tahoe Room 202 Mira Loma
Oroville, CA 95965

1. Introductions and Roll Call

TAC members present: Chair Joe Connell, Todd Greene, Richard Price and Debbie Spangler.

TAC members absent: Matt Meninga and Kyle Morgado

2. Approval of minutes for the January 17, 2019 meeting

Motion by Richard Price, second by Debby Spangler to approve the minutes for January 17, 2019. Motion carried 4-0-0.

3. Review and comment on Spring 2019 groundwater level measurements and BMOs

Information only, no action.

4. Sustainable Groundwater Management Act Updates

Information only, no action

5. Project Updates

a. Airborne Electromagnetic Method (AEM)

Information only, no action

b. Groundwater Sustainability Plans – Basin Setting Work

Information only, no action

c. Monitoring Network Evaluation

Information only, no action

6. Chapter 33A amendment update

Information only, no action

7. Departmental Updates

Information only, no action

8. Public Comment

None

9. Future Meeting date and location: November 21, 2019 at 2:00 PM at 202 Mira Loma Oroville, CA, in the Tahoe Room.

TAC Agenda
Item #3a

Summer Groundwater Level Conditions 2019

Kelly Peterson
Water Resources Scientist

Butte County Water Technical Advisory Committee
November 21, 2019

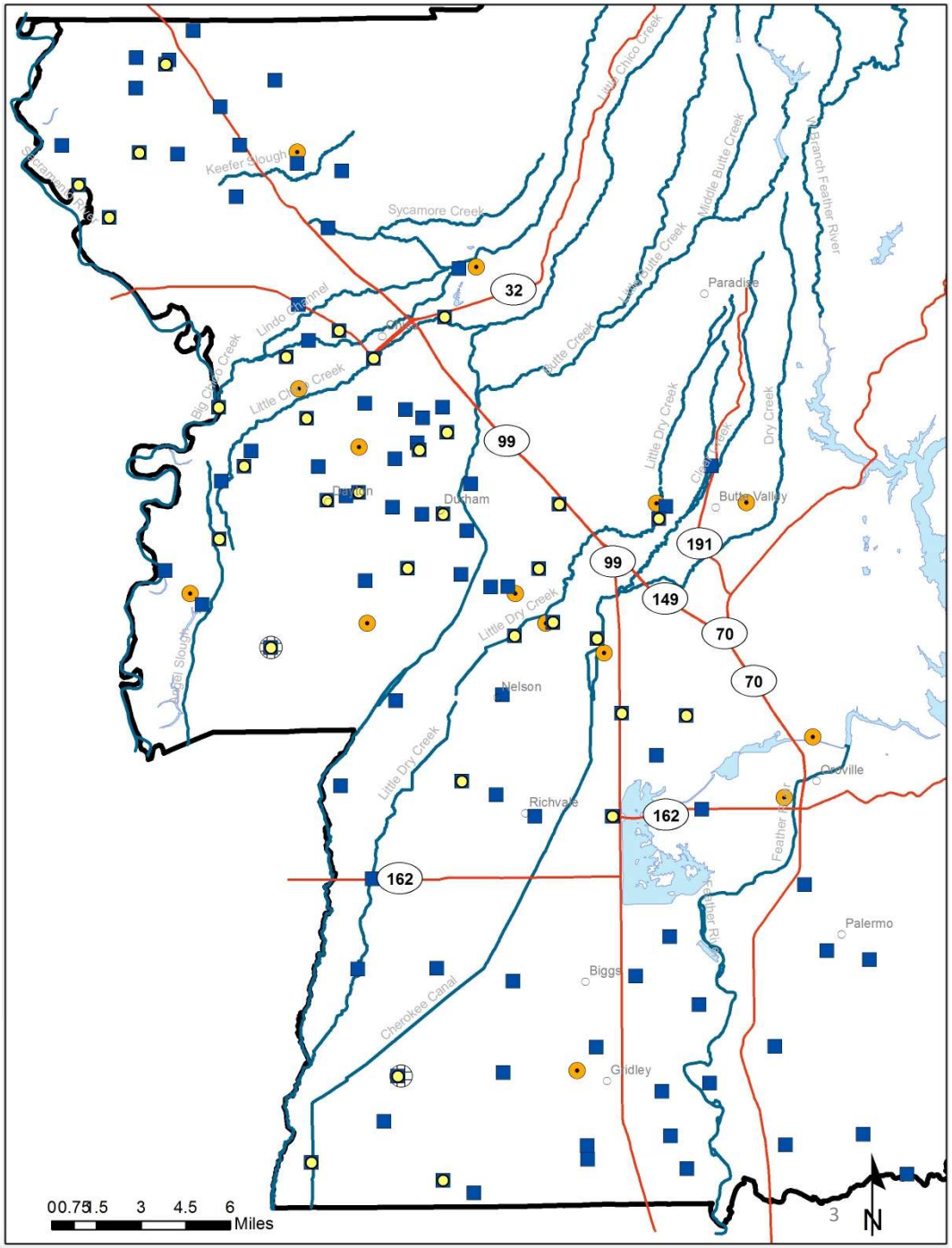
Summer Groundwater Level Conditions 2019

Topics:

1. **Brief Overview of Monitoring / Water Year Index**
2. **Map of Subbasins**
3. **Summer 2019 Depth to Water Conditions**
4. **Spring – Summer 2019 Changes**
5. **Summer 2018 – Summer 2019 Changes**

Groundwater Level Monitoring

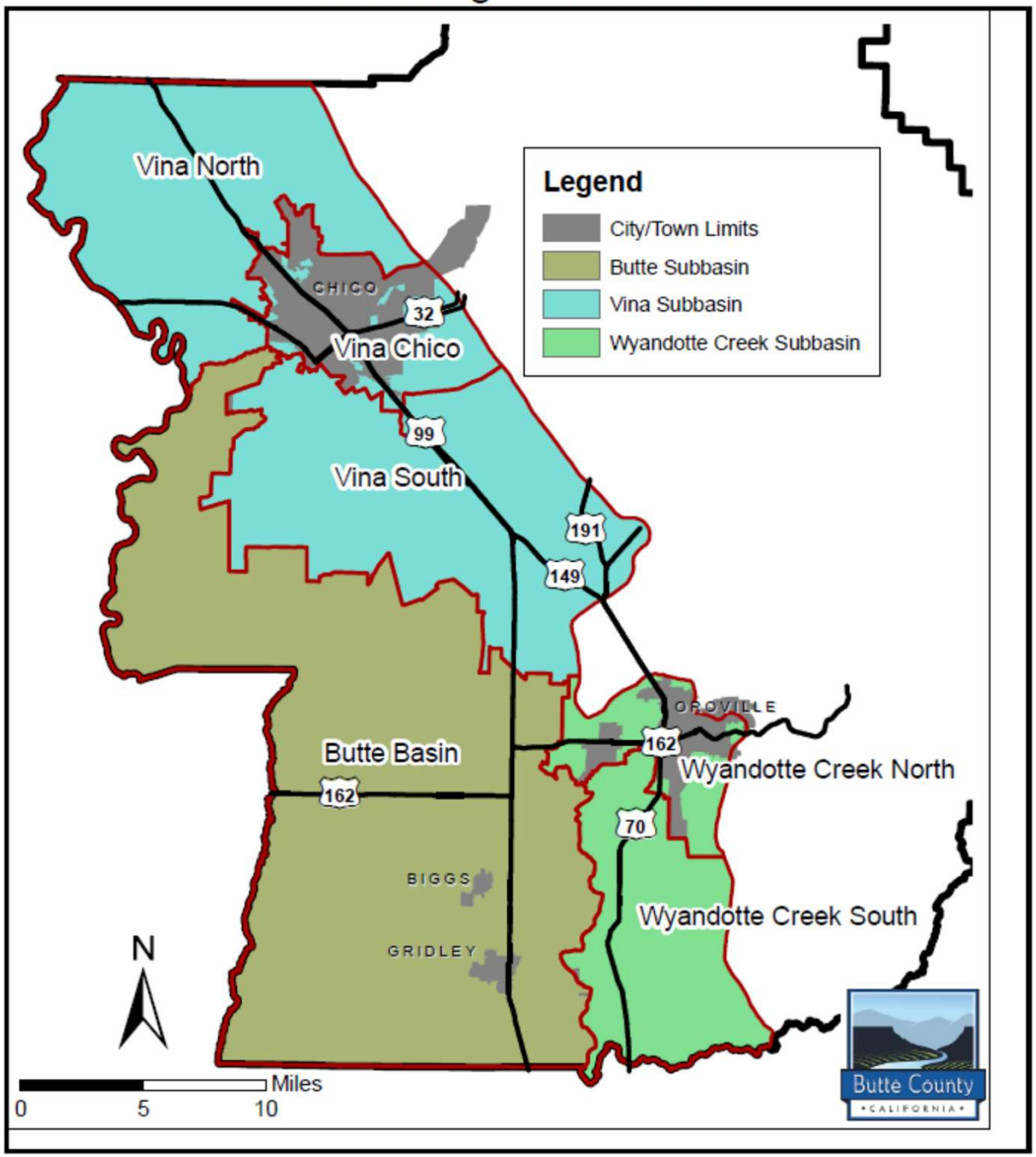
- ~125 wells Manually 4x/year: Mar., Jul., Aug., Oct. w/ DWR
- Hourly data (~60 wells)
- 69 additional wells since 2000
- Data available online: Water Data Library

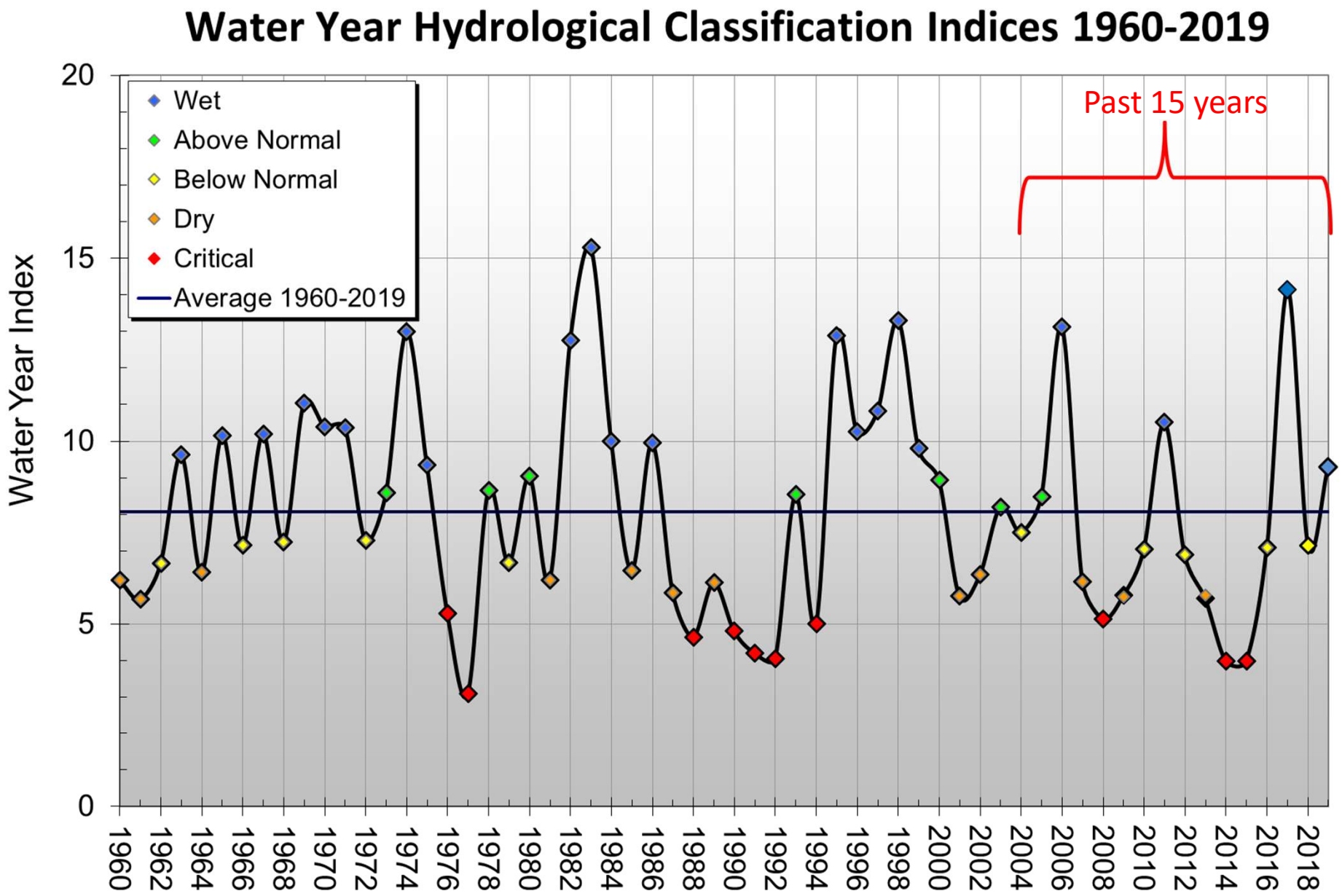


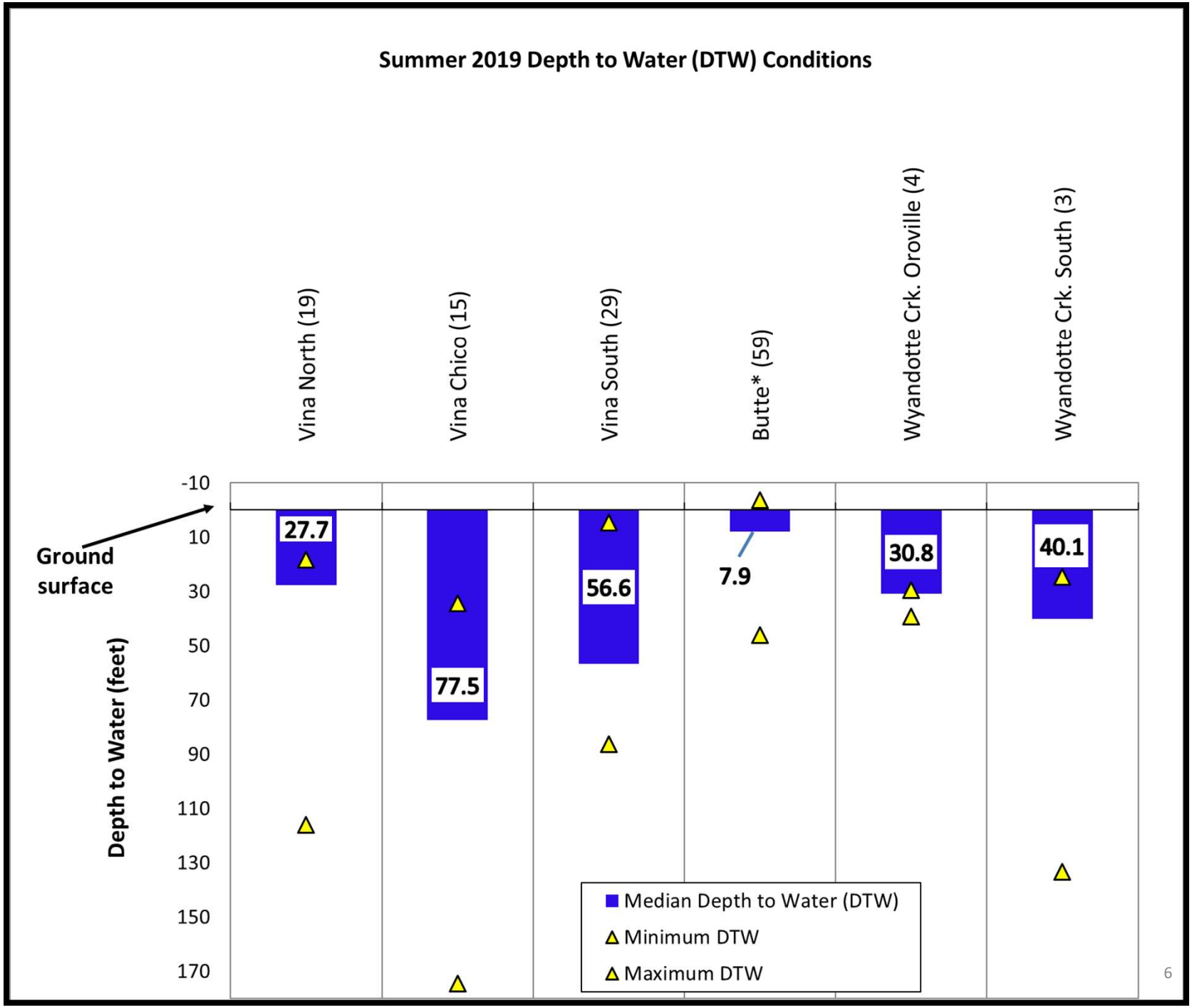
Legend

- Groundwater Level Well- Measured Mar, Jul, Aug, and Oct
- Groundwater Level Recorded Hourly
- BMO Water Quality Trend Monitoring Well
- Extensometer, Measures Land Subsidence
- Primary Streams

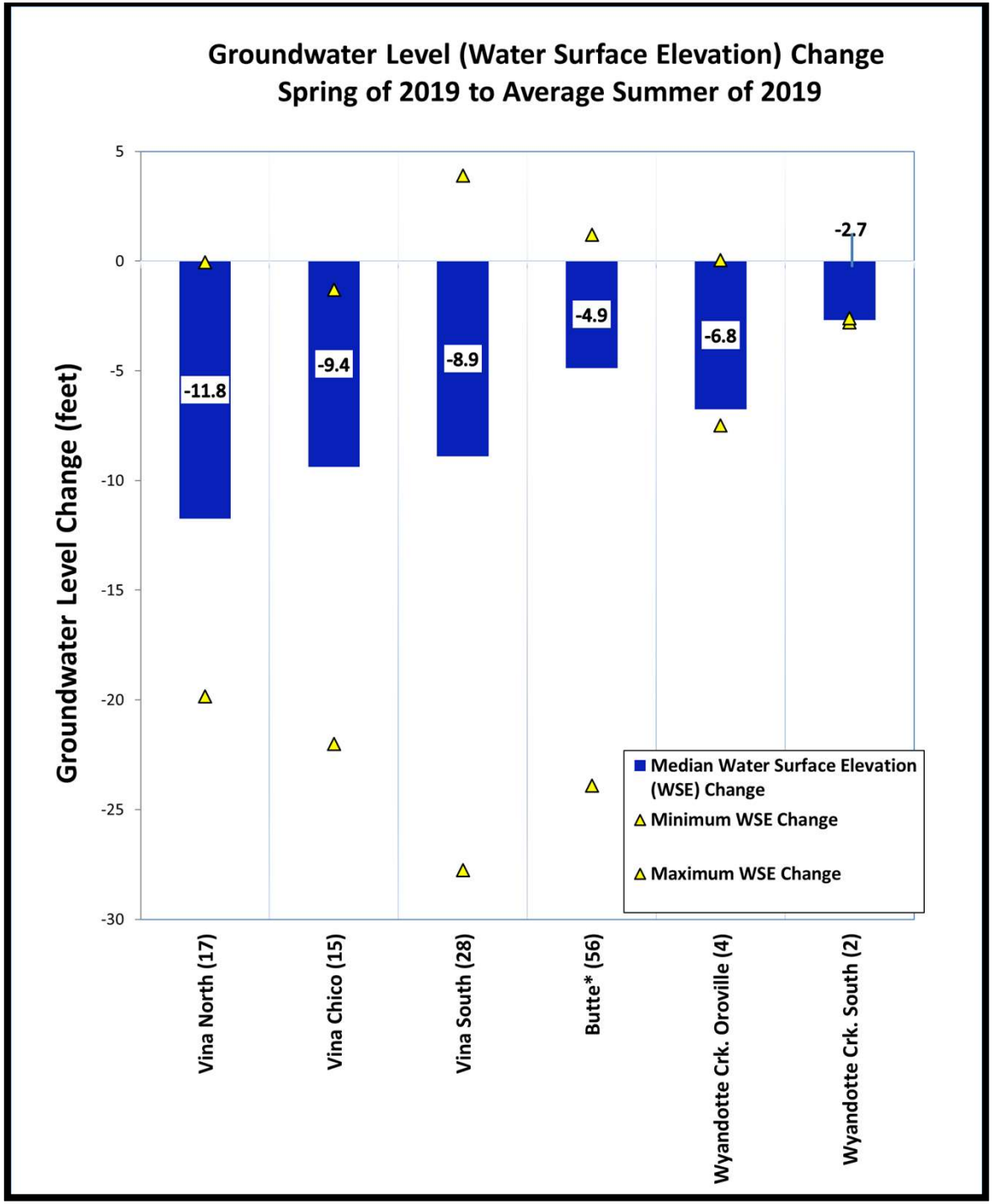
Draft Management Areas




Water Year Hydrological Classification Indices 1960-2019
Water Year Index
Wet
Above Normal
Below Normal
Dry
Critical
Average 1960-2019
Past 15 years
20
15
10
5
0
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018


Summer 2019 Depth to Water (DTW) Conditions
Vina North (19)
Vina Chico (15)
Vina South (29)
Butte* (59)
Wyandotte Crk. Oroville (4)
Wyandotte Crk. South (3)
Ground surface
Depth to Water (feet)
-10
10
30
50
70
90
110
130
150
170
27.7
77.5
56.6
7.9
30.8
40.1
Median Depth to Water (DTW)
Minimum DTW
Maximum DTW

Spring 2019 to Summer 2019
Water Surface Elevation Changes

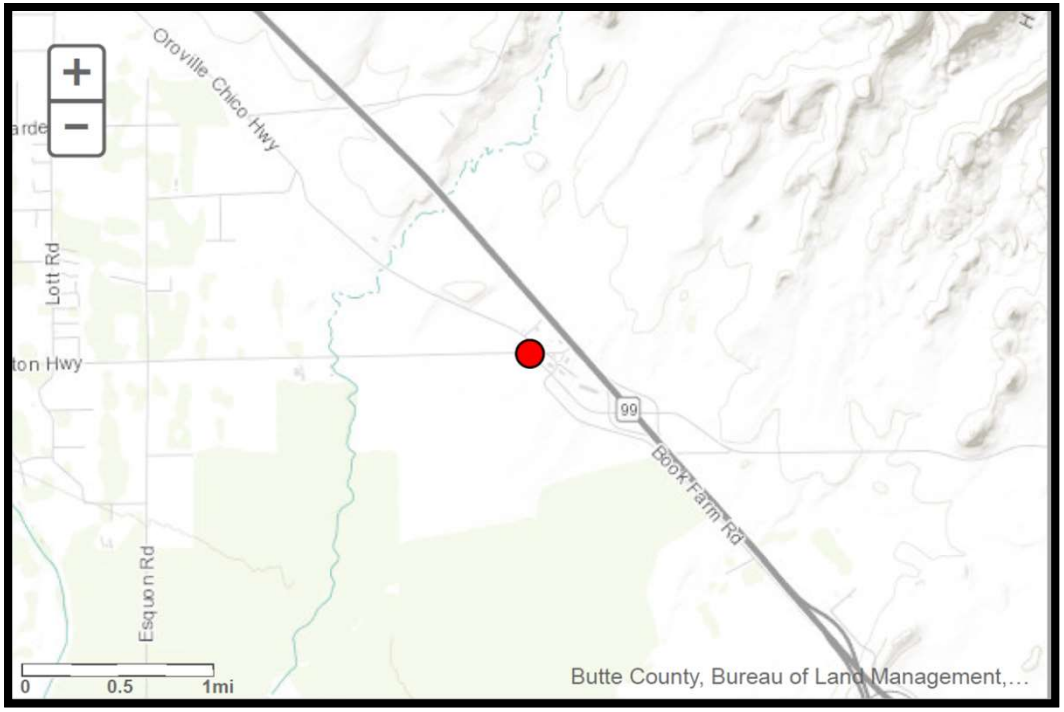

Groundwater Level (Water Surface Elevation) Change
Spring of 2019 to Average Summer of 2019
Groundwater Level Change (feet)
5
0
-5
-10
-15
-20
-25
-30
-11.8
-9.4
-8.9
-4.9
-6.8
-2.7
Median Water Surface Elevation (WSE) Change
Minimum WSE Change
Maximum WSE Change
Vina North (17)
Vina Chico (15)
Vina South (28)
Butte* (56)
Wyandotte Crk. Oroville (4)
Wyandotte Crk. South (2)

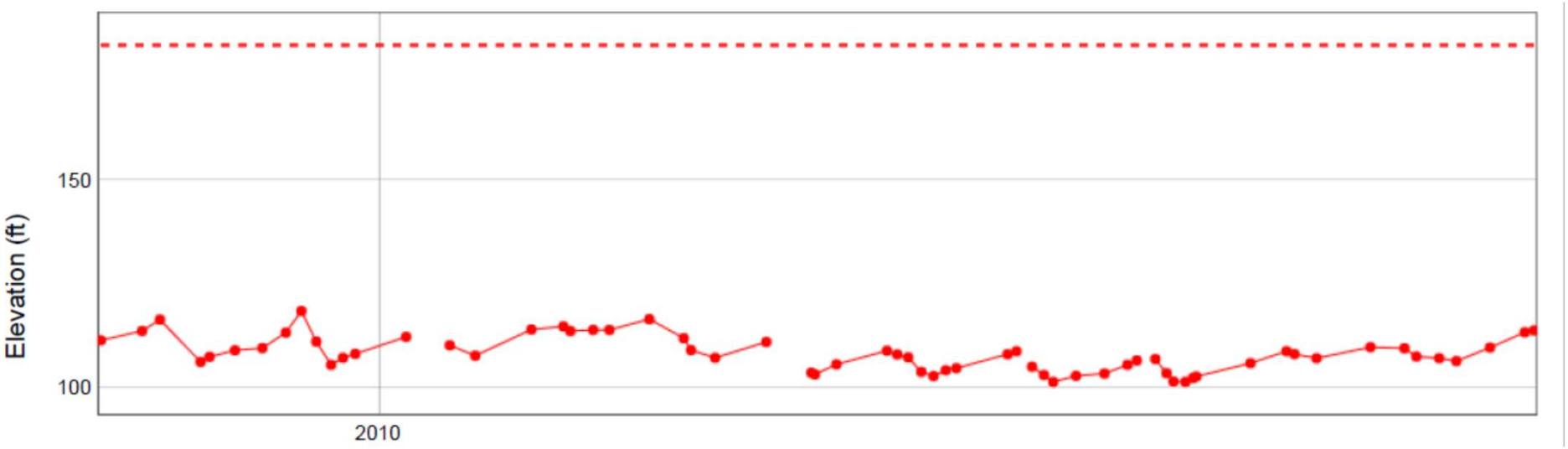
Max. Increase WSE Spring 2019 to Summer 2019

Vina South (+ 3.9’)

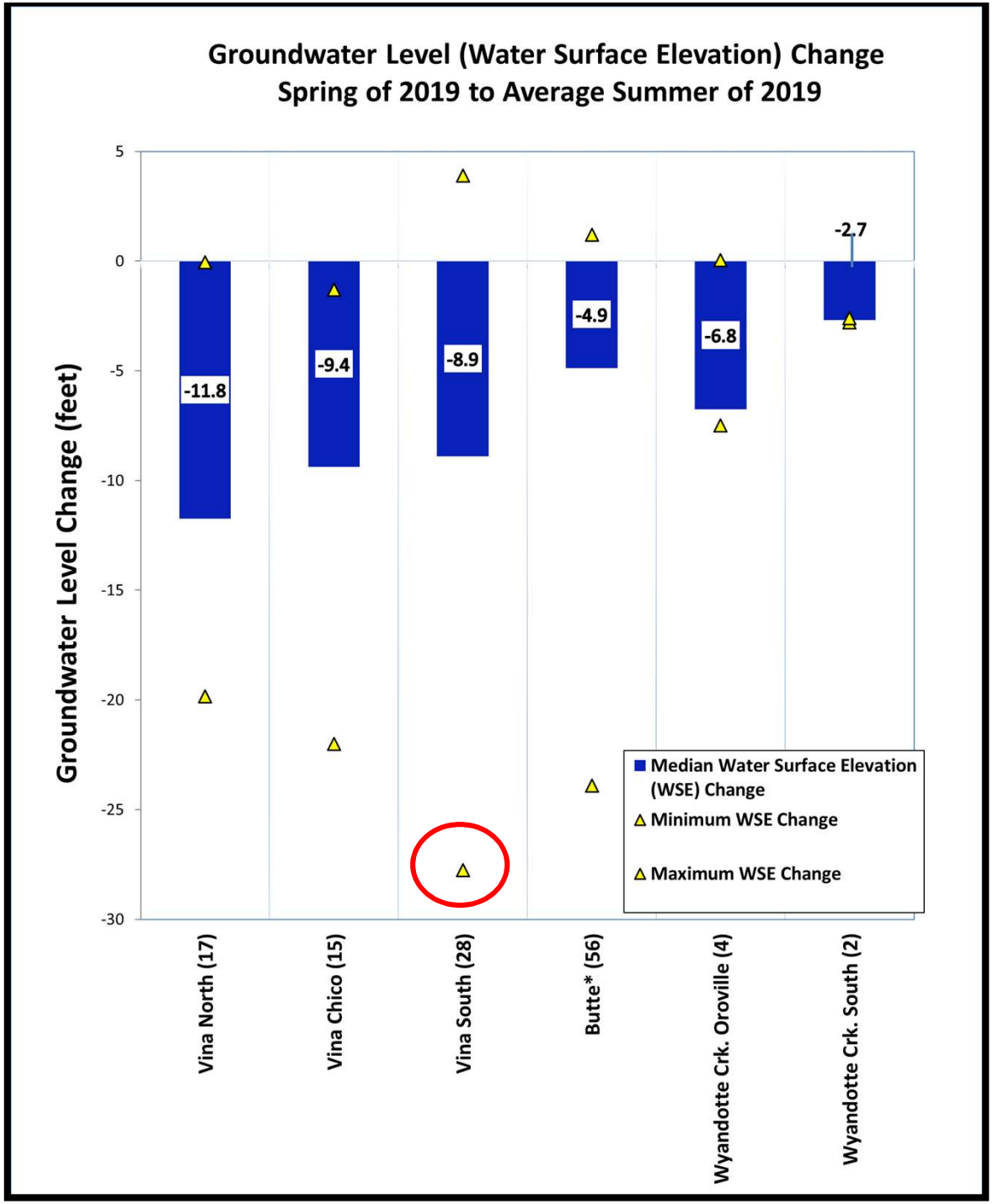
21N02E26E006M

Monitoring well ~180’ deep





--- Ground surface elevation

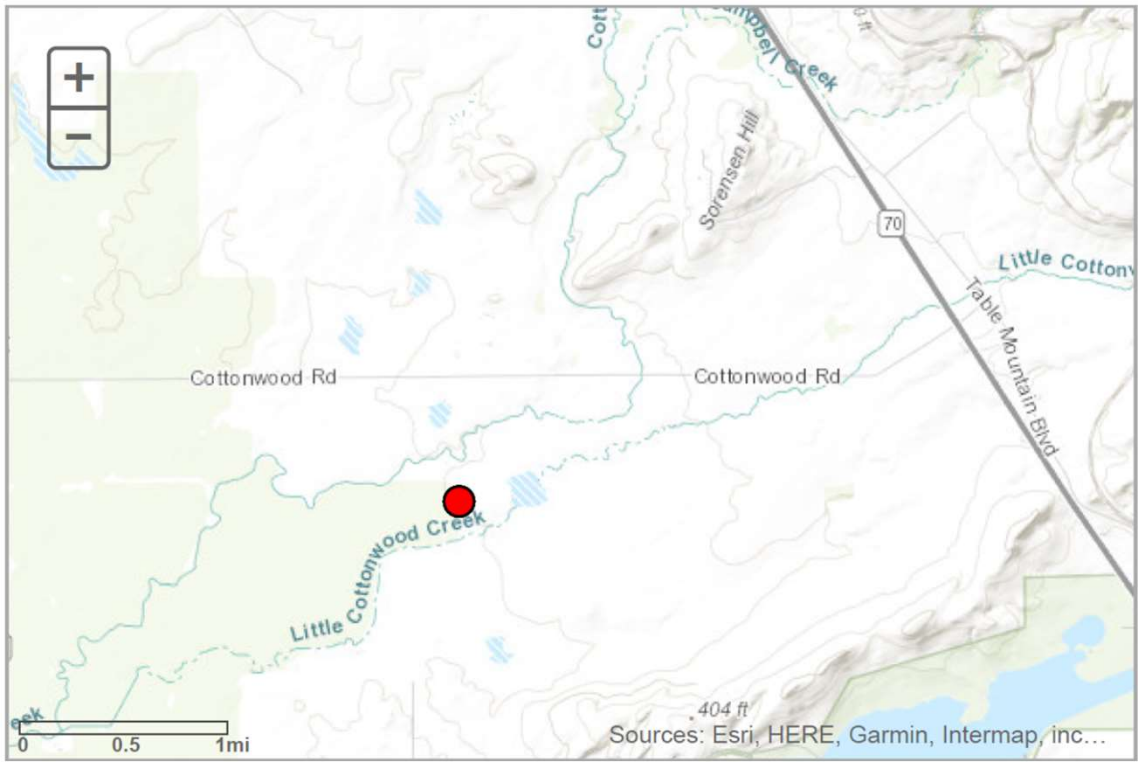

Groundwater Level (Water Surface Elevation) Change
Spring of 2019 to Average Summer of 2019
Groundwater Level Change (feet)
5
0
-5
-10
-15
-20
-25
-30
-11.8
-9.4
-8.9
-4.9
-6.8
-2.7
Median Water Surface Elevation (WSE) Change
Minimum WSE Change
Maximum WSE Change
Vina North (17)
Vina Chico (15)
Vina South (28)
Butte* (56)
Wyandotte Crk. Oroville (4)
Wyandotte Crk. South (2)

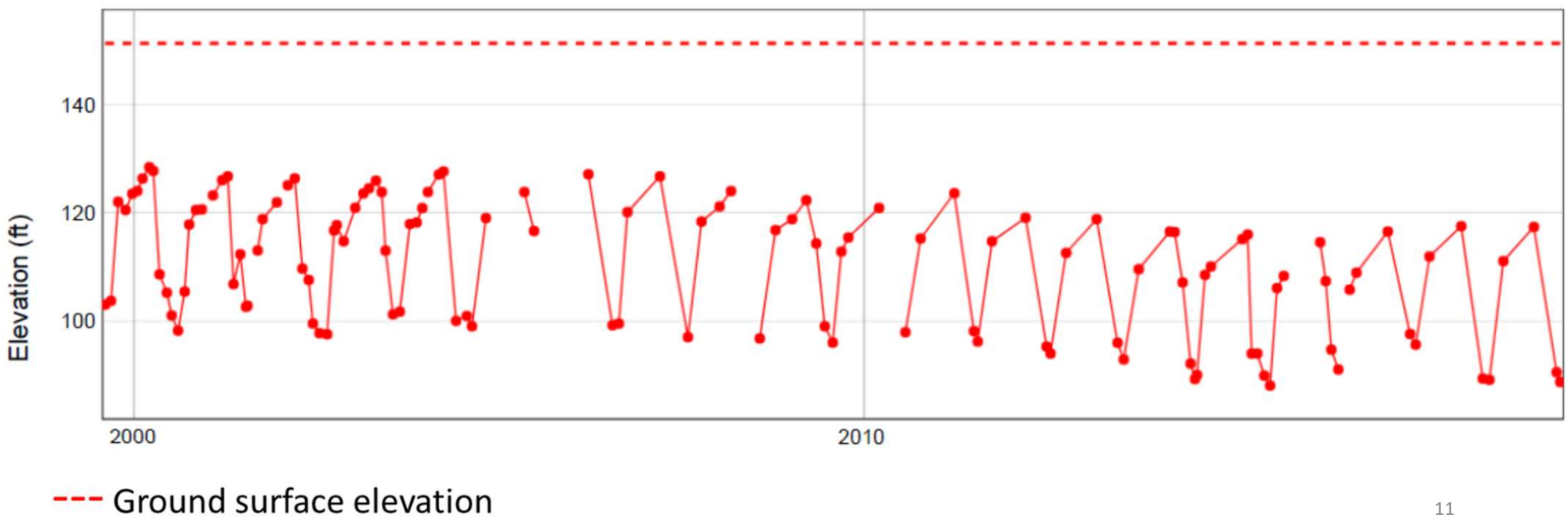
Max. Decrease WSE Spring 2019 to Summer 2019

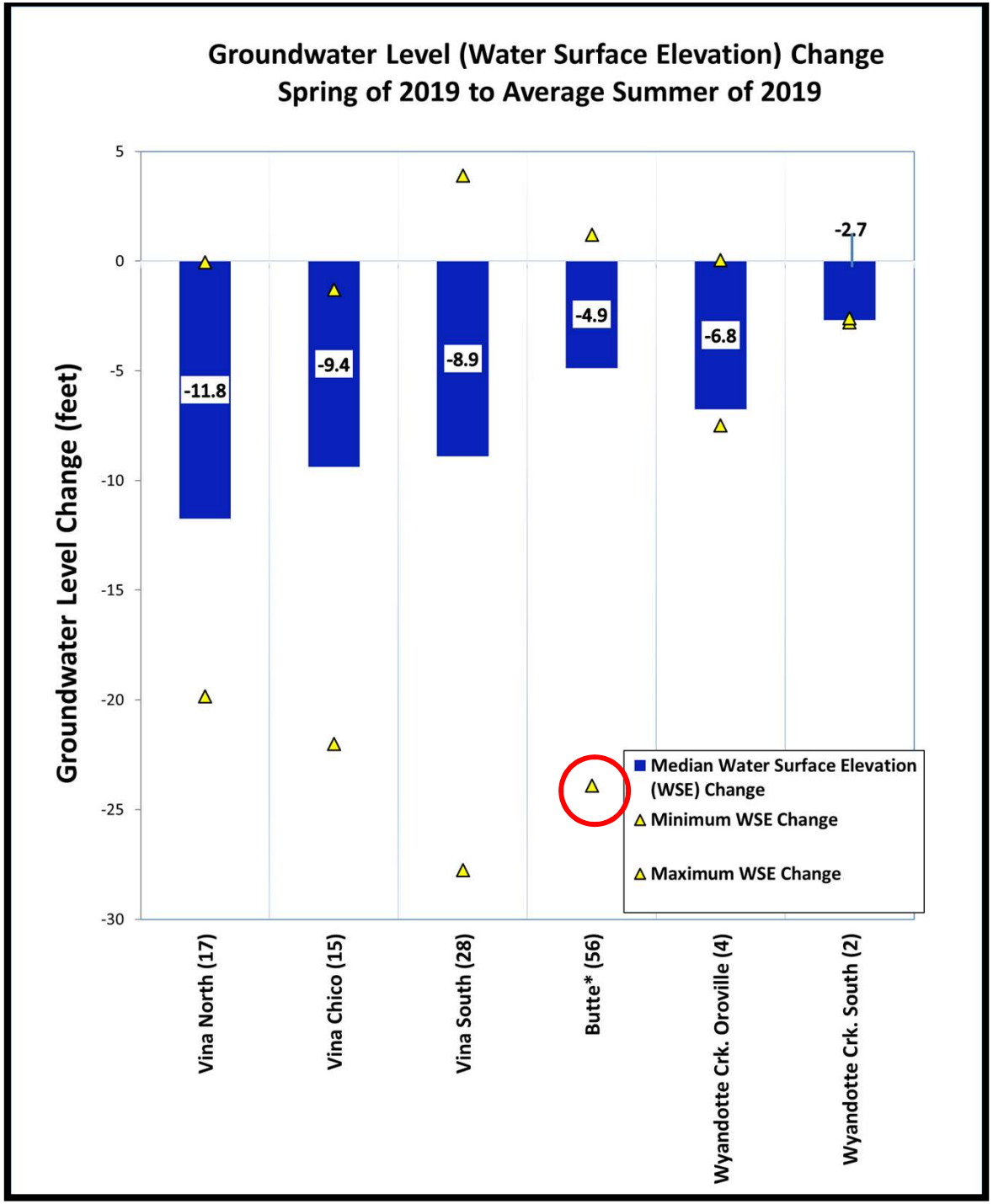
Vina South (- 27.8')

20N03E33L001M

"Other" well ~100' deep





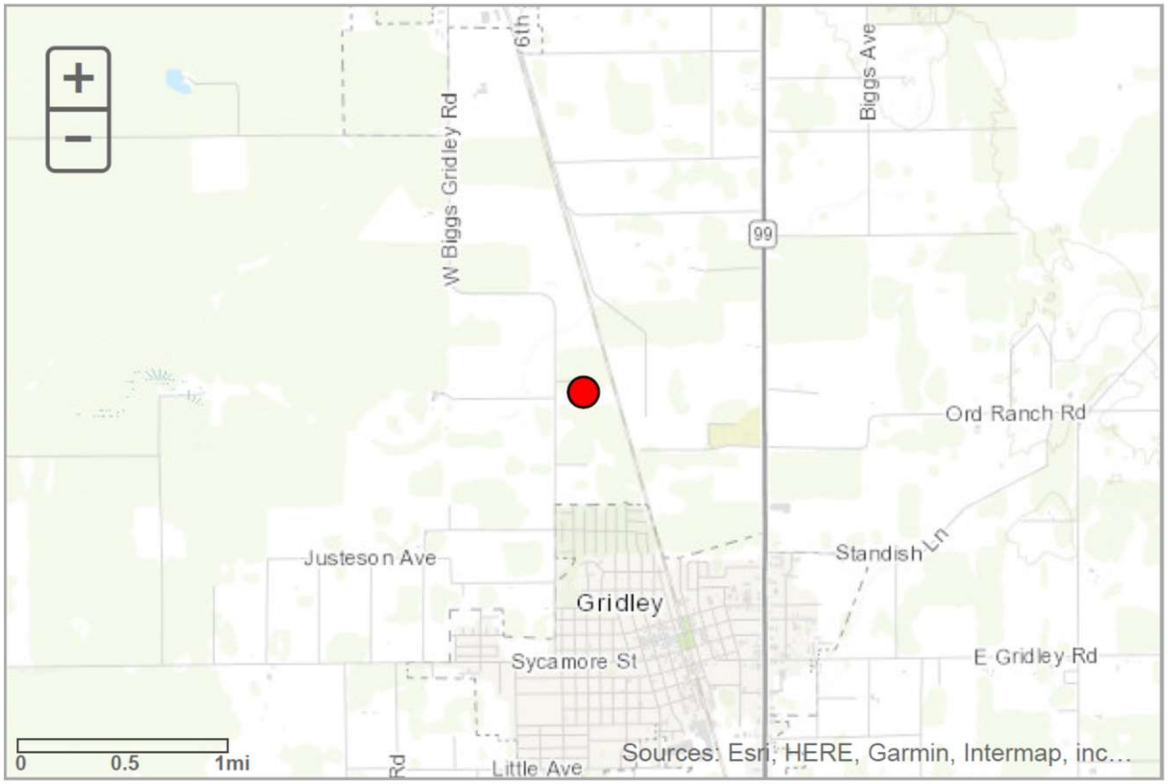

Groundwater Level (Water Surface Elevation) Change
Spring of 2019 to Average Summer of 2019
Groundwater Level Change (feet)
5
0
-5
-10
-15
-20
-25
-30
-11.8
-9.4
-8.9
-4.9
-6.8
-2.7
Median Water Surface Elevation (WSE) Change
Minimum WSE Change
Maximum WSE Change
Vina North (17)
Vina Chico (15)
Vina South (28)
Butte* (56)
Wyandotte Crk. Oroville (4)
Wyandotte Crk. South (2)

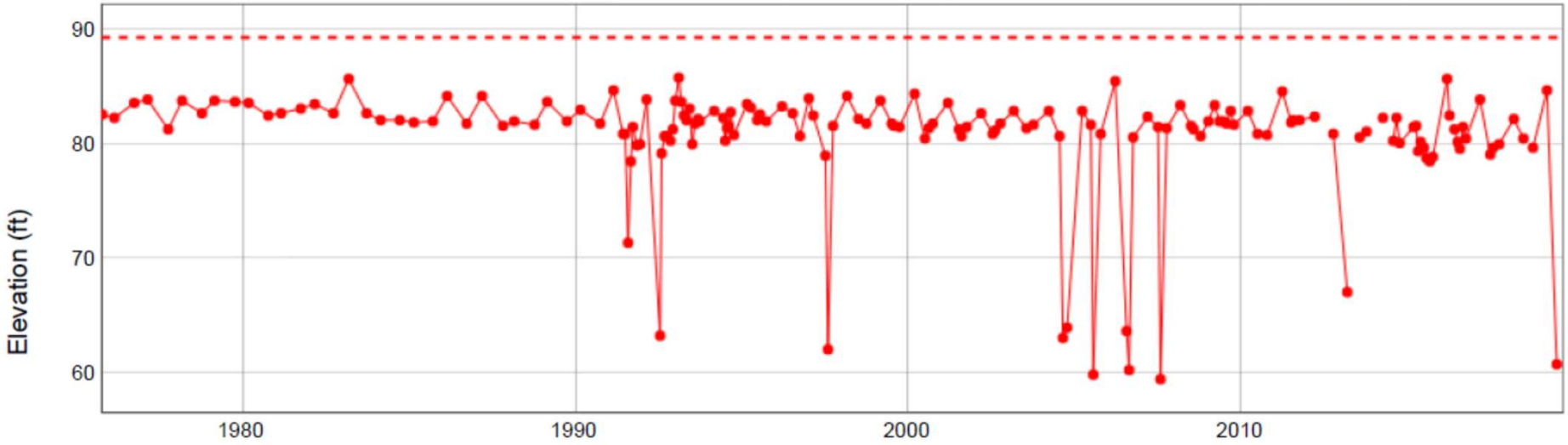
Second Largest Decrease WSE Spring 19 to Summer 19

Butte (- 23.9')

18N02E25M001M

Irrigation well ~220' deep





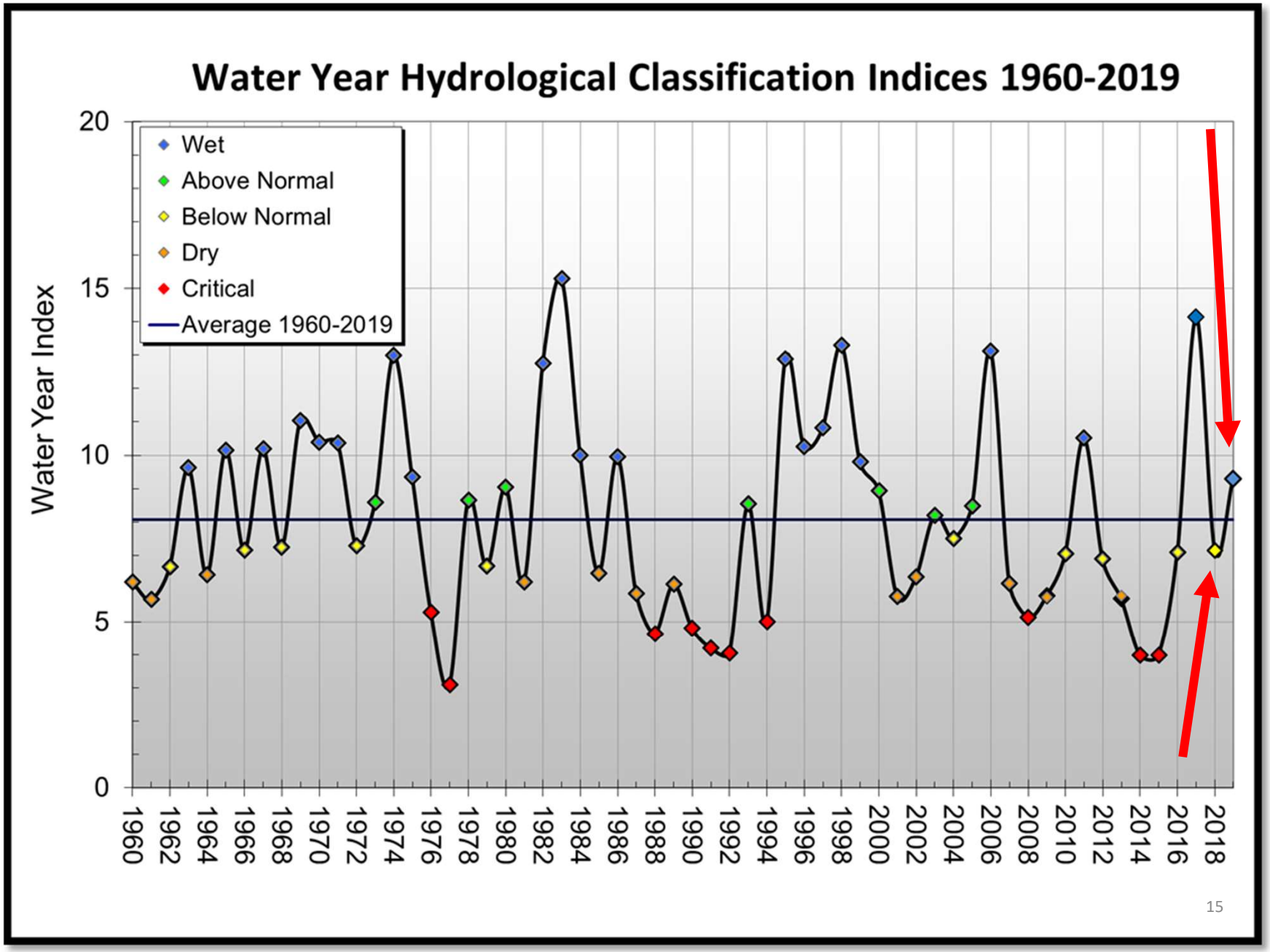
Note: In Fall 2019 back up to WSE 80.60'

Summer 2018 to Summer 2019
Water Surface Elevation Changes

Year 1

Year 2

Summer 2018 to 2019 Water Surface Elevation Changes

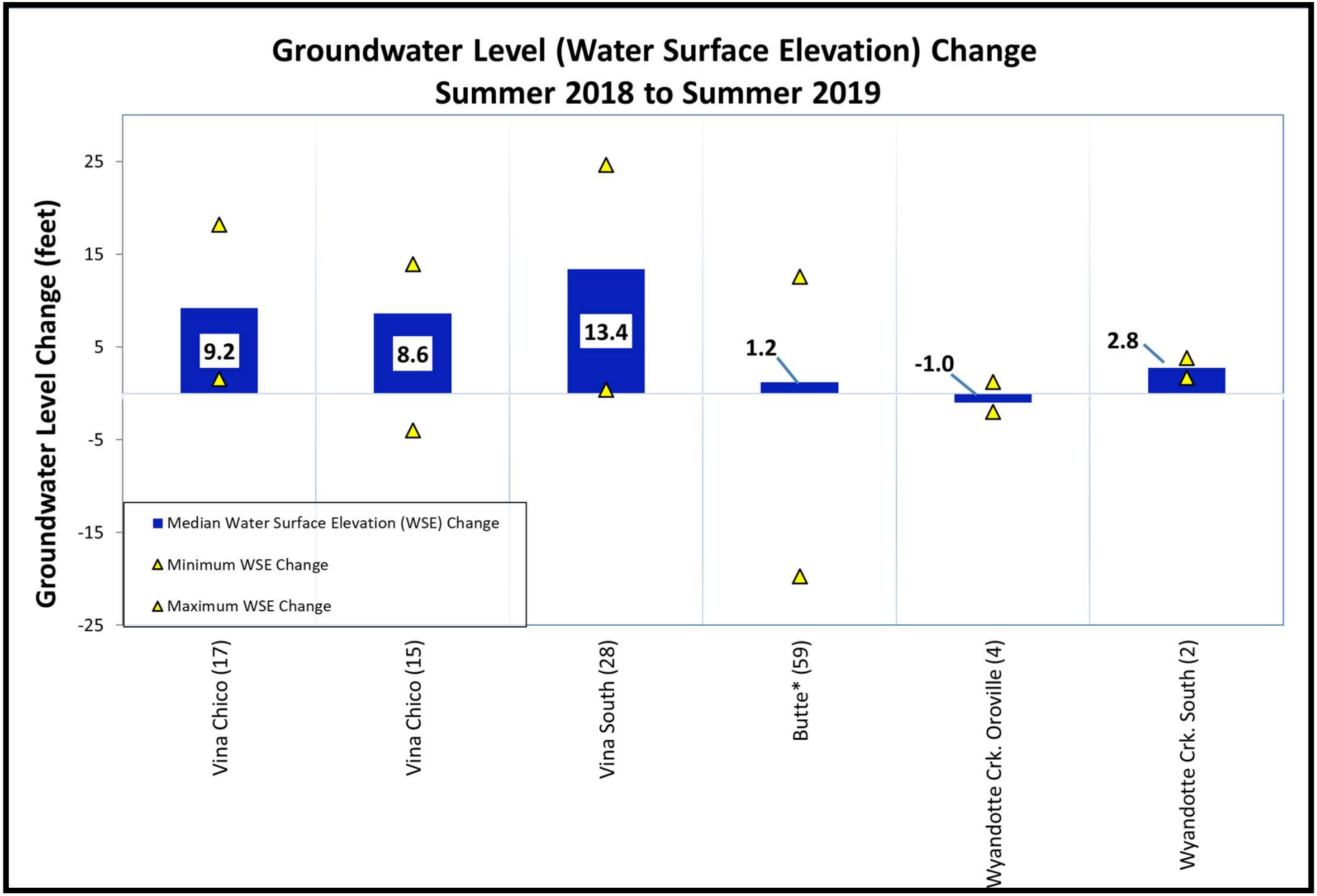


Summer Monitoring Data

Groundwater Level (GWL) Change in Water Surface Elevations Summer 2018 to 2019

Number of wells		Change (ft.)	Area
125	Average GWL Change	5.8	
	Median GWL Change	4.2	
106	Average Increase	7.3	
	Median Increase	5.9	
	Max Increase	24.7	Vina South
18	Average Decrease	-2.4	
	Median Decrease	-1.4	
	Max Decrease	-19.7	Butte

Note: Questionable measurements were included and 1 well measured did not change in GWL between Summer of 2018 and Summer of 2019

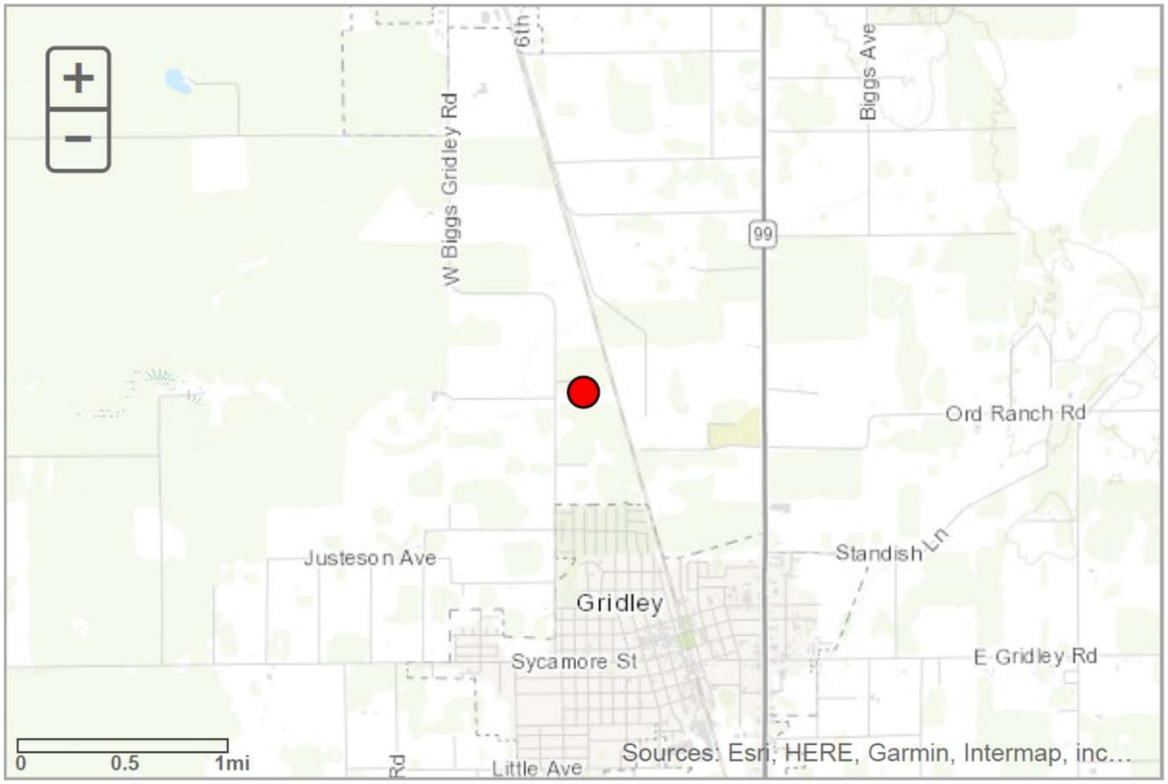

Groundwater Level (Water Surface Elevation) Change
Summer 2018 to Summer 2019
Groundwater Level Change (feet)
25
15
5
-5
-15
-25
9.2
8.6
13.4
1.2
-1.0
2.8
Median Water Surface Elevation (WSE) Change
Minimum WSE Change
Maximum WSE Change
Vina Chico (17)
Vina Chico (15)
Vina South (28)
Butte* (59)
Wyandotte Crk. Oroville (4)
Wyandotte Crk. South (2)

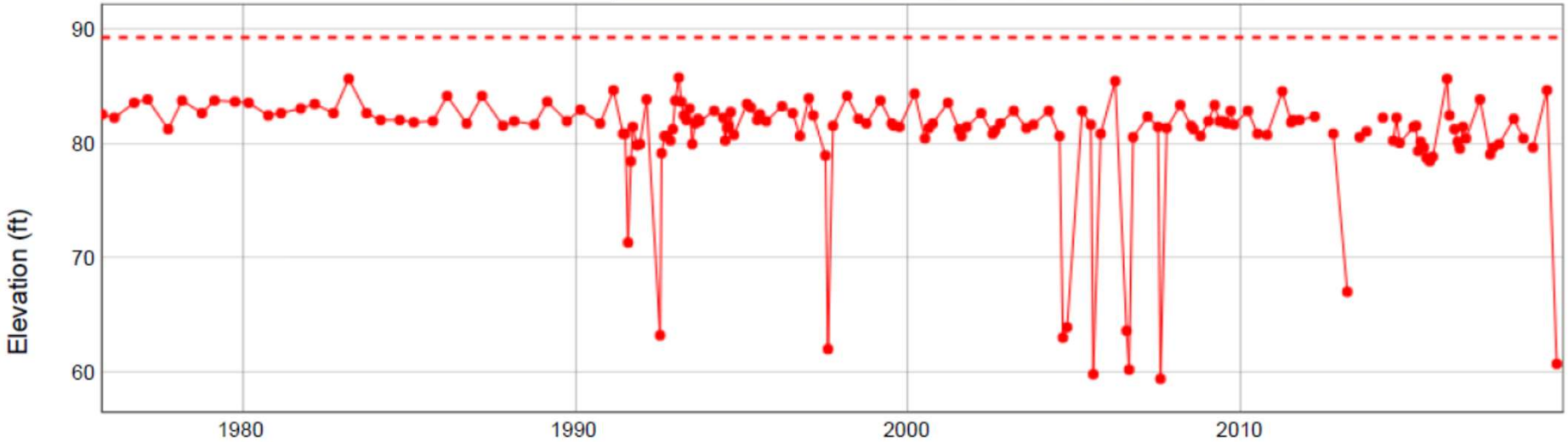
Largest Decrease WSE Spring to Summer 2019

Butte (- 19.7')

18N02E25M001M

Irrigation well ~220' deep





Note: In Fall 2019 back up to WSE 80.60'

Questions / Discussion

Summer 2011 - 2019 Groundwater Elevations - CASGEM

Sub Basin	Revised Subinventory Unit	Monitoring Wells	Well Type	Well Depth	First Record	Groundwater Elevations											Analysis		
						Summer 2011 Average WSE (ft)	Summer 2012 Average WSE (ft)	Summer 2013 Average WSE (ft)	Summer 2014 Average WSE (ft)	Summer 2015 Average WSE (ft)	Summer 2016 Average WSE (ft)	Summer 2017 Average WSE (ft)	Summer 2018 Average WSE (ft)	Spring 2019 (WSE) (ft)	7/1/19 - 7/11/19 WSE (ft)	7/28/19 - 8/21/19 WSE (ft)	2019 Average Summer WSE (ft)	Change Avg. Summer WSE 2018 to 2019 (ft)	Change Spring to Avg. Summer 2019 (ft)
VINA	Vina North	23N01E07H001M	D	S	2018									168.6	166.0	165.9	166.0	N/A	-2.65
		23N01E29P002M	D	S/I	1990	145.6	139.4	128.0	138.7	133.3	132.4	139.7	131.0	150.24	139.8	141.3	140.6	9.5	-9.7
		23N01W10E001M	I	I	2001	156.2	163.4	166.8	146.2	146.2	143.7	149.6	NM	**164.68**	NM	152.5	152.5	N/A	-12.2
		23N01W10M001M	M	S	2001	158.6	148.8	148.4	145.4	147.1	147.9	152.2	149.5	**165.86**	154.2	153.3	153.8	4.2	-12.1
		23N01W27L001M	D	S	1976	137.2	128.7	125.1	126.5	121.1	123.5	NA	123.3	148.87	135.9	133.5	134.7	11.4	-14.2
		23N01W36P001M	D	S	1959	131.6	112.4	113.2	109.6	108.4	108.6	119.5	112.8	144.95	136.4	125.7	131.0	18.2	-14.0
		23N02W25C001M	I	S/I	1967	136.8	137.3	132.3	130.0	131.1	133.9	137.1	123.0	NM	139.0	137.3	138.2	15.2	N/A
		23N01W25G001M	I	I	2007	125.5	134.1	134.4	132.8	127.4	121.9	131.7	126.6	147.05	136.5	132.2	134.3	7.7	-12.8
		23N01W03H002M	M	I	2012	NW	166.3	163.4	166.0	165.5	164.5	165.4	165.6	175.89	167.1	167.2	167.1	1.5	-8.8
		23N01W03H003M	M	I	2012	NW	168.3	166.0	162.4	166.6	166.1	168.4	167.2	175.91	170.2	170.8	170.5	3.3	-5.4
		23N01W03H004M	M	S	2012	NW	178.3	175.8	172.9	172.4	173.8	178.2	174.5	179.77	180.6	178.8	179.7	5.2	0.0
		23N01W28M002M	M	D	2009	141.1	135.3	129.8	127.2	125.1	130.0	136.0	129.6	147.73	141.7	137.8	139.8	10.2	-8.0
		23N01W28M003M	M	D	2009	137.9	131.7	127.4	124.9	124.6	128.6	135.2	129.0	149.87	140.2	136.1	138.2	9.2	-11.7
		23N01W28M004M	M	S	2009	137.1	127.7	127.6	125.3	124.1	128.0	134.6	128.8	150.1	139.2	136.4	137.8	9.0	-12.3
		23N01W28M005M	M	S	2009	138.2	130.8	128.9	126.4	127.0	129.4	135.6	129.8	150.25	140.0	137.0	138.5	8.6	-11.8
		23N01W31M001M	M	D	2008	133.4	127.8	111.4	118.7	106.6	123.8	131.0	121.7	139.26	136.9	132.0	134.4	12.8	-4.8
		23N01W31M002M	M	I	2008	129.0	122.1	117.8	112.7	117.1	117.6	126.1	115.7	147.46	133.7	126.8	130.3	14.6	-17.2
		23N01W31M003M	M	S	2008	123.1	120.1	119.9	118.5	118.7	116.9	121.2	116.9	147.23	130.6	124.2	127.4	10.5	-19.9
		23N01W31M004M	M	S	2008	136.5	134.2	133.7	132.2	132.0	133.0	135.5	133.6	141.83	137.2	135.8	136.5	2.9	-5.3
	Vina Chico	22N01E09B001M	D	S	2001	141.7	129.6	126.7	125.8	126.2	126.0	134.5	128.3	**138.43**	138.7	135.5	137.1	8.8	-1.3
		22N01E20K001M	D	S	1961	130.4	121.8	121.7	125.1	115.5	116.2	127.6	119.6	136.14	134.3	132.7	133.5	13.9	-2.6
		23N01E33A001M	I	S/I	2001	147.8	144.1	141.7	138.9	136.8	136.5	141.2	139.8	**144.59**	144.3	142.0	143.2	3.4	-1.4
		CWSCH01b	M&I	U	1988	NA	NA	NA	NA	NA	NA	NA	105.0	130	108	113.0	113.0	8.0	-17.0
		CWSCH02	M&I	U	1988	NA	NA	NA	NA	NA	NA	NA	104.5	131	109	110.0	110.0	5.5	-21.0
		CWSCH03	M&I	U	1988	NA	NA	NA	NA	NA	NA	NA	108.5	**123**	110	117.0	117.0	8.5	-6.0
		CWSCH04	M&I	U	1988	NA	NA	NA	NA	NA	NA	NA	105.5	132	114	118.0	118.0	12.5	-14.0
		CWSCH05	M&I	U	1988	NA	NA	NA	NA	NA	NA	NA	103.5	122	114	101.0	101.0	-2.5	-21.0
		CWSCH06	M&I	U	1988	NA	NA	NA	NA	NA	NA	NA	99.5	133	95	112.0	112.0	12.5	-21.0
		CWSCH07	M&I	U	1991	NA	NA	NA	NA	NA	NA	NA	102.0	120	93	98.0	98.0	-4.0	-22.0
		22N01E28J001M	M	I	1958	126.2	118.1	NM	118.1	116.9	115.5	124.6	120.1	**138.07**	130.5	126.8	128.7	8.6	-9.4
		22N01E28J003M	M	I	1958	132.7	125.9	NM	122.4	120.4	120.9	130.0	126.3	143.09	137.2	133.7	135.5	9.2	-7.6
		22N01E28J005M	M	D	1958	126.8	118.9	NM	114.2	114.8	119.0	125.2	119.2	**132.54**	131.3	128.0	129.6	10.5	-2.9
		22N01E35E001M	I	S/I	2005	116.2	103.7	104.2	104.5	105.7	105.6	112.7	107.0	130.37	NM	116.5	116.5	9.5	-13.9
		22N02E30C002M	M	S	2002	117.7	112.8	NM	111.8	NM	112.8	117.2	115.0	126.56	123.5	NM	123.5	8.5	-3.0
		20N01E02H003M	M	S	2001	102.0	92.2	NM	87.1	81.8	86.0	94.2	89.8	106.99	NM	99.0	99.0	9.3	-7.9
		20N01E10C002M	I	S	1947	NM	NM	NM	94.0	86.3	95.2	101.5	89.4	**110.25**	103.5	99.6	101.5	12.2	-8.8
		20N02E06Q001M	I	S/I	1947	112.7	101.4	99.2	98.5	92.5	96.6	105.2	94.0	**118.63**	112.6	106.8	109.7	15.7	-8.9
		20N02E08C001M	I	D	2018								89.5	117.2	NM	NM	N/A	N/A	N/A
		21N01E10B003M	I	I	1995	110.2	99.4	93.0	92.7	99.5	95.2	103.2	98.0	**124.13**	111.1	107.1	109.1	11.2	-15.0
		21N01E13L002M	M	D	2012	NW	90.9	77.1	81.4	86.6	87.9	95.0	85.4	120.35	104.3	102.2	103.2	17.8	-17.1
		21N01E13L003M	M	I	2012	NW	89.8	76.5	81.3	83.8	86.6	94.0	83.3	120.49	104.4	101.8	103.1	19.8	-17.4

Well Type
D-Domestic, I-Irrigation
M-Monitoring, M/I-Municipal and Industrial
Well Depth
S-Shallow, I-Intermediate
D-Deep

Sub Basin	Revised Subinventory Unit	Monitoring Wells	Well Type	Well Depth	First Record	Groundwater Elevations											Analysis		
						Summer 2011 Average WSE (ft)	Summer 2012 Average WSE (ft)	Summer 2013 Average WSE (ft)	Summer 2014 Average WSE (ft)	Summer 2015 Average WSE (ft)	Summer 2016 Average WSE (ft)	Summer 2017 Average WSE (ft)	Summer 2018 Average WSE (ft)	Spring 2019 (WSE) (ft)	7/1/19 - 7/11/19 WSE (ft)	7/28/19 - 8/21/19 WSE (ft)	2019 Average Summer WSE (ft)	Change Avg. Summer WSE 2018 to 2019 (ft)	Change Spring to Avg. Summer 2019 (ft)
	Vina South	21N01E13L004M	M	I	2012	NW	92.6	78.6	83.3	86.4	88.7	95.9	86.8	120.51	105.3	103.9	104.6	17.8	-15.9
		21N01E25K001M	D	S	1993	104.1	NM	NM	83.8	83.5	85.7	95.8	91.1	109.63	107.6	102.4	105.0	14.0	-4.6
		21N01E26K001M	I	I	1993	97.6	92.7	90.6	71.6	79.5	81.4	84.8	77.1	110.84	87.0	NM	87.0	9.9	-23.8
		21N01E27D001M	D	S	NM	102.0	91.4	88.6	82.1	80.2	81.5	91.3	84.0	105.24	NM	NM	N/A	N/A	N/A
		21N02E18C001M	M	D	2010	104.4	95.5	86.6	90.0	89.5	91.9	97.5	89.7	118.91	102.8	102.9	102.8	13.2	-16.1
		21N02E18C002M	M	I	2010	105.1	95.5	87.9	90.7	89.7	91.3	97.6	90.1	119.42	104.9	104.0	104.5	14.4	-15.0
		21N02E18C003M	M	S	2010	154.4	145.4	143.6	140.4	142.9	149.2	162.8	158.0	171.5	166.4	165.1	165.8	7.8	-5.7
		21N02E30L001M	D	S/I	1995	110.1	98.7	93.3	92.6	90.2	92.4	99.1	93.8	118.23	112.3	108.5	110.4	16.6	-7.9
		20N02E24C001M	M	S	1999	104.6	103.7	98.1	94.2	89.9	92.3	101.4	97.2	110.95	103.0	99.9	101.5	4.2	-9.5
		20N02E24C002M	M	I	1999	104.6	103.8	98.1	94.3	90.0	92.4	101.3	97.4	110.84	102.3	99.9	101.1	3.7	-9.7
		20N02E24C003M	M	I	1999	107.6	103.3	98.0	94.4	90.0	92.4	101.3	97.5	110.84	102.4	99.8	101.1	3.7	-9.7
		20N03E31M001M	M	S	2001	101.5	98.6	96.3	93.9	89.0	92.5	100.1	96.1	113.42	100.8	98.5	99.6	3.6	-13.8
		20N03E33L001M	I	S	1999	97.2	94.6	94.4	91.1	89.0	91.0	96.6	89.3	117.38	90.5	88.7	89.6	0.4	-27.8
		21N03E22C001M	D	S	2001	367.3	365.4	371.0	365.0	358.8	360.2	365.3	N/A	382.87	378.4	376.9	377.6	N/A	-5.3
		21N03E29J003M	D	S/I	2007	NM	NM	NM	NM	206.8	208.3	208.3	203.4	227.1	226.6	222.2	224.4	20.9	-2.7
		21N03E32B001M	I	S	1999	224.0	221.7	222.0	217.8	217.9	217.9	220.8	219.3	222.78	223.7	223.1	223.4	4.1	0.6
		20N02E08H003M	D	S	2008	119.7	111.2	109.3	106.2	100.7	107.0	108.6	101.9	122.33	116.1	114.6	115.4	13.5	-7.0
		20N02E09G001M	M	S	2001	114.8	97.1	93.4	92.2	89.0	94.8	97.9	95.7	118.84	116.3	112.3	114.3	18.6	-4.5
		20N02E09L001M	I	I	1953	110.4	96.8	94.2	98.6	88.5	100.7	99.1	91.1	123.93	NM	112.7	112.7	21.7	-11.2
		21N02E20P001M	I	S/I	1995	103.4	89.4	90.8	93.5	89.6	93.4	94.1	75.9	120.53	97.3	103.8	100.6	24.7	-20.0
		21N02E26E003M	M	D	2007	112.0	102.5	95.4	98.8	100.8	97.7	106.4	102.6	115.57	117.4	114.6	116.0	13.4	0.4
		21N02E26E004M	M	I	2007	109.1	100.5	85.9	98.0	101.1	96.0	106.7	101.3	115.88	117.0	114.7	115.9	14.6	0.0
		21N02E26E005M	M	I	2007	106.3	97.8	90.0	95.6	99.9	94.1	106.0	98.9	114.88	116.3	114.0	115.2	16.3	0.3
		21N02E26E006M	M	S	2007	114.1	110.4	103.5	103.2	102.1	102.4	108.3	108.4	109.53	113.2	113.7	113.4	5.1	3.9
BUTTE	Butte*	17N03E05C003M	I	S	2001	86.3	N/A	N/A	N/A	67.8	85.0	85.8	83.5	N/A	87.5	85.7	86.6	3.1	N/A
		17N01E10A001M	D	S	1953	58.2	54.2	NM	59.6	35.0	58.4	58.3	59.4	59.5	56.8	57.3	57.1	-2.3	-2.4
		18N01E35L001M	M	D	2005	73.1	71.7	71.1	68.2	54.9	70.5	71.4	69.9	74.75	NM	72.1	72.1	2.2	-2.6
		18N02E16F001M	I	S	1947	78.3	77.5	77.9	78.1	74.3	78.5	78.5	78.0	77.82	77.9	78.9	78.4	0.4	0.6
		18N02E25M001M	I	S	1959	82.0	NM	80.6	80.3	79.3	79.9	79.4	80.5	84.7	60.8	NM	60.8	-19.7	-23.9
		18N02E32H001M	D	S	2001	75.4	73.8	75.5	70.6	73.5	76.0	73.8	75.3	72.92	75.5	72.6	74.1	-1.2	1.1
		17N02E14A001M	I	S	1947	77.8	77.0	76.6	76.9	76.0	79.3	77.6	76.9	82.59	76.8	76.6	76.7	-0.3	-5.9
		17N02E14H001M	D	S	2000	73.3	63.2	75.1	72.9	58.0	68.3	72.4	67.1	NM	76.0	74.2	75.1	8.0	N/A
		17N03E16N001M	D	S	1953	72.3	66.3	71.7	68.0	NM	NM	NM	66.3	NM	64.7	66.8	65.7	-0.5	N/A
		17N01E17F001M	M	S	1992	52.3	51.7	51.6	47.1	45.1	50.9	51.7	49.9	57.17	52.2	52.1	52.2	2.2	-5.0
		17N01E17F002M	M	I	1992	53.5	52.4	51.8	45.7	41.2	50.1	52.5	47.9	58.2	52.5	52.1	52.3	4.4	-5.9
		17N01E17F003M	M	I	1992	54.2	53.3	52.5	44.6	38.9	50.3	53.4	47.3	59.3	53.3	52.7	53.0	5.6	-6.3
		17N01E24A003M	M	D	2007	74.6	72.6	72.4	68.0	60.8	70.6	72.9	70.0	74.05	73.6	72.9	73.2	3.2	-0.8
		17N01E24A004M	M	I	2007	51.6	52.7	47.3	47.7	42.1	51.6	52.8	46.5	65.68	50.6	50.0	50.3	3.7	-15.4
		17N01E24A005M	M	I	2007	51.6	52.8	47.3	47.7	42.2	51.7	52.9	48.1	65.6	50.6	50.0	50.3	2.2	-15.3
		17N01E24A006M	M	S	2007	66.3	66.7	66.3	64.8	65.0	66.7	65.6	65.8	68.75	67.3	66.7	67.0	1.2	-1.8
		17N02E19J001M	I	S/I	2000	64.3	61.4	61.8	53.7	61.2	65.3	64.3	64.8	66.93	63.5	63.0	63.3	-1.6	-3.7
		18N01E13A002M	I	S/I	2001	77.2	76.5	76.7	76.5	55.0	76.5	76.7	76.8	76.54	76.5	75.6	76.1	-0.7	-0.5
		18N01E15D002M	D	S	1976	69.9	70.7	70.6	70.2	33.6	70.7	70.3	71.1	71.75	70.7	69.9	70.3	-0.8	-1.4
		19N01E27Q001M	M	I	1978	84.0	83.0	83.4	83.2	72.3	83.6	83.2	83.2	84.95	83.9	84.1	84.0	0.7	-1.0
		19N01E35B001M	M	S	2002	84.0	83.6	84.0	83.4	74.7	84.2	84.1	83.7	83.3	NM	83.9	83.9	0.2	0.6
		19N01E35B002M	M	D	2005	90.7	89.2	88.8	87.5	74.4	88.1	89.7	88.5	90.91	NM	90.1	90.1	1.6	-0.8
		19N01E35B003M	M	I	2005	85.2	84.1	84.2	83.3	67.6	84.0	84.3	84.0	86.15	NM	84.9	84.9	0.9	-1.3
		19N02E15N002M	I	U	2000	103.1	101.9	103.5	101.6	99.7	103.2	103.0	102.2	103.52	102.8	103.2	103.0	0.8	-0.5
		18N03E08B003M	I	S/I	2001	91.2	87.4	88.7	88.3	86.8	80.3	91.4	90.2	102.2	91.9	89.8	90.9	0.7	-11.4
		18N03E21G001M	I	S	1953	88.1	85.0	84.2	80.1	82.3	83.5	89.2	83.2	89.48	89.1	88.0	88.5	5.3	-1.0
		19N03E05N002M	D	S	1967	117.9	110.5	107.5	106.8	109.2	113.0	111.9	113.2	119.01	111.8	110.8	111.3	-1.9	-7.7
		19N01E09Q001M	I	S	1991	89.7	89.0	NM	NM	NM	NM	90.0	89.2	88.36	89.1	90.1	89.6	0.4	1.2
		19N02E07K002M	M	I	2006	101.7	99.9	98.9	98.3	85.1	98.9	100.6	99.3	102.72	100.7	100.2	100.5	1.1	-2.3
		19N02E07K003M	M	I	2006	100.7	100.1	100.3	100.3	92.3	100.5	100.5	100.1	100.02	100.1	100.6	100.3	0.2	0.3
		19N02E07K004M	M	S	2006	99.7	100.0	100.2	106.2	90.6	100.4	100.5	100.1	100.21	99.9	100.5	100.2	0.2	0.0

Well Type
D-Domestic, I-Irrigation
M-Monitoring, M/I-Municipal and Industrial
Well Depth
S-Shallow, I-Intermediate
D-Deep

Sub Basin	Revised Subinventory Unit	Monitoring Wells	Well Type	Well Depth	First Record	Groundwater Elevations											Analysis		
						Summer 2011 Average WSE (ft)	Summer 2012 Average WSE (ft)	Summer 2013 Average WSE (ft)	Summer 2014 Average WSE (ft)	Summer 2015 Average WSE (ft)	Summer 2016 Average WSE (ft)	Summer 2017 Average WSE (ft)	Summer 2018 Average WSE (ft)	Spring 2019 (WSE) (ft)	7/1/19 - 7/11/19 WSE (ft)	7/28/19 - 8/21/19 WSE (ft)	2019 Average Summer WSE (ft)	Change Avg. Summer WSE 2018 to 2019 (ft)	Change Spring to Avg. Summer 2019 (ft)
		19N02E13Q001M	M	S	2002	114.5	112.9	113.6	113.4	110.3	114.2	113.3	113.9	116.82	113.9	113.2	113.5	-0.3	-3.3
		19N02E13Q002M	M	I	2006	114.7	113.3	113.2	113.2	109.4	114.0	114.3	113.7	117.28	114.1	113.3	113.7	0.0	-3.6
		19N02E13Q003M	M	D	2006	115.0	113.6	113.2	113.4	109.2	114.1	114.7	113.7	117.53	114.3	113.5	113.9	0.1	-3.7
		20N01E18L001M	M	D	2000	101.2	96.4	93.5	93.0	78.4	93.7	97.7	94.8	**104.87**	NM	99.8	99.8	5.0	-5.1
		20N01E18L002M	M	I	2001	100.8	97.9	97.6	96.3	89.9	97.3	98.5	98.2	104.3	NM	99.4	99.4	1.3	-4.9
		20N01E18L003M	M	S	2001	103.3	101.0	101.8	99.3	104.3	103.8	103.5	103.9	104.91	NM	103.2	103.2	-0.6	-1.7
		20N01E35C001M	D	S	1947	100.8	NM	NM	NM	98.2	100.1	NA	99.4	99.85	100.4	100.9	100.6	1.2	0.8
		20N02E15H001M	M	S	1995	113.5	102.7	97.9	90.9	89.4	94.7	96.1	92.6	118.01	99.2	96.4	97.8	5.3	-20.2
		20N02E15H002M	M	S	1995	134.3	132.4	123.7	117.6	116.7	118.4	124.4	118.0	130.27	NM	124.3	124.3	6.3	-6.0
		20N02E16P001M	I	U	1990	117.1	NM	NM	103.2	88.8	100.0	102.5	102.9	120.93	113.0	111.3	112.2	9.2	-8.8
		20N02E28N001M	D	S/I	1947	117.4	116.5	115.8	116.1	116.0	117.3	116.4	117.2	119.13	117.2	117.8	117.5	0.3	-1.6
		21N01W23J001M	I	S	1941	107.6	107.4	106.5	102.0	102.8	103.5	106.2	103.5	116.96	103.7	106.3	105.0	1.5	-12.0
		21N01W35K002M	I	S/I	1994	98.9	97.0	95.2	94.1	94.9	95.4	96.9	96.0	NM	99.1	97.7	98.4	2.3	N/A
		20N01E18L001M	M	D	2000	101.2	96.4	93.5	93.0	78.4	93.7	97.7	94.8	104.87	NM	99.8	99.8	5.0	-5.1
		20N01E18L002M	M	I	2001	100.8	97.9	97.6	96.3	89.9	97.3	98.5	98.2	104.3	NM	99.4	99.4	1.3	-4.9
		20N01E18L003M	M	S	2001	103.3	101.0	101.8	99.3	104.3	103.8	103.5	103.9	104.91	NM	103.2	103.2	-0.6	-1.7
		20N01W04J001M	I	S	2008	82.9	83.0	82.2	80.1	80.4	81.0	81.9	81.8	NM	82.3	82.0	82.1	0.3	N/A
		20N01W11N002M	I	S	2008	95.7	93.1	93.5	91.4	91.6	92.1	93.0	91.1	102.57	94.4	93.5	93.9	2.8	-8.6
		21N01W35K002M	I	S/I	1994	98.9	97.0	95.2	94.1	94.9	95.4	96.9	96.0	NM	99.1	97.7	98.4	2.3	N/A
		21N01W11A001M	M	D	2010	108.2	107.5	104.2	102.8	99.2	104.1	111.6	107.3	122.62	NM	113.5	113.5	6.2	-9.1
		21N01W11A002M	M	S	2010	115.0	114.3	113.8	113.5	111.9	112.3	114.5	114.2	122.56	NM	115.4	115.4	1.2	-7.2
		21N01W11A003M	M	S	2010	115.8	115.8	115.5	114.5	113.5	114.2	115.6	115.7	122.23	NM	115.8	115.8	0.1	-6.4
		21N01W13J001M	M	D	2012	NW	101.5	97.8	96.3	92.5	97.0	103.9	99.6	118.24	107.6	106.0	106.8	7.2	-11.4
		21N01W13J002M	M	I	2012	NW	103.1	101.3	97.1	95.0	98.6	105.1	100.0	118.91	107.3	105.4	106.4	6.4	-12.6
		21N01W13J003M	M	I	2012	NW	104.9	97.2	87.9	96.4	100.2	106.4	91.0	119.26	98.4	95.8	97.1	6.1	-22.2
		21N01W24B001M	M	D	1995	103.3	98.9	93.8	94.5	89.0	93.8	102.4	94.4	**115.84**	NM	103.3	103.3	8.9	-12.6
		22N01E29R001M	I	I	1947	126.5	121.2	113.0	100.0	94.8	107.3	123.0	127.1	**134.64**	NM	124.7	124.7	-2.4	-9.9
		22N01E32E004M	D	S	1992	119.8	111.3	112.9	107.3	105.0	107.2	116.6	110.8	**128.59**	125.3	121.5	123.4	12.6	-5.2
WYANDOTTE CREEK	Wyandotte Creek Oroville	CWS-01	M&I	U	1978	NA	NA	NA	NA	NA	NA	NA	132.0	137	135	126	130.5	-1.5	-6.5
		CWS-02	M&I	U	1978	NA	NA	NA	NA	NA	NA	NA	148.0	153	152	140	146.0	-2.0	-7.0
		CWS-03	M&I	U	1978	NA	NA	NA	NA	NA	NA	NA	166.0	173	168	163	165.5	-0.5	-7.5
		19N03E16Q001M	D	S	2000	140.0	137.5	137.4	137.7	139.4	140.0	140.1	138.8	140.02	140.2	139.9	140.1	1.3	0.05
	Wyandotte Creek South	17N03E03D001M	I	S	1947	73.0	71.0	69.8	67.9	70.8	72.8	75.2	68.8	75.37	72.1	73.2	72.6	3.8	-2.8
		17N04E09N002M	I	S/I	2001	73.5	71.4	NM	59.1	NM	58.8	64.3	N/A	NM	63.1	61.4	62.2	N/A	N/A
		17N04E22B001M	D	S	1976	99.0	96.6	67.5	81.4	63.7	93.9	93.5	N/A	105.36	NM	NM	N/A	N/A	N/A
		19N04E31F001M	D	S	2001	125.4	118.7	116.6	118.4	120.5	122.5	125.3	124.2	128.47	125.5	126.3	125.9	1.7	-2.6

* Indicates sub-inventory unit corresponding to an Irrigation District primarily served by surface water

Note: Red font indicates Questionable Measurement (QM)

NA- Not available, NM- No measurement, NW- New well

Depth Category

S- Shallow: indicates total well depth or screening interval is less than 200 feet below ground surface

I- Intermediate: total well depth or screening interval is 200-600 feet

S/I- Shallow/Intermediate: screened interval spans portions of the shallow and intermediate depth intervals

D- Deep: total well depth or screening interval is greater than 600 feet

Well Type

D-Domestic, I-Irrigation

M-Monitoring, M/I-Municipal and Industrial

Well Depth

S-Shallow, I-Intermediate

D-Deep

TAC Agenda Item #3b

Butte County Basin Monitoring Objective Program Preliminary 2019 Water Quality Results for Temperature, pH, and Electrical Conductivity

Table 1. Annual groundwater temperature (°C)

Sub-Inventory Unit	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Biggs-West Gridley	18.5	18.5	18.1	20.5	18.2	18.3	18.7	19.0	19.2	20.1	18.0	18.4	19.0	18.5	18.4	18.6	19.3	18.9
Cherokee	22.4	21.9	21.2	21.4	21.1	20.7	21.0	20.9	21.9	21.8	21.8	21.3	21.9	21.2	20.8	21.2	21.3	21.1
Chico Urban Area						18.4	20.1	18.2	18.8	19.5	21.6	18.0	NM	18.4	17.8	19.0	22.6	18.0
Durham Dayton	18.8	19.9	21.8	20.4	17.4	NM	19.3	NM	18.9	18.0	NM	18.5	19.1	18.1	18.0	18.8	19.9	18.0
Esquon	19.7	18.9	19.6	20.1	20.7	19.0	19.6	19.0	19.1	20.0	21.4	18.1	20.2	18.9	18.0	19.1	18.6	18.4
Llano Seco							20.8	20.6	20.7	20.6	21.7	20.4	23.5	19.9	20.0	19.9	20.1	20.0
M & T	17.6	18.2	17.8	19.2	18.6	18.0	17.7	18.6	17.8	NM	18.3	17.9	NM	17.1	17.2	17.2	17.9	17.5
Pentz						22.2	21.5	21.3	21.5	23.9	21.9	21.9	21.9	21.5	21.5	21.6	22.1	21.2
*Pentz-Butte Valley	27.0	26.4	26.7	23.2														
Thermalito	18.3	17.9	17.1	17.1	18.4	17.7	18.9	17.6	NM	NM	17.8	17.3	17.5	17.3	17.4	17.5	17.8	17.6
Thermalito (domestic)							19.4	19.4	19.4	NM	NM	19.8	NM	19.9	19.8	20.0	20.3	22.6
Vina	19.6	20.3	19.2	19.2	19.6	18.9	19.6	18.9	18.8	22.8	18.8	20.2	21.4	19.5	19.8	19.5	20.5	19.6
Western Canal (East)	18.4	18.2	19.9	20.5	18.8	18.6	19.1	19.0	18.8	19.0	NM	18.3	18.9	18.5	19.1	18.6	20.1	19.5
Western Canal (West)	19.0	18.1	19.8	20.8	18.5	20.6	21.8	18.5	19.1	20.5	20.1	19.1	20.2	18.6	18.8	NM	NM	18.7

*Pentz-Butte Valley well discontinued in 2006

Table 2. Groundwater temperature average and ranges per sub inventory unit (°C)

Sub-Inventory Unit	Average	Range
Biggs-West Gridley	18.8	2.5
Cherokee	21.4	1.7
Chico Urban Area	19.2	4.8
Durham Dayton	19.0	4.4
Esquon	19.4	3.4
Llano Seco	20.7	3.6
M & T	17.9	2.1
Pentz	21.8	2.7
*Pentz-Butte Valley	25.8	3.8
Thermalito	17.7	1.8
Thermalito (domestic)	20.1	3.2
Vina	19.8	4.0
Western Canal (East)	19.0	2.3
Western Canal (West)	19.5	3.7

*Pentz-Butte Valley well discontinued in 2006

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Table 3. Annual groundwater pH

Sub-Inventory Unit	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Biggs-West Gridley	7.6	7.5	7.5	7.0	7.6	7.6	7.7	7.9	7.9	7.2	7.9	7.9	7.1	7.6	7.6	7.7	7.7	7.5
Cherokee	7.5	7.5	7.1	7.4	7.4	7.3	7.3	7.3	7.2	7.6	7.3	7.3	6.9	7.2	7.2	7.1	6.9	7.2
Chico Urban Area						6.9	6.9	6.9	7.0	7.5	7.3	7.1	NM	6.9	7.0	7.0	7.1	7.0
Durham Dayton	7.7	7.2	7.6	7.6	7.5	NM	7.5	NM	7.4	7.7	NM	7.5	NM	7.5	7.5	7.3	6.7	7.2
Esquon	7.3	7.5	7.1	7.4	7.5	7.4	7.2	7.4	7.4	7.6	7.2	7.3		7.4	7.2	7.3	6.9	7.2
Llano Seco							7.9	8.1	8.2	8.1	7.9	8.0	7.0	7.8	7.8	7.7	7.8	8.1
M & T	7.2	7.5	6.9	7.8	7.9	7.6	7.7	7.6	7.6	NM	7.2	7.9	NM	7.4	7.7	7.6	7.6	7.6
Pentz						7.6	7.4	7.5	7.4	7.3	7.8	7.5	6.7	7.0	7.4	7.2	7.3	7.2
*Pentz-Butte Valley	7.1	6.9	7.3	6.2														
Thermalito	7.0	6.5	7.1	7.1	7.9	7.4	7.4	7.4	NM	NM	8.0	7.7	7.5	7.1	7.1	7.1	7.4	7.4
Thermalito domestic							7.7	7.8	7.7	NM	NM	7.8	NM	6.9	7.6	7.6	7.4	7.5
Vina	7.5	7.6	6.9	6.2	7.7	7.5	7.5	7.4	7.6	8.0	7.3	7.8	7.9	7.1	7.4	7.3	7.4	7.6
Western Canal (East)	7.0	6.6	6.8	6.9	7.3	6.9	7.0	7.0	7.1	7.0	NM	7.2	6.5	7.1	7.0	7.0	7.0	6.9
Western Canal (West)	7.8	8.1	7.1	6.9	7.9	7.9	7.8	6.6	7.8	7.5	7.7	7.5	7.1	7.5	7.4	NM	NM	7.7

*Pentz-Butte Valley well discontinued in 2006

Table 4. Groundwater pH average and range per sub inventory unit

Sub-Inventory Unit	Average	Range
Biggs-West Gridley	7.6	0.9
Cherokee	7.3	0.7
Chico Urban Area	7.0	0.7
Durham Dayton	7.4	1.1
Esquon	7.3	0.6
Llano Seco	7.9	1.1
M & T	7.6	1.0
Pentz	7.3	1.1
*Pentz-Butte Valley	6.9	1.1
Thermalito	7.3	1.5
Thermalito domestic	7.6	1.0
Vina	7.4	1.8
Western Canal (East)	7.0	0.8
Western Canal (West)	7.5	1.5

*Pentz-Butte Valley well discontinued in 2006

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Table 5. Annual groundwater Electrical Conductivity (µS/cm)

Sub-Inventory Unit	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Biggs-West Gridley	346	370	323	361	351	382	354	331	343	320	300	291	326	288	296	290	297	150
Cherokee	222	232	215	266	242	267	268	243	270	275	245	260	330	255	261	284	293	147
Chico Urban Area						280	291	260	249	250	248	217	NM	214	221	254	295	120
Durham Dayton	315	348	259	340	322	NM	327	NM	307	315	NM	298	304	322	316	322	355	176
Esquon	388	526	470	557	507	480	439	419	427	415	408	512	443	417	499	416	529	253
Llano Seco							204	195	196	198	192	184	240	180	182	179	186	92
M & T	418	551	678	504	465	451	667	445	592	NM	427	391	NM	362	333	498	337	177
Pentz						218	229	227	225	224	204	204	231	210	204	207	213	109
*Pentz-Butte Valley	195	186	211	240														
Thermalito	132	164	149	150	152	242	205	158	NM	NM	292	179	181	136	159	136	204	151
Thermalito domestic							374	350	354	NM	NM	342	NM	320	324	327	333	179
Vina	197	225	180	216	192	224	203	200	199	194	174	188	201	200	186	181	190	94
Western Canal (East)	447	344	400	524	492	471	482	488	465	459	NM	447	442	449	444	441	422	206
Western Canal (West)	464	248	407	501	309	477	469	462	455	460	630	629	695	428	581	NM	NM	221

*Pentz-Butte Valley well discontinued in 2006

** 2019 Electrical conductivity results are currently undergoing additional analysis with the Butte County Technical Advisory Committee due to an error in calibration of the probe.

Table 6. Groundwater EC (µS/cm) average and range per sub inventory unit

Sub-Inventory Unit	Average	Range
Biggs-West Gridley	318	232
Cherokee	254	183
Chico Urban Area	242	175
Durham Dayton	308	179
Esquon	450	304
Llano Seco	186	148
M & T	456	501
Pentz	208	123
*Pentz-Butte Valley	208	54
Thermalito	174	160
Thermalito domestic	323	195
Vina	191	131
Western Canal (East)	437	318
Western Canal (West)	465	474

*Pentz-Butte Valley well discontinued in 2006

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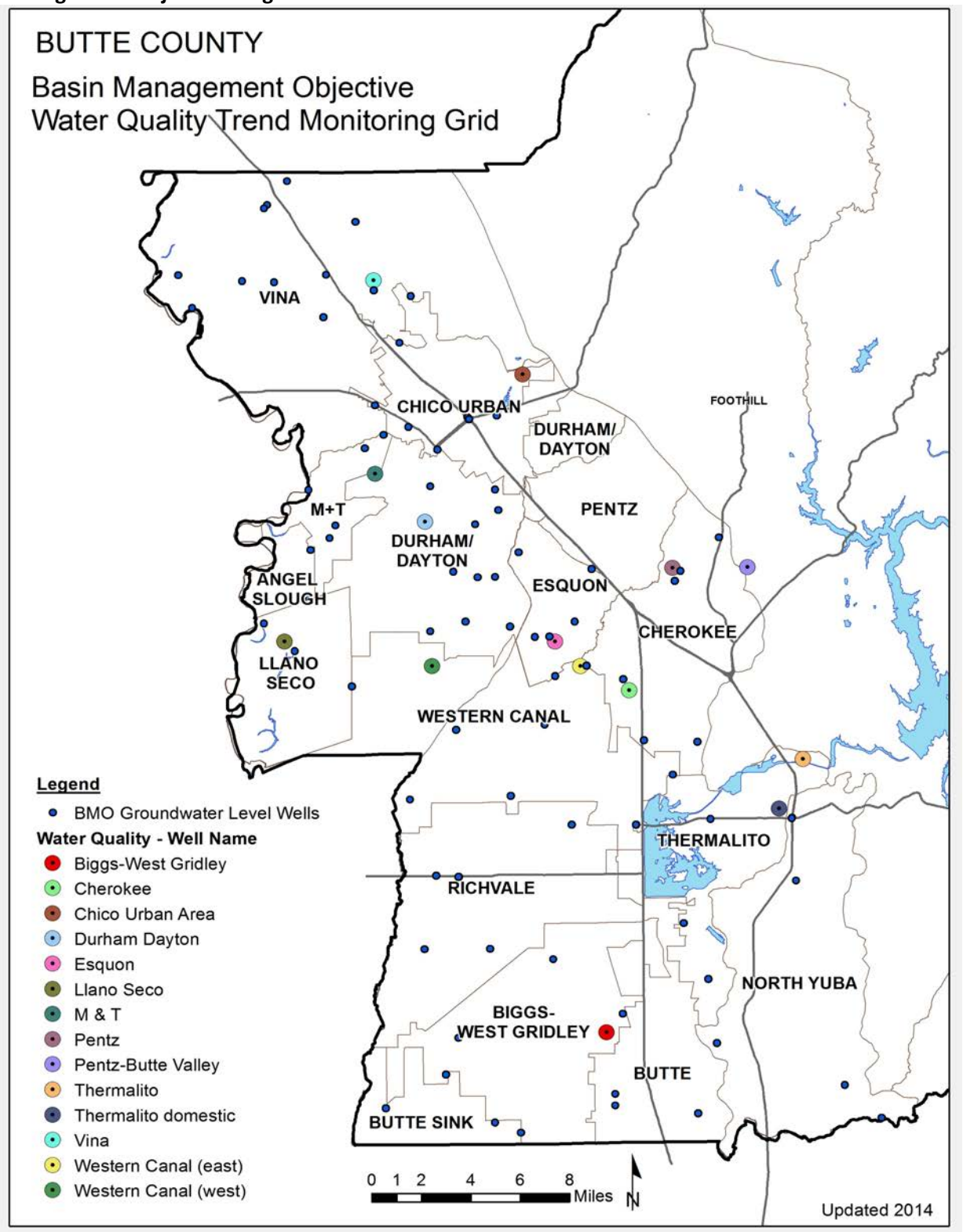
Figure 1. Approximate water quality and groundwater level monitoring locations for the Butte County Basin Management Objective Program



2019 Butte County Water Quality Trend Draft Monitoring Results Supplemental Notes

In 2019, the summer groundwater electrical conductivity (EC) measurements all depicted record low levels in each site measured. Upon closer inspection, it was noted that the sodium chloride standard solution used to calibrate the probe was the incorrect solution. It is reasonable to assume the low measurements recorded in 2019 are a result of this error.

The calibration standard typically used with this probe is a HACH product consists of:

- 491 ± 2.5 milligrams per liter (mG/L) as Sodium Chloride (NaCl)
- 1000 ± 10 micro Siemens per centimeter (µS/cm)

The HACH calibration standard used in 2019 was:

- 1,000 ± 5 milligrams per liter (mG/L) as Sodium Chloride (NaCl)
- 1900 ± 10 micro Siemens per centimeter (µS/cm)

In November 2019, staff plans to record EC measurements on four water samples from private residences; three private wells and one municipal water source from various locations throughout Butte County. After calibrating and taking measurements with the two standard solutions, comparisons of the EC levels of each water sample can be conducted in an effort to provide the TAC data to analyze the appropriateness of using a correction factor for the 2019 data if warranted.

The results of these tests were not available in time for inclusion in the TAC meeting packet of information; however they will be provided as soon as possible prior to the November 21, 2019 TAC meeting.