Lisa Hunter

From: Barbara Vlamis <barbarav@aqualliance.net>
Sent: Friday, April 19, 2024 9:05 AM
To: Lisa Hunter
Cc: Jim Brobeck; Michael Jackson
Subject: Second comments- Revised Colusa GSP
Attachments: AquAlliance Exhibits Comments on Final Colusa GSP 3.25.2022 (optimized).pdf; AquAllianceEtAlCommentsRevisedColusaGSPUpdate2024.pdf

Importance: High

Lisa, See attached for additional comments.

Barbara

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Barbara Vlamis
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https://gcc02.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.aqualliance.net%2F&data=05%7C02%7Clhunter%40countyofglenn.net%7Ce28665b1206a4d94463a08dc608ad1aa%7Cc4b8b9b4758f42d1ab7d7abbb2b863f9%7C0%7C0%7C638491398173105390%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7C&sdata=dFZbuULLB6qXTgSi4Xn7E0DpKqzuU7EyCrTraDAES1M%3D&reserved=0

AquAlliance Exhibit 1

FINAL COLUSA SUBBASIN GSP MONITORING WELLS

MODIFIED FINAL COLUSA SUBBASIN GSP TABLE 5-2 and 5-3

A	B	C	D	E	F	G	H	I	J	K	L	M
SWN[1]	CASGEM ID	Screen Interval[2], ft bgs	DWR Zone Monitored	Measurable Objective DTW, ft bgs	Minimum Threshold DTW, ft bgs	20th Percentile Domestic Wells, ft bgs	50% of Range Below Historical Low, ft bgs	Minimum Threshold Method	20th Percentile Depth Below 50% Range, ft	MT Depth Below 20th Percentile, ft	MO - MT Difference Shallow Zone, < 200 ft bgs	MO - MT Difference ICSW, ft
12N01E06D004	16331	275-285	I	29	136	136	94	(a)	42	--	--	--
13N01E11A001	18534	136-158	S	10	106	106	28	(a)	78	--	96	--
			ICSW	10	19	--	--	--	--	--	--	9
13N01W07G001	36246	108-180	S	99	196[3]	153	196	(b)	--	43	97	--
			ICSW	100	110	--	--	--	--	--	--	10
13N01W13P003	**36248**	**271-278**	**I**	**24**	**120**	**120**	**89**	**(a)**	**31**	**--**	--	--
13N01W22P002	16357	196-236	S - I	34	184	184	116	(a)	68	--	--	--
13N02W12L001	31899	NA	U	126	208	200	208	(b)	--	8	--	--
13N02W15J001	39884	270-362	I	152	274	215	274	(b)	--	59	--	--
13N02W20H002	25005	200 to 320*	I	169	248	248	201	(a)	47	--	--	--
14N01E35P003	**24656**	**135 to 225***	**S - I**	**19**	**165**	**165**	**48**	**(a)**	**117**	**--**	--	--
14N01W04K003	18554	45-70	S	25	124	124	44	(a)	80	--	99	--
			ICSW	25	34	--	--	--	--	--	--	9
14N02W13N001	18563	104-392	S - I	38	142	142	78	(a)	64	--	--	--
14N02W22A002	54756	1020-1030	D	0	210	210	0	(a)	210	--	--	--
14N02W29J001	18566	119 to 480*	S - I	141	248	216	248	(b)	--	32	--	--
14N03W14Q003	32324	390 to 685*	I - D	186	261	115	261	(b)	--	146	--	--
14N03W24C001	16691	292-312	I	135	178	138	178	(b)	--	40	--	--
15N01W05G001	14309	75-140	S	19	101	101	51	(a)	50	--	82	--
			ICSW	20	29	--	--	--	--	--	--	9
15N02W19E001	14319	162 to 334*	I	14	100	100	50	(a)	50	--	--	--
15N03W08Q001	N/A	30 to 350*	S - I	6	70	70	10	(a)	60	--	--	--
15N03W20Q002	**24470**	**130-160**	**S**	**16**	**69**	**69**	**34**	**(a)**	**35**	**--**	53	--
16N02W05B003	**38669**	**174 to 256***	**S - I**	**18**	**136**	**136**	**74**	**(a)**	**62**	**--**	--	--
16N02W25B002	33868	254-256	I	25	80	80	54	(a)	26	--	--	--
16N03W14H006	**24685**	**295-305**	**I**	**15**	**160**	**160**	**3**	**(a)**	**157**	**--**	--	--
16N04W02P001	16308	112-203	S	24	100	100	42	(a)	58	--	76	--
17N02W09H004	**25515**	**250 - 260**	**I**	**11**	**119**	**119**	**56**	**(a)**	**63**	**--**	--	--
17N02W30J002	16960	157-159	S	19	182[3]	182	51	(a)	131	--	163	--
			ICSW	19	37	--	--	--	--	--	--	18
17N03W08R001	39127	125-130	S	19	120	120	28	(a)	92	--	101	--
17N03W32H001	35475	68-112*	S	8	138[3]	138	35	(a)	103	--	130	--
18N02W18D004	**38358**	**246 - 256**	**I**	**23**	**165**	**165**	**62**	**(a)**	**103**	**--**	--	--
18N02W36B001	16914	88 to 340*	S - I	22	78	78	59	(a)	19	--	--	--
19N02W08Q002	**25763**	**208-218**	**I**	**10**	**96**	**96**	**40**	**(a)**	**56**	**--**	--	--
19N02W33K001	19793	160-260	S - I	16	66	66	53	(a)	13	--	--	--
19N04W14M002	25787	45-55	S	35	140[3]	140	50	(a)	90	--	105	--
20N02W11A001	17170	70-90	S	6	76	76	22	(a)	54	--	70	--
			ICSW	6	20	--	--	--	--	--	--	14
20N02W18R008	**23988**	**140 to 180***	**S**	**11**	**84**	**84**	**18**	**(a)**	**66**	**--**	73	--
20N02W25F004	**23991**	**55-65**	**S**	**5**	**65[3]**	**65**	**12**	**(a)**	**53**	**--**	60	--
			ICSW	5	15	--	--	--	--	--	--	10

FINAL COLUSA SUBBASIN GSP MONITORING WELLS

MODIFIED FINAL COLUSA SUBBASIN GSP TABLE 5-2 and 5-3

A	B	C	D	E	F	G	H	I	J	K	L	M
SWN[1]	**CASGEM ID**	**Screen Interval[2], ft bgs**	**DWR Zone Monitored**	**Measurable Objective DTW, ft bgs**	**Minimum Threshold DTW, ft bgs**	**20th Percentile Domestic Wells, ft bgs**	**50% of Range Below Historical Low, ft bgs**	**Minimum Threshold Method**	**20th Percentile Depth Below 50% Range, ft**	**MT Depth Below 20th Percentile, ft**	**MO - MT Difference Shallow Zone, < 200 ft bgs**	**MO - MT Difference ICSW, ft**
20N02W33B001	17174	100 to 320*	S - I	5	74	74	17	(a)	57	--	--	--
20N03W07E004	**37861**	**118-128**	**S**	**79**	**148[3]**	**148**	**124**	**(a)**	**24**	**--**	69	--
21N02W01F003	**39954**	**109-119**	**S**	**37**	**90**	**90**	**67**	**(a)**	**23**	**--**	53	--
21N02W01F004	40029	55-65	ICSW	36	57	--	--	--	--	--	--	21
21N02W04G004	**38359**	**165 to 279***	**S -I**	**57**	**127**	**92**	**127**	**(b)**	**--**	**35**	--	--
21N02W05M002	**36588**	**122-132**	**S**	**49**	**134[3]**	**134**	**112**	**(a)**	**22**	**--**	85	--
21N02W05M003	23996	44-54	ICSW	41	64[3]	--	--	--	--	--	--	23
21N02W33M003	**24207**	**140-150**	**S**	**30**	**82**	**82**	**52**	**(a)**	**30**	**--**	52	--
21N02W36A002	21239	120-140	S	44	112	81	112	(b)	--	31	68	--
			ICSW	44	76	--	--	--	--	--	--	32
21N03W01R002	25232	235-245	I	52	155	108	155	(b)	--	47	--	--
21N03W23D002	**25233**	**142 to 170***	**S**	**65**	**121**	**89**	**121**	**(b)**	**--**	**32**	56	--
21N03W34Q004	**25790**	**60-70**	**S**	**55**	**125[3]**	**125**	**89**	**(a)**	**36**	**--**	70	--
21N04W12A002	**25725**	**247-257**	**I**	**175**	**230**	**98**	**230**	**(b)**	**--**	**132**	--	--
22N02W30H003	**25727**	**130 to 260***	**S - I**	**54**	**122**	**76**	**122**	**(b)**	**--**	**46**	--	--
22N02W30H004	38609	45 to 70*	ICSW	25	43	--	--	--	--	--	--	18
22N03W24E002	**38667**	**130 to 180***	**S**	**55**	**109**	**90**	**109**	**(b)**	**--**	**19**	54	--
22N03W24E003	25758	50-60	ICSW	23	36	--	--	--	--	--	--	13
					Number of Wells	35	13			Average MO - MT Difference ft:	81.5	15.7
					Percentage of Wells	73%	27%					

Number and Percent of Zone Monitored	ICSW	12
	S	21, 44%
	S - I	11, 23%
	I	13, 27%
	I - D	1, 2%
	D	1, 2%
	U	1, 2%

DWR Zones: Shallow < 200 feet bgs; Intermediate 200 to 600 feet bgs; Deep > 600 feet bgs; U = unknown

SWN = State Well Number CASGEM ID = California Statewide Groundwater Elevation Monitoring Identification Code

GWE = groundwater elevation DTW = depth to water ft = feet

amsl = above mean sea level bgs = below ground surface 1 - Bolded wells changed from Draft GSP

2 - * Indicates multiple screened intervals, see Table 4-2 for details on intervals 3 - Minimun Threshold depth at or below well screen interval

Minimum Threshold method: (a) the 20th percentile of domestic well depth near the monitoring well; or (b) 50 percent of the measured water level range below the historical low within the monitoring well

AquAlliance Exhibit 1

FINAL COLUSA SUBBASIN GSP MONITORING WELLS

MODIFIED FINAL COLUSA SUBBASIN GSP TABLE 5-2

A	B	C	D	E	F	G	H	I	J	K	L
SWN[1]	**CASGEM ID**	**Screen Interval[2], ft bgs**	**DWR Zone Monitored**	**Measurable Objective DTW, ft bgs**	**Minimum Threshold DTW, ft bgs**	**20th Percentile Domestic Wells, ft bgs**	**50% of Range Below Historical Low, ft bgs**	**Minimum Threshold Method**	**20th Percentile Depth Below 50% Range, ft**	**MT Depth Below 20th Percentile, ft**	**MO - MT Difference Shallow Zone, < 200 ft bgs**
12N01E06D004	16331	275-285	I	29	136	136	94	(a)	42	--	--
13N01E11A001	18534	136-158	S	10	106	106	28	(a)	78	--	96
13N01W07G001	36246	108-180	S	99	196[3]	153	196	(b)	--	43	97
13N01W13P003	**36248**	**271-278**	**I**	**24**	**120**	**120**	**89**	**(a)**	**31**	**--**	--
13N01W22P002	16357	196-236	S - I	34	184	184	116	(a)	68	--	--
13N02W12L001	31899	NA	U	126	208	200	208	(b)	--	8	--
13N02W15J001	39884	270-362	I	152	274	215	274	(b)	--	59	--
13N02W20H002	25005	200 to 320*	I	169	248	248	201	(a)	47	--	--
14N01E35P003	**24656**	**135 to 225***	**S - I**	**19**	**165**	**165**	**48**	**(a)**	**117**	**--**	--
14N01W04K003	18554	45-70	S	25	124	124	44	(a)	80	--	99
14N02W13N001	18563	104-392	S - I	38	142	142	78	(a)	64	--	--
14N02W22A002	54756	1020-1030	D	0	210	210	0	(a)	210	--	--
14N02W29J001	18566	119 to 480*	S - I	141	248	216	248	(b)	--	32	--
14N03W14Q003	32324	390 to 685*	I - D	186	261	115	261	(b)	--	146	--
14N03W24C001	16691	292-312	I	135	178	138	178	(b)	--	40	--
15N01W05G001	14309	75-140	S	19	101	101	51	(a)	50	--	82
15N02W19E001	14319	162 to 334*	I	14	100	100	50	(a)	50	--	--
15N03W08Q001	N/A	30 to 350*	S - I	6	70	70	10	(a)	60	--	--
15N03W20Q002	**24470**	**130-160**	**S**	**16**	**69**	**69**	**34**	**(a)**	**35**	**--**	53
16N02W05B003	**38669**	**174 to 256***	**S - I**	**18**	**136**	**136**	**74**	**(a)**	**62**	**--**	--
16N02W25B002	33868	254-256	I	25	80	80	54	(a)	26	--	--
16N03W14H006	**24685**	**295-305**	**I**	**15**	**160**	**160**	**3**	**(a)**	**157**	**--**	--
16N04W02P001	16308	112-203	S	24	100	100	42	(a)	58	--	76
17N02W09H004	**25515**	**250 - 260**	**I**	**11**	**119**	**119**	**56**	**(a)**	**63**	**--**	--
17N02W30J002	16960	157-159	S	19	182[3]	182	51	(a)	131	--	163
17N03W08R001	39127	125-130	S	19	120	120	28	(a)	92	--	101
17N03W32H001	35475	68-112*	S	8	138[3]	138	35	(a)	103	--	130
18N02W18D004	**38358**	**246 - 256**	**I**	**23**	**165**	**165**	**62**	**(a)**	**103**	**--**	--
18N02W36B001	16914	88 to 340*	S - I	22	78	78	59	(a)	19	--	--

AquAlliance Exhibit 2

DRAFT COLUSA SUBBASIN GSP MONITORING WELLS

MODIFIED DRAFT COLUSA SUBBASIN GSP TABLE 5-2

A	B	C	D	E	F	G	H	I	I	K
SWN[1]	**CASGEM ID**	**Screen Interval[2], ft bgs**	**DWR Zone Monitored**	**Measurable Objective DTW, ft bgs**	**Minimum Threshold DTW, ft bgs**	**20th Percentile Domestic Wells, ft bgs**	**50% of Range Below Historical Low, ft bgs**	**Minimum Threshold Method**	**20th Percentile Depth Below 50% Range, ft**	**MT Depth Below 20th Percentile, ft**
12N01E06D004	16331	275-285	I	29	136	136	94	(a)	42	--
13N01E11A001	18534	136-158	S	10	106	106	28	(a)	78	--
13N01W07G001	36246	108-180	S	99	196	153	196	(b)	--	43
13N01W13P001	**18549**	**865-875**	**D**	**34**	**120**	**120**	**89**	**(a)**	**31**	**--**
13N01W22P002	16357	196-236	S - I	34	184	184	116	(a)	68	--
13N02W12L001	31899	NA	U	126	208	200	208	(b)	--	8
13N02W15J001	39884	270-362	I	152	274	215	274	(b)	--	59
13N02W20H002	25005	200 to 320*	I	169	248	248	201	(a)	47	--
14N01E35P001	**38718**	**985-995**	**D**	**29**	**165**	**165**	**48**	**(a)**	**117**	**--**
14N01W04K003	18554	45-70	S	25	124	124	44	(a)	80	--
14N02W13N001	18563	104-392	S - I	38	142	142	78	(a)	64	--
14N02W22A002	54756	1020-1030	D	0	210	210	0	(a)	210	--
14N02W29J001	18566	119 to 480*	S - I	141	248	216	248	(b)	--	32
14N03W14Q003	32324	390 to 685*	I - D	186	261	115	261	(b)	--	146
14N03W24C001	16691	292-312	I	135	178	138	178	(b)	--	40
15N01W05G001	14309	75-140	S	19	101	101	51	(a)	50	--
15N02W19E001	14319	162 to 334*	I	14	100	100	50	(a)	50	--
15N03W08Q001	N/A	30 to 350*	S - I	6	70	70	10	(a)	60	--
15N03W20Q001	**38293**	**370-410**	**I**	**26**	**69**	**69**	**34**	**(a)**	**35**	**--**
16N02W05B001	**25511**	**730-750**	**D**	**32**	**136**	**136**	**74**	**(a)**	**62**	**--**
16N02W25B002	33868	254-256	I	25	80	80	54	(a)	26	--
16N03W14H003	**24683**	**1370-1420***	**D**	**-6**	**160**	**160**	**3**	**(a)**	**157**	**--**
16N04W02P001	16308	112-203	S	24	100	100	42	(a)	58	--
17N02W09H002	**25514**	**779-800**	**D**	**18**	**119**	**119**	**56**	**(a)**	**63**	**--**
17N02W30J002	16960	157-159	S	19	182	182	51	(a)	131	--
17N03W08R001	39127	125-130	S	19	120	120	28	(a)	92	--
17N03W32H001	35475	68-112*	S	8	138	138	35	(a)	103	--
18N02W18D001	**24953**	**975-985**	**D**	**13**	**165**	**165**	**24**	**(a)**	**141**	**--**
18N02W36B001	16914	88-340*	S - I	22	78	78	59	(a)	19	--

AquAlliance Exhibit 2

DRAFT COLUSA SUBBASIN GSP MONITORING WELLS

MODIFIED DRAFT COLUSA SUBBASIN GSP TABLE 5-2

A	B	C	D	E	F	G	H	I	I	K
SWN[1]	CASGEM ID	Screen Interval[2], ft bgs	DWR Zone Monitored	Measurable Objective DTW, ft bgs	Minimum Threshold DTW, ft bgs	20th Percentile Domestic Wells, ft bgs	50% of Range Below Historical Low, ft bgs	Minimum Threshold Method	20th Percentile Depth Below 50% Range, ft	MT Depth Below 20th Percentile, ft
19N02W08Q001	**25762**	**856.6-876.6**	**D**	**29**	**96**	**96**	**72**	**(a)**	**24**	**--**
19N02W33K001	19793	160-260	S - I	16	66	66	53	(a)	13	--
19N04W14M002	25787	45-55	S	35	140	140	50	(a)	90	--
20N02W11A001	17170	70-90	S	6	76	76	22	(a)	54	--
20N02W18R005	**23986**	**920 to 980***	**D**	**61**	**103**	**84**	**103**	**(b)**	**--**	**19**
20N02W25F001	**23989**	**940-960**	**D**	**6**	**65**	**65**	**16**	**(a)**	**49**	**--**
20N02W33B001	17174	100 to 320*	S - I	5	74	74	17	(a)	57	--
20N03W07E001	**37860**	**984-1014**	**D**	**146**	**229**	**148**	**229**	**(b)**	**--**	**81**
21N02W01F001	**38535**	**517-557**	**I**	**45**	**90**	**90**	**89**	**(a)**	**1**	**--**
21N02W04G002	**24993**	**928-938**	**D**	**75**	**138**	**92**	**138**	**(b)**	**--**	**46**
21N02W05M001	**39676**	**442-452**	**I**	**59**	**150**	**134**	**150**	**(b)**	**--**	**16**
21N02W33M001	**38536**	**869-890**	**D**	**55**	**97**	**82**	**97**	**(b)**	**--**	**15**
21N02W36A002	21239	120-140	S	44	112	81	112	(b)	--	31
21N03W01R002	25232	235-245	I	52	155	108	155	(b)	--	47
21N03W23D001	**23992**	**363-373**	**I**	**63**	**179**	**89**	**179**	**(b)**	**--**	**90**
21N03W34Q002	**25789**	**930-960**	**D**	**131**	**221**	**125**	**221**	**(b)**	**--**	**96**
21N04W12A004	**24650**	**520 to 600***	**I**	**237**	**356**	**98**	**356**	**(b)**	**--**	**258**
22N02W30H002	**25726**	**850-880**	**D**	**104**	**175**	**76**	**175**	**(b)**	**--**	**99**
22N03W24E001	**25236**	**800-820**	**D**	**194**	**273**	**90**	**273**	**(b)**	**--**	**183**

Number and Percent of Zone Monitored		
	S	11, 23%
	S - I	7, 15%
	I	12, 25%
	I - D	1, 2%
	D	16, 33%
	U	1, 2%

G	H	
30	18	Number of Wells
63%	38%	Percentage of Wells

DWR Zones: Shallow < 200 feet bgs; Intermediate 200 to 600 feet bgs; Deep > 600 feet bgs; U = unknown

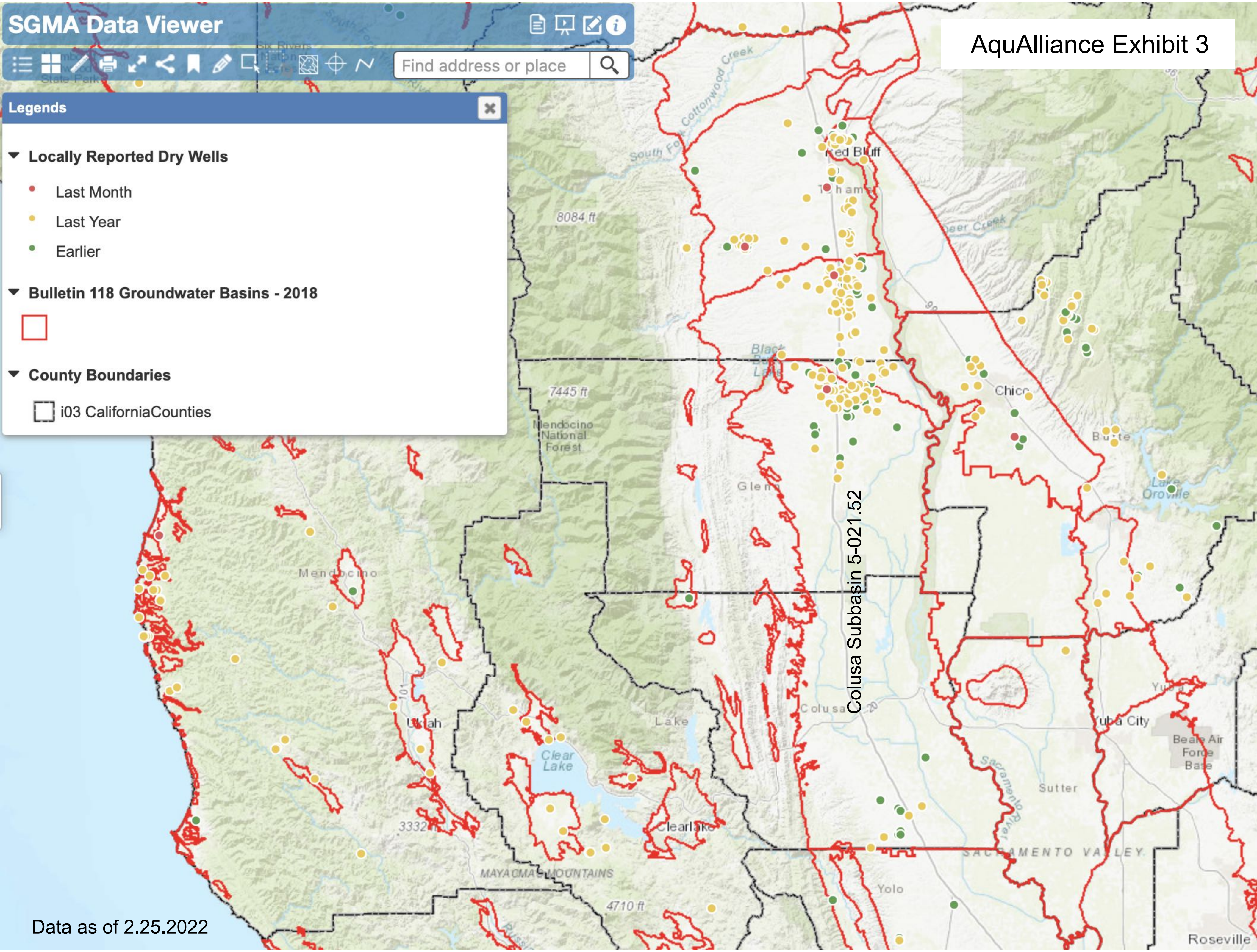
SWN = State Well Number CASGEM ID = California Statewide Groundwater Elevation Monitoring Identification Code

GWE = groundwater elevation DTW = depth to water ft = feet

amsl = above mean sea level bgs = below ground surface

1 - Bolded wells changed in Final GSP 2 - * Indicates multiple screened intervals, see Table 4-2 for details of intervals

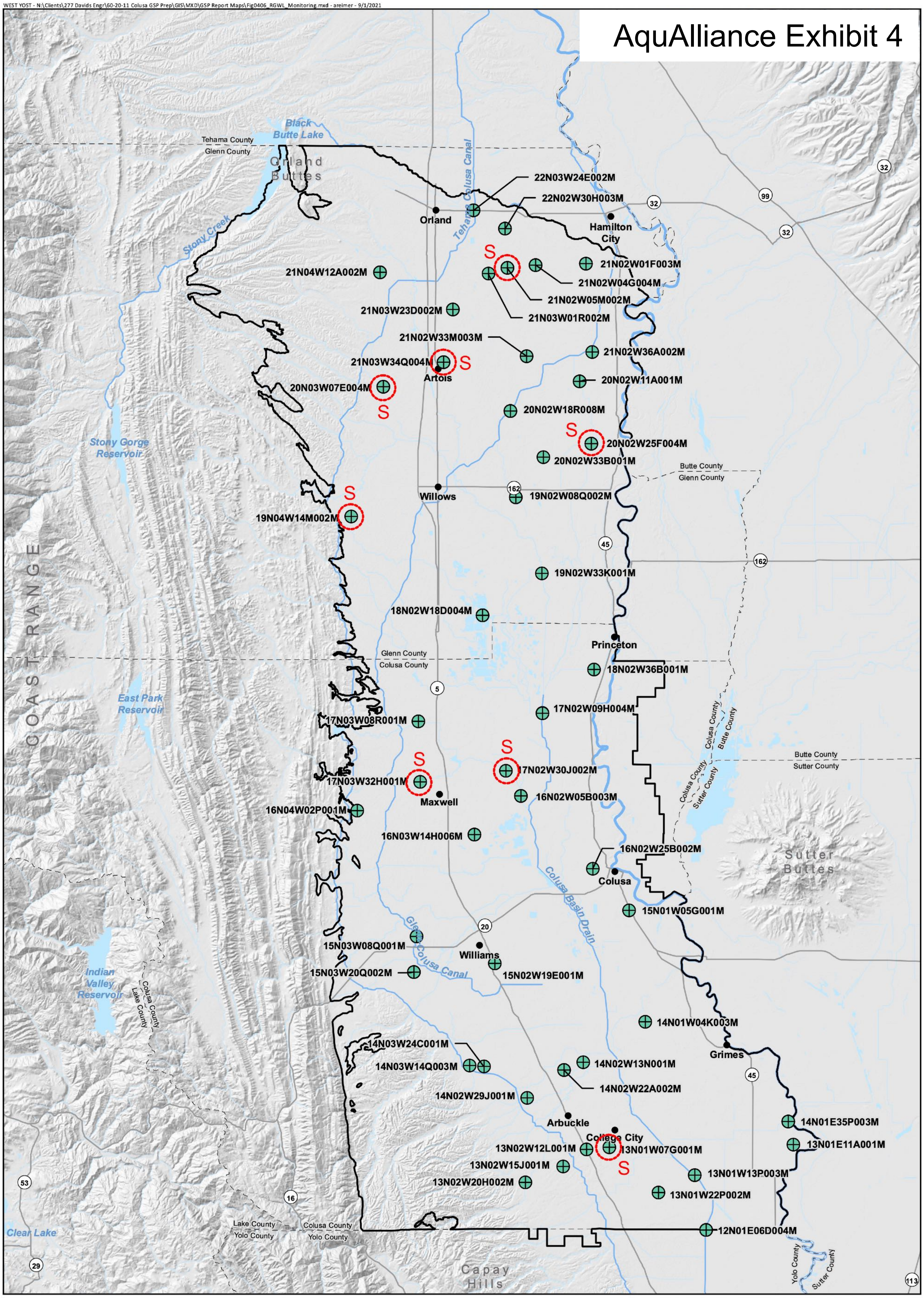
Minimum Threshold method: (a) the 20th percentile of domestic well depth near the monitoring well; or (b) 50 percent of the measured water level range below the historical low within the monitoring well



SGMA Data Viewer
Find address or place
AquAlliance Exhibit 3
Legends
Locally Reported Dry Wells
Last Month
Last Year
Earlier
Bulletin 118 Groundwater Basins - 2018
County Boundaries
i03 CaliforniaCounties
Colusa Subbasin 5-021.52
Data as of 2.25.2022
Red Bluff
Chico
Glenn
Colusa
Yuba City
Ukiah
Clear Lake
Clearlake
Mendocino
Mendocino National Forest
Lake Oroville
Sutter
Yolo
Roseville
Beale Air Force Base
SACRAMENTO VALLEY
MAYACMAS MOUNTAINS
8084 ft
7445 ft
4710 ft

WEST YOST - N:\Clients\277 Davids Engr\60-20-11 Colusa GSP Prep\GIS\MXD\GSP Report Maps\Fig0406_RGWL_Monitoring.mxd - areimer - 9/1/2021

AquAlliance Exhibit 4



Representative Groundwater Level Monitoring Network Site

Colusa Subbasin

- Well that has an MT at a depth at or below the screened interval

S - Screened above a depth of 200 feet

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

0 2.5 5

Scale in Miles

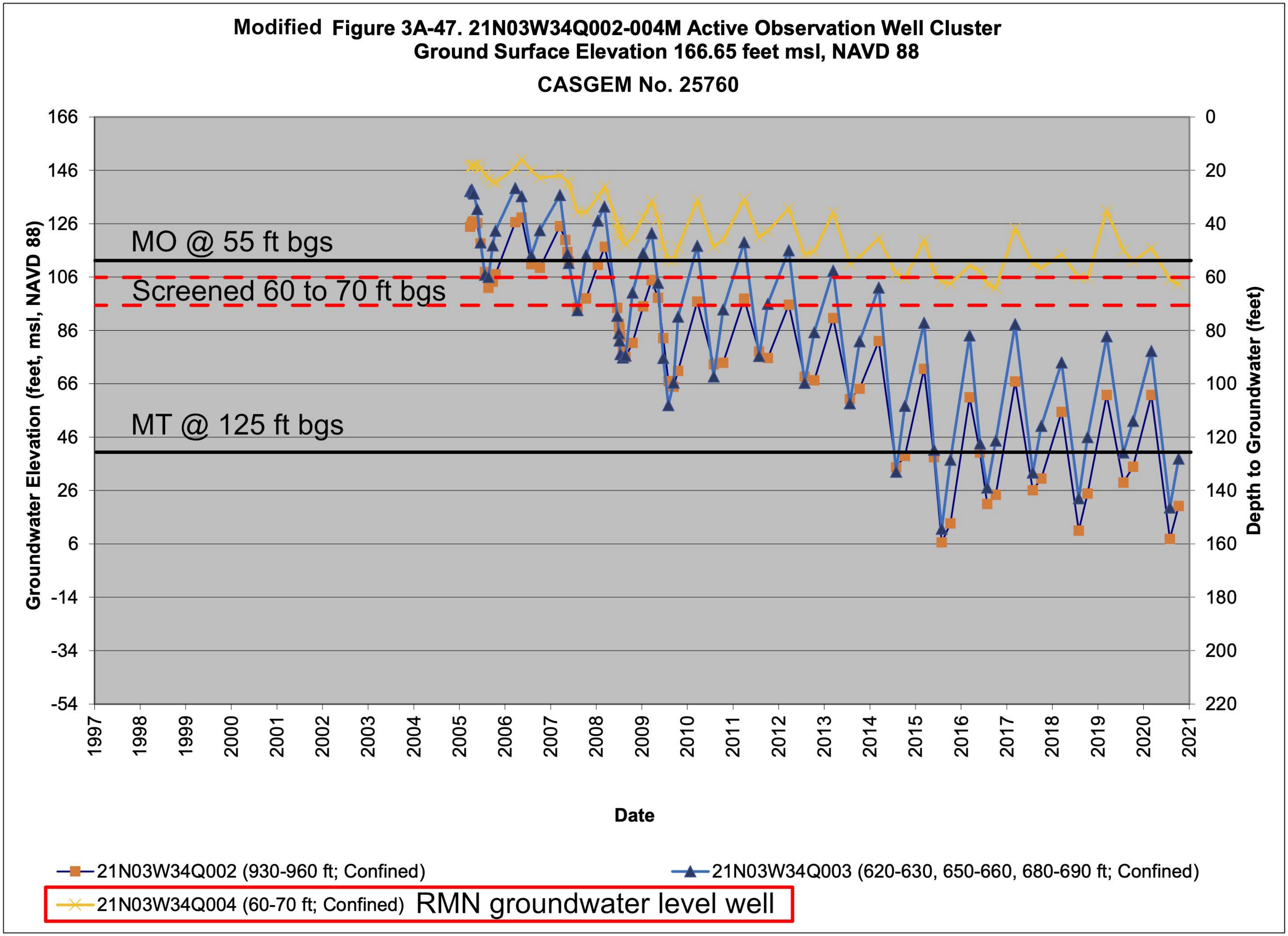
Modified **Figure 4-6**

Representative Groundwater Level Monitoring Network

Colusa Groundwater Authority and Glenn Groundwater Authority

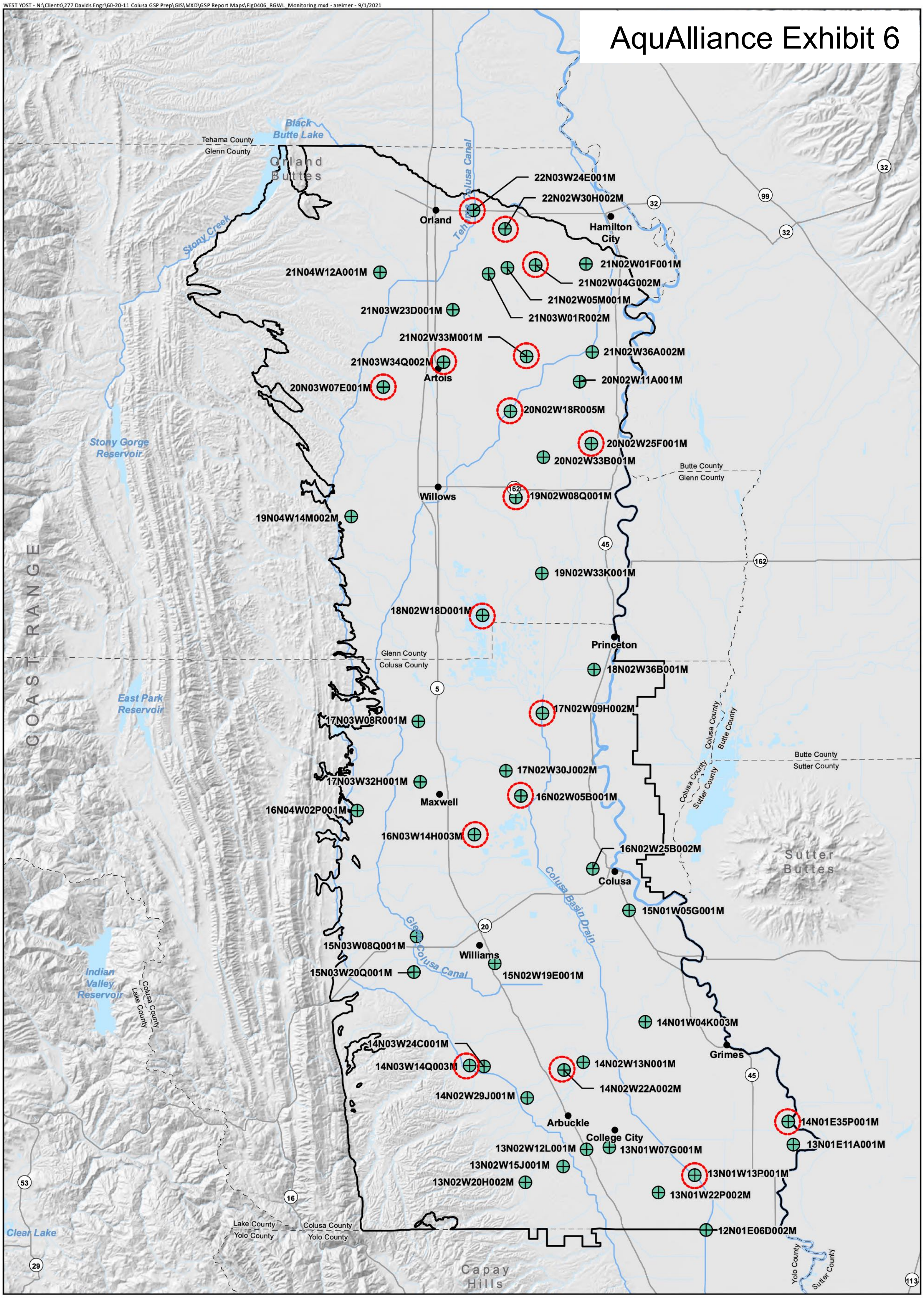
Final Colusa Subbasin Groundwater Sustainability Plan

AquAlliance Exhibit 5



WEST YOST - N:\Clients\277 Davids Engr\60-20-11 Colusa GSP Prep\GIS\MXD\GSP Report Maps\Fig0406_RGWL_Monitoring.mxd - areimer - 9/1/2021

AquAlliance Exhibit 6



Representative Groundwater Level Monitoring Network Site

Colusa Subbasin

Well that monitor below a depth of 600 feet or greater

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

N

0 2.5 5

Scale in Miles

Modified DRAFT **Figure 4-6**

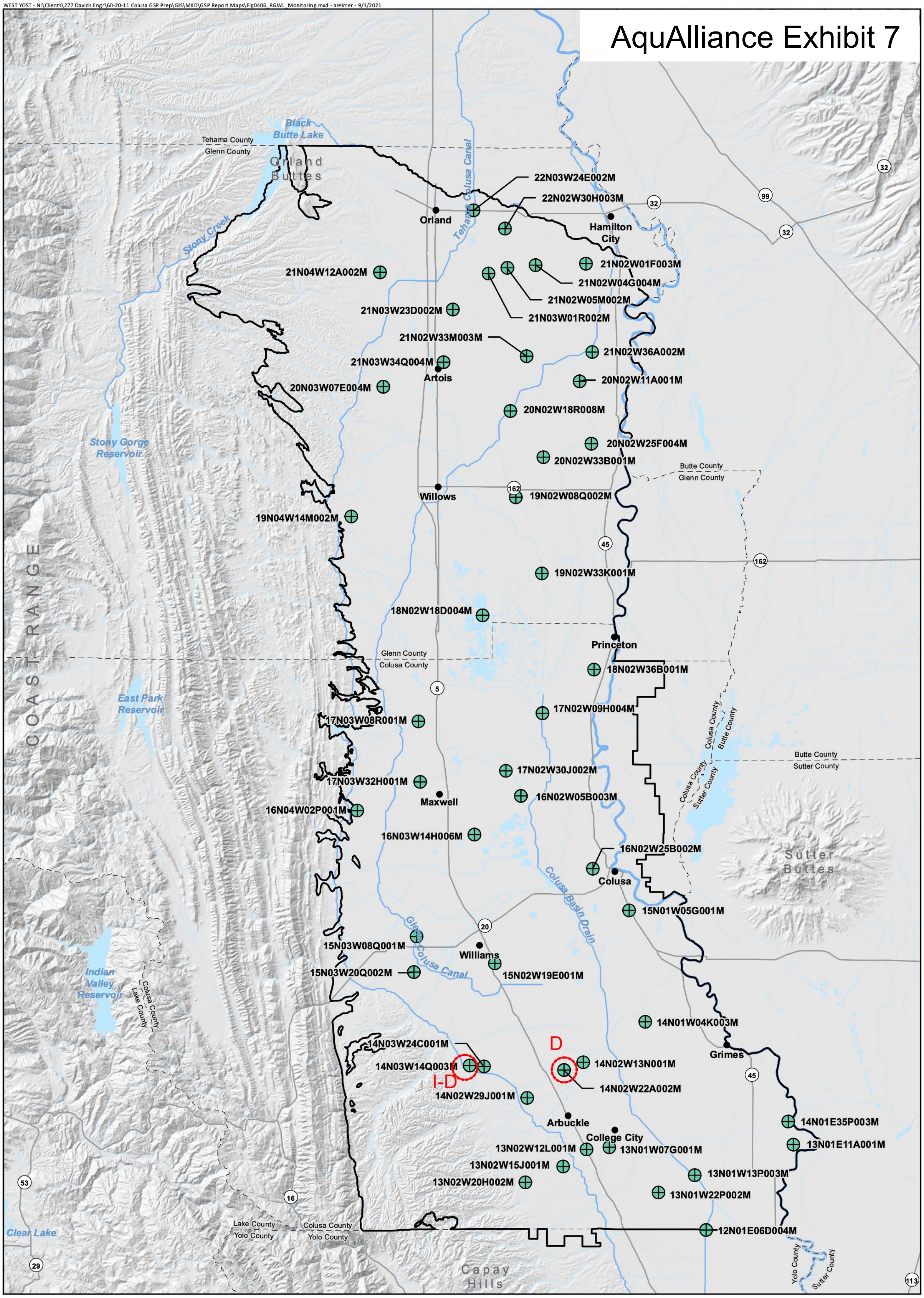
Representative Groundwater Level Monitoring Network

Colusa Groundwater Authority and Glenn Groundwater Authority

Colusa Subbasin

Groundwater Sustainability Plan

WEST YOST - N:\Clients\277 Davids Engr\60-20-11 Colusa GSP Prep\GIS\MXD\GSP Report Maps\Fig0406_RGWL_Monitoring.mxd - areimer - 9/1/2021



Representative Groundwater Level Monitoring Network Site

Colusa Subbasin

Well screened in the Deep aquifer zone

Horizontal Datum: North American Datum of 1983 (NAD 83), California State Plane Zone II, feet.

N

0 2.5 5

Scale in Miles

Modified **Figure 4-6**

Representative Groundwater Level Monitoring Network

Colusa Groundwater Authority and Glenn Groundwater Authority

Final Colusa Subbasin Groundwater Sustainability Plan

AquAlliance Exhibit 8

Modified Colusa Final GSP Table 3-12.

Average Annual Groundwater System Inflows, Outflows, and Changes in Storage in Acre-feet/Year for the Water Budget Analysis Periods

	A	B	C	D	E	F	G	H	I	J
	Component	**Historical Simulation, 1990 - 2015**	**Current Conditions Baseline, 2016 - 2065**	**Future Conditions, No Climate Change Baseline**	**Future Conditions, 2030 Climate Change Baseline**	**Future Conditions, 2070 Climate Change Baseline**	**2070 Future - Historical, AFY**	**2070 Future - Historical, Percent**	**2070 Future - Current, AFY**	**2070 Future - Current, Percent**
	Inflows									
1	**Subsurface Water Inflows**	200,000	203,000	203,000	205,000	209,000	**9,000**	**4.5%**	**6,000**	**3.0%**
2	**Deep Percolation**	441,000	416,000	415,000	415,000	411,000	**-30,000**	**-6.8%**	**-5,000**	**-1.2%**
3	Precipitation	174,000	162,000	162,000	160,000	156,000	-18,000	-10.3%	-6,000	-3.7%
4	Applied Surface Water	196,000	162,000	162,000	161,000	158,000	-38,000	-19.4%	-4,000	-2.5%
5	Applied Groundwater	72,000	92,000	91,000	94,000	97,000	25,000	34.7%	5,000	5.4%
6	**Seepage**	345,000	379,000	379,000	387,000	401,000	**56,000**	**16.2%**	**22,000**	**5.8%**
7	Streams	206,000	231,000	231,000	239,000	253,000	47,000	22.8%	22,000	9.5%
8	Canals and Drains	139,000	148,000	148,000	148,000	148,000	9,000	6.5%	0	0.0%
9	**Total Inflow**	**986,000**	**998,000**	**997,000**	**1,007,000**	**1,021,000**	**35,000**	**3.5%**	**23,000**	**2.4%**
	Outflows									
10	**Subsurface Water Outflows**	146,000	149,000	149,000	148,000	**147,000**	**1,000**	**0.7%**	**-2,000**	**-1.3%**
11	**Groundwater Pumping**	502,000	499,000	499,000	525,000	**559,000**	**57,000**	**11.4%**	**60,000**	**12.0%**
12	Agricultural	463,000	458,000	458,000	484,000	516,000	53,000	11.4%	58,000	12.7%
13	Urban and Industrial	11,000	11,000	10,000	10,000	10,000	-1,000	-9.1%	-1,000	-9.1%
14	Managed Wetlands	28,000	30,000	30,000	31,000	32,000	4,000	14.3%	2,000	6.7%
15	**Stream Gains from Groundwater (Stream Accretions)**	366,000	349,000	349,000	337,000	323,000	**-43,000**	**-11.7%**	**-26,000**	**-7.4%**
16	**Total Outflow**	**1,014,000**	**997,000**	**996,000**[1]	**1,010,000**	**1,028,000**[1]	**15,000**	**1.4%**	**32,000**	**3.1%**
17	**Change in Storage (Inflow - Outflow)**	**-28,000**	**1,000**	**1,000**[1]	**-3,000**	**-7,000**[1]	**20,000**	**-75.0%**	**-9,000**	**-800.0%**
18	**Net Stream Gains (Accretion)**	**160,000**	**118,000**	**118,000**	**98,000**	**70,000**	**-90,000**	**-56.3%**	**-48,000**	**-40.7%**
19	**Ratio Net Accretion / GW Pumping**	**31.9%**	**23.6%**	**23.6%**	**18.7%**	**12.5%**	**-157.9%**		**-80.0%**	

1. Value of Final Table 3-12 as entered.

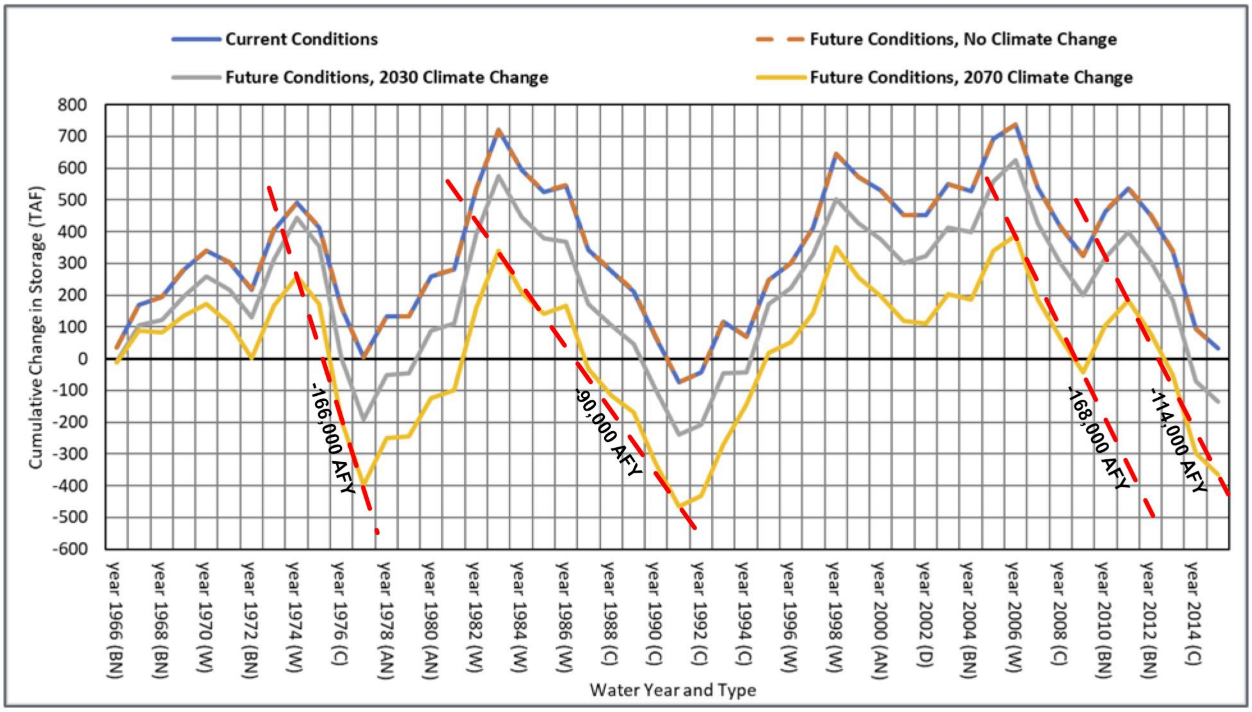
AquAlliance Exhibit 9

Modified Colusa Final GSP Table 3-11.

Average Annual Land and Surface Water System Inflows, Outflows, and Changes in Storage in Acre-Feet/Year for the Water Budget Analysis Periods

	A	B	C	D	E	F	G	H	I	J
	Component	**Historical Simulation, 1990 - 2015**	**Current Conditions Baseline, 2016 - 2065**	**Future Conditions, No Climate Change Baseline**	**Future Conditions, 2030 Climate Change Baseline(a)**	**Future Conditions, 2070 Climate Change Baseline(b)**	**2070 Future - Historical, AFY**	**2070 Future - Historical, Percent**	**2070 Future - Current, AFY**	**2070 Future - Current, Percent**
	Inflows									
1	**Surface Water Inflows**	11,747,000	12,556,000	12,556,000	12,597,000	12,715,000	**968,000**	**8.2%**	**159,000**	**1.3%**
2	Sacramento River Diversions	1,076,000	1,192,000	1,196,000	1,196,000	1,196,000	120,000	11.2%	4,000	0.3%
3	Stony Creek Diversions	92,000	95,000	91,000	91,000	91,000	-1,000	-1.1%	-4,000	-4.2%
4	Sacramento River Inflows	10,500,000	11,188,000	11,188,000	11,228,000	11,335,000	835,000	8.0%	147,000	1.3%
5	Other Inflows from Boundary Streams	78,000	81,000	81,000	81,000	92,000	14,000	17.9%	11,000	13.6%
6	**Precipitation**	1,210,000	1,183,000	1,183,000	1,198,000	1,258,000	**48,000**	**4.0%**	**75,000**	**6.3%**
7	**Groundwater Pumping**	502,000	499,000	499,000	525,000	559,000	**57,000**	**11.4%**	**60,000**	**12.0%**
8	Agricultural	463,000	458,000	458,000	484,000	516,000	53,000	11.4%	58,000	12.7%
9	Urban and Industrial	11,000	11,000	10,000	10,000	10,000	-1,000	-9.1%	-1,000	-9.1%
10	Managed Wetlands	28,000	30,000	30,000	31,000	32,000	4,000	14.3%	2,000	6.7%
11	**Stream Gains from Groundwater (Stream Accretions)**	366,000	349,000	349,000	337,000	323,000	**-43,000**	**-11.7%**	**-26,000**	**-7.4%**
12	**Total Inflow**	**13,824,000**	**14,587,000**	**14,586,000**	**14,658,000**	**14,853,000**	**1,029,000**	**7.4%**	**266,000**	**1.8%**
	Outflows									
13	**Evapotranspiration**	1,740,000	1,790,000	1,790,000	1,841,000	1,901,000	**161,000**	**9.3%**	**111,000**	**6.2%**
14	Agricultural	1,430,000	1,494,000	1,494,000	1,542,000	1,596,000	166,000	11.6%	102,000	6.8%
15	Urban and Industrial	22,000	28,000	28,000	28,000	28,000	6,000	27.3%	0	0.0%
16	Managed Wetlands	69,000	69,000	69,000	70,000	73,000	4,000	5.8%	4,000	5.8%
17	Native Vegetation	180,000	163,000	163,000	165,000	167,000	-13,000	-7.2%	4,000	2.5%
18	Canal Evaporation	40,000	36,000	36,000	36,000	36,000	-4,000	-10.0%	0	0.0%
19	**Deep Percolation**	441,000	416,000	415,000	415,000	411,000	**-30,000**	**-6.8%**	**-5,000**	**-1.2%**
20	Precipitation	174,000	162,000	162,000	160,000	156,000	-18,000	-10.3%	-6,000	-3.7%
21	Applied Surface Water	196,000	162,000	162,000	161,000	158,000	-38,000	-19.4%	-4,000	-2.5%
22	Applied Groundwater	72,000	92,000	91,000	94,000	97,000	25,000	34.7%	5,000	5.4%
23	**Seepage**	345,000	379,000	379,000	387,000	401,000	**56,000**	**16.2%**	**22,000**	**5.8%**
24	Streams	206,000	231,000	231,000	239,000	253,000	47,000	22.8%	22,000	9.5%
25	Canals and Drains	139,000	148,000	148,000	148,000	148,000	9,000	6.5%	0	0.0%
26	**Surface Water Outflows**	11,302,000	12,002,000	12,003,000	12,015,000	12,141,000	**839,000**	**7.4%**	**139,000**	**1.2%**
27	Precipitation Runoff	55,000	51,000	51,000	52,000	60,000	5,000	9.1%	9,000	17.6%
28	Applied Surface Water Return Flows	96,000	93,000	93,000	92,000	90,000	-6,000	-6.3%	-3,000	-3.2%
29	Applied Groundwater Return Flows	22,000	19,000	18,000	19,000	20,000	-2,000	-9.1%	1,000	5.3%
30	Sacramento River	9,371,000	11,049,000	11,050,000	11,086,000	11,187,000	1,816,000	19.4%	138,000	1.2%
31	Colusa Basin Drain	709,000	759,000	759,000	742,000	774,000	65,000	9.2%	15,000	2.0%
32	Colusa Weir to Sutter Bypass	994,000	0	0	0	0	-994,000	-100.0%	0	
33	Other Outflows to Boundary Streams	56,000	32,000	32,000	23,000	10,000	-46,000	-82.1%	-22,000	-68.8%
34	**Total Outflow**	**13,828,000**	**14,587,000**	**14,587,000**	**14,658,000**	**14,853,000**	**1,025,000**	**7.4%**	**266,000**	**1.8%**
35	**Change in Storage (Inflow - Outflow)**	**-3,000**	**0**	**0**	**0**	**0**	**3,000**		**0**	
36	**Net Stream Gains (Accretion)**	**160,000**	**118,000**	**118,000**	**98,000**	**70,000**	**-90,000**	**-56.3%**	**-48,000**	**-40.7%**
37	**Net Stream Accretion / GW Pumping**	**31.9%**	**23.6%**	**23.6%**	**18.7%**	**12.5%**	**-157.9%**		**-80.0%**	
38	**Sacramento River (Inflows - Outflows)**	**1,129,000**	**139,000**	**138,000**	**142,000**	**148,000**	**-981,000**	**-86.9%**	**9,000**	**6.5%**

AquAlliance Exhibit 10



Modified **Figure 3-49. Cumulative Change in Groundwater Storage for Current and Future Conditions Baseline Scenarios**

Lines show range of slopes of annual average groundwater change in storage during future 2070 Climate Change scenario droughts.

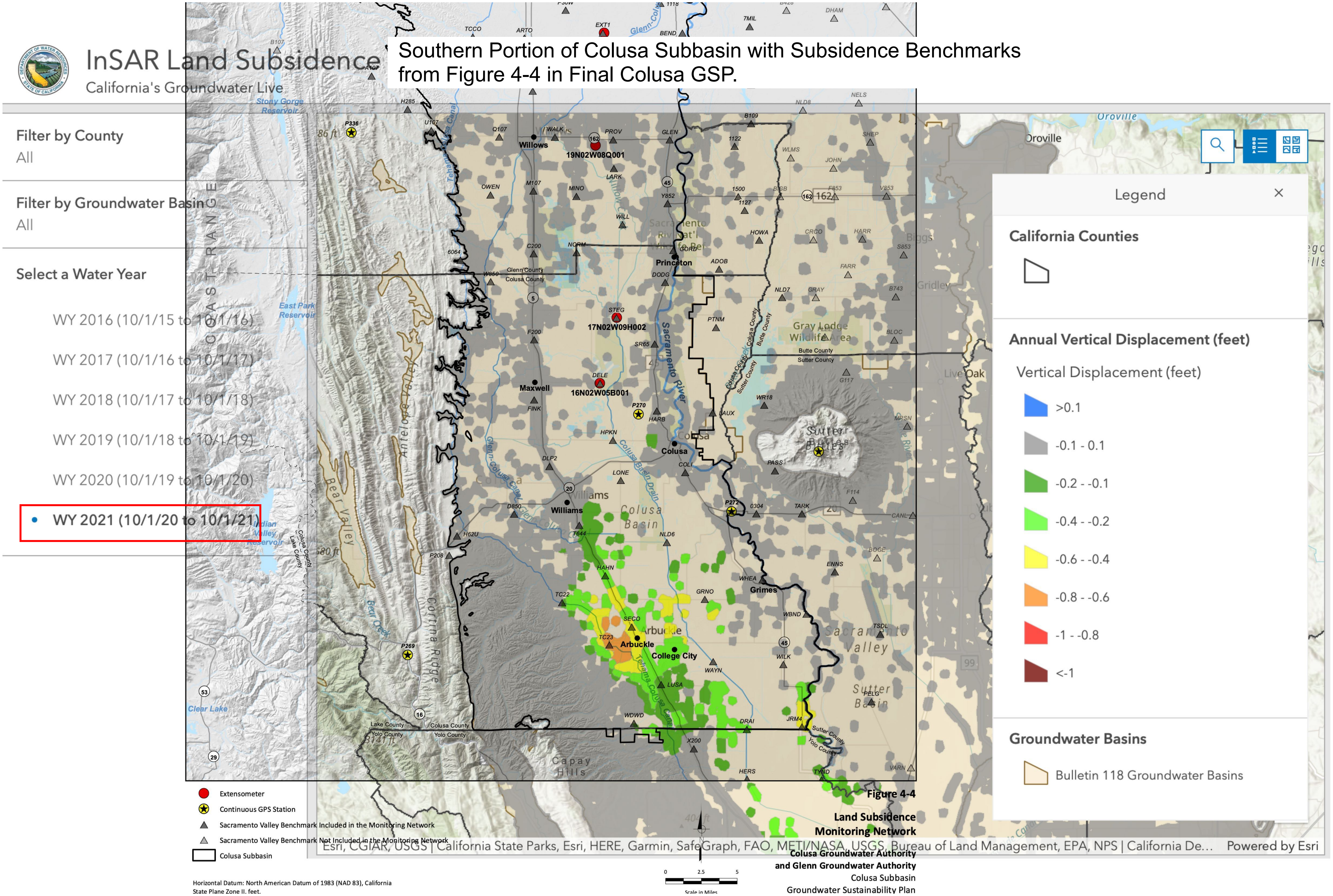
3.3.5 Water Budget Uncertainty

Water budget uncertainty refers to a lack of understanding of the subbasin setting that significantly affects an Agency's ability to develop sustainable management criteria and appropriate projects and management actions in a GSP, or to evaluate the efficacy of plan implementation, and therefore may limit the ability to assess whether a subbasin is being sustainably managed. Substantial uncertainty exists in all components of each water budget component. Substantial uncertainty also exits in the assumptions used to project potential future conditions related to planned development and associated urban demands, as well as projections of climate change. Consequently, the estimated negligible or very small changes in groundwater storage for current and future water budgets, calculated as total subbasin inflows minus outflows, are highly uncertain. It is anticipated that confidence in model results will be increased over time through additional monitoring and data collection, refinements to C2VSimFG-Colusa input, and coordination with neighboring subbasins.

However, the uncertainties that currently exist do not substantially limit the ability to develop and implement a GSP for the subbasin including the ability to develop sustainable management criteria and appropriate projects and management actions, including improved monitoring, nor the ability to assess whether the subbasin is being sustainably managed over time. GSPs are by nature iterative, and each opportunity will allow for improvements that will (1) lower uncertainty and (2) facilitate more refined analyses of sustainable management criteria and projects and management actions, and (3) refine the GSP implementation.

AquAlliance Exhibit 10

Southern Portion of Colusa Subbasin with Subsidence Benchmarks from Figure 4-4 in Final Colusa GSP.



AquAlliance Exhibit 11

InSAR Land Subsidence

California's Groundwater Live

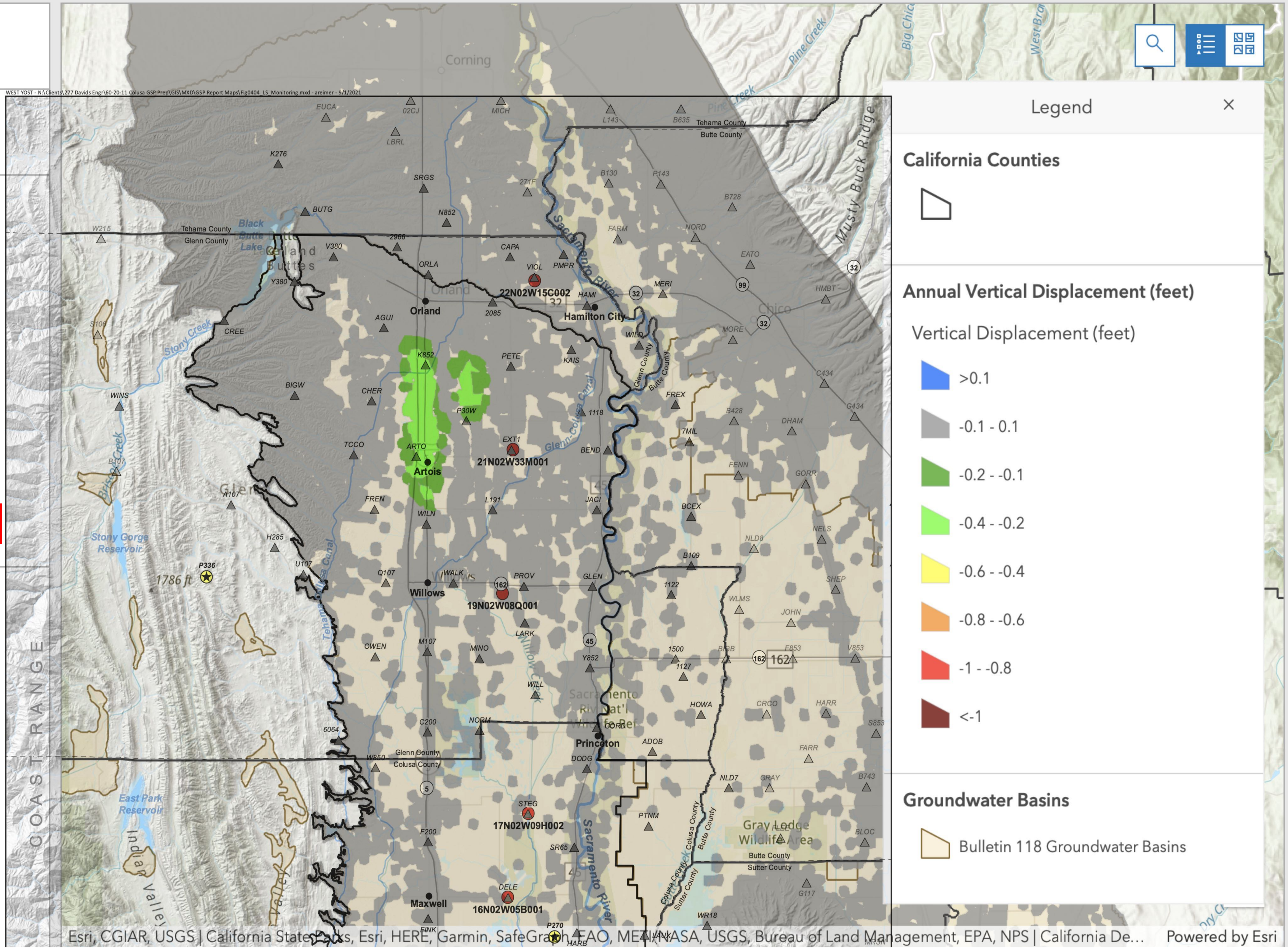
Northern Portion of Colusa Subbasin with Subsidence Benchmarks from Figure 4-4 in Final Colusa GSP.

Filter by County
All

Filter by Groundwater Basin
All

Select a Water Year

- WY 2016 (10/1/15 to 10/1/16)
- WY 2017 (10/1/16 to 10/1/17)
- WY 2018 (10/1/17 to 10/1/18)
- WY 2019 (10/1/18 to 10/1/19)
- WY 2020 (10/1/19 to 10/1/20)
- • **WY 2021 (10/1/20 to 10/1/21)**



April 19, 2024

Lisa Hunter (County of Glenn)
225 North Tehama Street
Willows, CA 95988
lhunter@countyofglenn.net

Re: Second Comments on the Revised Colusa Subbasin Groundwater Sustainability Plan

Dear Ms. Hunter and the Colusa Subbasin GSAs:

AquAlliance, the California Sportfishing Protection Alliance, and the California Water Impact Network (hereinafter AquAlliance) submit the following comments and questions on the Revised Colusa Subbasin Groundwater Sustainability Plan ("Colusa GSP" or "Plan"). This second set of comments is in addition to what AquAlliance was able to assemble in the two days provided upon the release of the Revised GSP on April 16, 2024 late in the day. These comments were originally submitted to DWR in 2022, but since many of our concerns are still not addressed in 2024, we are sending them to the Colusa Subbasin GSAs now. However, it must be stated that some of the text will be redundant and maybe confusing due to the changes made in the Revised GSP. Because the SGMA process for "Inadequate" plans has no guidance and is therefore dysfunctional for the public, AquAlliance is responding in kind while attempting to advance the public's interests as well as environmental and public trust interests.

Most of the comments are as germane today as they were in 2022, particularly since much of the 2022 GSP will remain in effect. No matter how we refer to the GSP in these comments, either as final, revised, amended, or any other nomenclature, our intention is that the comments and questions here apply to all forms of the GSP that have been approved by the GSAs or are planned for approval by the GSAs in 2024. Anything in our comments that seems confusing is due to the fact we are trying review a 700+ page package and there is completely inadequate time allowed for public comments.

Introduction

The goal of the Sustainable Groundwater Management Act (SGMA) is to sustainably manage groundwater resources for long-term reliability and multiple economic, social, and environmental benefits for current and future beneficial uses based on the best available science (Water Code 113). The people of California have a primary interest in the protection, management, and reasonable beneficial use of the water resources of the state, both surface and underground, and in the integrated management of the state's water resources to meet the state's water management goals. Proper management of groundwater resources will help protect communities, farms, and the environment against prolonged dry periods and climate change, while preserving water supplies for existing and potential beneficial use. Failure to manage groundwater to prevent long-term overdraft infringes on overlying and other proprietary rights to groundwater.

California's Water Code specifically established as state policy that *every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes* (WAT § 106.3(a)). State agencies, including the California Department of Water Resources ("DWR"), the State Water Resources Control Board ("SWRCB"), and the State Department of Public Health, are required to *consider this state policy when revising, adopting, or establishing policies, regulations, and grant criteria when those policies, regulations, and criteria are pertinent to the uses of* water (WAT § 106.3(b)). The Water Code also creates a state policy *that the use of water for domestic purposes is the highest use of water and that the next highest use is for irrigation* (WAT § 106). The Groundwater Sustainability Agencies (GSAs) were created by SGMA and are delegated by the state the authority to create and implement a Groundwater Sustainability Plan (GSP), which makes the GSA(s) a political subdivision of the state. Therefore, approval of any SGMA GSP created by a GSA, multiple GSAs, or a county agency, that is then approved by DWR and the SWRCB, must be consistent with the state policies that protect and prioritize the public's right to safe and available supply of groundwater for all beneficial uses and protect the Public Trust.

Implementation of the SGMA requires the creation of a GSP that provides for the development and reporting of those data necessary to support sustainable groundwater management, including those data that help describe the basin's geology, the short- and long-term trends of the basin's water balance, and other measures of sustainability, and those data necessary to resolve disputes regarding sustainable yield, beneficial uses, and water rights. The December 2021 Colusa Subbasin[1] Final GSP fails to meet the SGMA goal of water resource sustainability and protection of the water rights of all beneficial users and uses.

These comments on the December 2021 Colusa Subbasin Final GSP (Colusa GSP) are being provided to support our recommendation that the California Department of Water Resources and the State Water Resources Control Board find that the GSP is incomplete because of multiple deficiencies and the overall failure of the document to comply with the statutory and regulatory requirements of the SGMA and the Water Code. These comments are supplemental to AquAlliance's previous comments provided on the September 2021 Draft Colusa Subbasin GSP, which are attached in Final Colusa GSP in Appendix 2B-2 (pdf pp. 606 to 662). The proposed sustainable management criteria presented in the Colusa GSP fail to demonstrate as required by SGMA that the goal of groundwater sustainability is achievable and will occur within 20 years of GSP adoption to prevent: (1) chronic lowering of groundwater levels, (2) reduction of groundwater storage, (3) degraded water quality, (4) inelastic land subsidence, and (5) depletions of interconnected surface waters. The Final

[1] California Groundwater basin number 5-021.52, part of the Sacramento Valley Groundwater Basin, as defined by DWR Bulletin 118 (DWR, 2006) and updated in February 2019. Additional basin boundary modifications were submitted to DWR in June 2021; however, the modifications have not been approved as of the writing of this GSP.

Colusa GSP fails to protect the beneficial uses for all users of groundwater in the subbasin because of the following:

1. The final plan sets the minimum thresholds (MTs) for unreasonable results in the management of the groundwater levels at depths that can result in 20% or more of the domestic wells going dry for sustained periods, if not permanently.
2. The final plan without a clear explanation has reduced the number of representative monitoring network groundwater level wells screened in the deep aquifer zone, defined by DWR as greater than 600 feet below the ground surface (bgs), from 17 (possibly 18) in the Draft GSP to 2 (possibly 3). The deep aquifer zone is used for agricultural production so sustainability criteria and extensive monitoring of groundwater levels and water quality in this zone must be included in the GSP.
3. The final plan assumes that sustainable management of the subbasin will allow for groundwater pumping to increase 57,000 acre-feet per year (afy) above the 1990-2015 Historical baseline with 93% of the increase going to agricultural uses.
4. The final plan assumes that sustainable management of the subbasin will result in a decrease in net stream accretion of 90,000 afy, or 56.3% below the 1990-2015 Historical baseline of 160,000 afy.
5. The final plan assumes that sustainable management of the subbasin results when the future ratio of additional loss of stream flow to additional pumping is approximately 158% (-90,000 afy / 57,000 afy = -1.579 = -158%).
6. The final plan assumes that sustainable management of the subbasin will cause 350,000 acre-feet (af) of groundwater storage to be lost in the next 50 years in addition to the approximate 700,000 af lost as of January 2015, for a total of approximately 1 million af since 1990, before an unreasonable result is declared.
7. The final plan sets the subbasin average margin of operational flexibility (MOF), the difference in the depths between the management objectives (MOs) and the MTs, for the shallow aquifer zone at a thickness that can allow a loss in groundwater storage of over 4 million acre-feet before an unreasonable result is declared (see details in section "i" below).
8. The final plan requires without analysis or justification that before an unreasonable result can occur the MTs for a sustainability indicator must be continuously and simultaneously exceeded for 24 months at 25% of the representative groundwater network (RMN) monitoring wells.
9. The final plan requirement for simultaneous, continuous exceedance of the MT at multiple benchmarks or RMN monitoring wells can result in significant magnitudes and expansive areas of decline in groundwater levels, groundwater storage, water quality, interconnected surface waters, and surface elevations (subsidence) so long as one of the monitored stations in the group cycles above and below the MT depth. In other words, there is no limit to decline in the beneficial uses of groundwater if measurements in one of the monitoring stations within a group is above the MT at least once every 24 months.
10. The final plan has 9 of the 12 Interconnected Surface Water (ICSW) monitoring wells included in the 48 RMN groundwater level monitoring wells. The MOs for these 9 ICSW wells are nearly the same as the RMN groundwater level wells. However, the MTs in all 12 ICSW wells are significantly shallower than the MTs for the RMN groundwater level wells, even though they are at the same location. How are the GSP management actions for

preventing depletion of ICSW different from the actions to prevent the chronic lowering of groundwater level when the groundwater level for both sustainability criteria is taken at the same location in the same aquifer zone?

11. The final plan assumes the DWR 2070 Climate Change scenario will result in an increase in surface water inflows to the subbasin over the Historical baseline of 968,000 afy, and an increase in precipitation over the baseline of 48,000 afy.
12. The final plan assumes that contrary to the 2070 climate-change-induced increases in inflow of surface water and precipitation, groundwater inflows from deep percolation of precipitation and applied surface water will decrease from the Historical baseline by 18,000 afy and 38,000 afy, respectively.
13. The final plan assumes that groundwater sustainability of the subbasin will be achieved in part because 86,000 afy of additional Central Valley Project (CVP) surface water will be available for In-Lieu Recharge, and that a funding plan will be developed to promote the use of CVP water instead of pumping groundwater. It fails to note that groundwater recharge alters the rights to groundwater[2] and may not be a solution acceptable to subbasin users. It also fails to demonstrate that creating the space for recharge harms groundwater dependent farms and residential property as well as streams and habitat for myriad species. This has long been the plan of Glenn Colusa Irrigation District and the Bureau of Reclamation – to take over the basin and manipulate for the benefit of moneyed interests, not the local people or environment.[3], [4] Repeating the mistakes of the Owens, San Fernando, and San Joaquin valleys is not in the best interests of the communities, businesses, groundwater dependent farms, and the environment.
14. The final plan fails to analyze, monitor, or consider the potential impacts to water quality from the proposed allowable changes in groundwater levels and storage, except for one constituent, salinity. Although the final plan calls for coordination in management of water quality with other governmental agencies, the plan doesn't indicate what the MOs and MTs are for all the potential contaminants of concern in the Colusa subbasin, or what and how GSP management actions will be taken whenever a water quality impact is identified.
15. The final plan sets the rate and expanse of inelastic subsidence that appear to exceed the current conditions while providing no current assessment of the sensitivity of local infrastructure to subsidence. A future study is proposed to fill the infrastructure data gap, but the Colusa Subbasin GSAs aren't committed to leading or funding this study, and there is no timeline for its completion.

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[2] Los Angeles v. Glendale (1943) 23 Cal.2d 68, 76-78; Los Angeles v. San Fernando (1975) 14 Cal.3d 199, 258-60; Stevens v. Oakdale Irrigation District (1939) 13 Cal.2d 343, 352-43; Crane v. Stevinson (1936) 5 Cal. 2d 387, 398.

[3] U.S. Bureau of Reclamation, September 2006. Grant Assistance Agreement. "GCID shall define three hypothetical water delivery systems from the State Water Project (Oroville), the Central Valley Project (Shasta) and the Orland Project reservoirs sufficient to provide full and reliable surface water delivery to parties now pumping from the Lower Tuscan Formation. The purpose of this activity is to describe and compare the performance of three alternative ways of furnishing a substitute surface water supply to the current Lower Tuscan Formation groundwater users to eliminate the risks to them of more aggressive pumping from the Formation and to optimize conjunctive management of the Sacramento Valley water resources." (p. 5)

[4] *Id.* GCID's actual purpose is best expressed using their own words: to "…improve Central Valley system-wide water supply reliability through participation in the emerging water transfer markets…" (p. 2) that would "…integrate the Lower Tuscan Formation into the local water supply system and into the Central Valley wide water supply system;…" (p. 6)

16. The final plan doesn't provide a requirement for the frequency of monitoring subsidence benchmarks or monitoring critical infrastructure, but instead leaves the responsibility of subsidence monitoring and analysis to others.
17. The final plan assumes that subsidence data collection would be grant-funded and *implemented by state and federal agencies, such as DWR or USGS* (U.S. Geological Survey), and the Sacramento Valley Subsidence Interbasin Working Group.
18. The final plan assumes that any projects to address or mitigate inelastic land subsidence would be led, implemented, and funded by other local entities and not the Colusa Subbasin GSAs.

Failure to Comply with SGMA and the Water Code

The following sections provide expanded discussions on the deficiencies listed above regarding how the Colusa GSP fails to protect the beneficial uses for all users of groundwater in the subbasin.

a) The Colusa GSP sets the MTs for unreasonable results in the management of the groundwater levels at depths that can result in 20% or more of the domestic wells going dry for sustained periods, if not permanently. The MTs for groundwater levels in the 48 representative monitoring network (RMN) wells are set at the lowest elevation, greatest depth, of either *50% of measured historical groundwater elevation range below the historical measured low elevation,* or *the elevation corresponding to the 20th percentile of domestic well depths*, Table 5-1, page 5-18 (pdf 282) and Section 5.4.1.1 (pages 5-19 to 5-21, pdf 283 to 285). This effectively requires that before a declaration that groundwater levels in the subbasin are undesirable and management actions need to be taken, a significant number of domestic wells that are today functioning must go dry. The requirement that the greatest depth to groundwater of either criterion is controlling sustainability means that domestic wells in the subbasin will experience water levels far below those that have occurred in the past. The greatest depth criterion also means that more than 20% of the domestic wells will be allowed to go dry before the GSAs declare an undesirable result.

The attached AquAlliance Exhibits 1 and 2 are modifications of the Final and Draft Colusa GSP Table 5-2 that lists the 48 RMN groundwater level monitoring wells, the sustainable management criteria for each well, and the difference in depth between the two MT determination methods. AquAlliance Exhibit 1 also lists the 12 Interconnected Surface Water monitoring wells from Table 5-3 (page 5-33, pdf 297) because 7 of these wells are also part of the 48 RMN wells. Columns are alphabetically labeled at the top of the tables. Column I lists which MT method was used for each well; (a) for 20th percentile of domestic wells, and (b) for 50% of historic range below lowest historic level. Columns J and K give the difference in depth between chosen MT and the rejected threshold. For example, the first well in AquAlliance Exhibit 1 lists the selected MT in Column F at a depth of 136 feet below the ground surface (bgs) based on 20th percentile depths (Column I). This is 42 feet lower than the depth for the 50% of the historic range below the historic lowest groundwater level (Column J). So, domestic wells in the polygon controlled by this well will be subjected to declines in groundwater that are greater than what has been historical experience, and greater than 50% of the range below the historical low by an additional decline of 42 feet.

This GSP's requirement to maximize the decline in groundwater levels is considered reasonable by the Colusa Subbasin GSAs because it allows for a *margin of operational flexibility* that is adequate *to* *allow for increased groundwater production during drought years with recovery during normal or wet years, accounting for uncertainty in each*, Section 5.4.1.3 (page 5-23, pdf 287). The GSP doesn't state which groundwater producers will benefit from increasing production during a drought, but it is clear that at least 20% of the domestic well producers are not likely to be among them.

As introduced above, for those RMN groundwater level wells where the MT is set at the 50% range below the historical low, more than 20% of the domestic wells will be allowed to go dry to provide *operational flexibility*. For example, at well 21N04W12A002, CASGEM ID 25725 (fifth well from the bottom of page 2 of AquAlliance Exhibit 1), the MT is set at a depth of 230 feet (Column F), 132 feet below the 20th percentile depth of 98 feet for domestic wells (Columns G and K). This is a 135 percent increase in the depth below which 20% of the domestic wells will go dry. Based on the CASGEM database, the depth to groundwater at this RMN well in October 2021 was approximately 206 feet, or 108 feet below the depth of 20% of the domestic wells, and yet an additional decline in water level of 24 feet is needed before the MT depth for this well is exceeded.

This well is one of two RMN wells closest to the City of Orland. Glenn County, as the Colusa GSP Preface notes, has had 282 reports of problems associated with groundwater wells, with about 65 percent of those being reports of dry wells. AquAlliance Exhibit 3 is a screen capture of the SGMA Data Viewer showing that most of the reported dry wells in the Colusa Subbasin are near Orland. The October 20, 2021 comment letter by the City of Orland Council on the Draft Colusa GSP noted that 150 domestic wells had gone dry in the summer of 2021 (pdf pages 683 and 684).

b) In addition to groundwater levels having to decline below the MT depth to declare an undesirable result, the Colusa GSP also requires that the MT must be exceeded continuously for 24 consecutive months in at least 25% of the 48 RMN groundwater level wells, i.e., 12 wells, Table 5-1 (page 5-18, pdf 282). The reasoning given for the method of selection of these 12 or more wells is that they aren't predetermined but selected as the groundwater level in the well falls below the minimum threshold. Once selected the well must be in the same subset of wells. The implications of these additional requirements on the water supply for domestic and smaller agricultural users will be discussed below in comment no. 3. The reasoning for selecting the 25% well groups raises several questions:

- Why is the selection of the 12 or more wells not based on how groundwater production in the subbasin is being managed and the implementation of the sustainability projects?
- What is the start date of the 24 consecutive month clock? Does it start on the earliest day that any one of the 25% wells exceeds its MT, on the day the 12th well exceeds its MT, or some other intermediate date?
- What happens to the start date of the 24-consecutive-month clock if a 13th well, or more, exceeds its MT? Does the start date begin anew when a well is added to the group?
- How many 25% MT exceedance groups are possible, only one, up to 4, or more?
- If the wells must remain in the same subset, do they remain in that 25% subset forever, or do the wells in a 25% group change when there are fewer than 12 and the 24-month clock stops?
- Can the areas of the subbasin monitored by multiple 25% groups overlap?
- What happens when the locations of the first 12 wells that exceed their MTs span the entire subbasin and then additional MT exceedance wells are clustered around a pumping depression?

- Why does the MT exceedance need to be continuous in multiple wells for 24 months? Why is the dewatering of a domestic and/or small agricultural well for less than 24 months considered a beneficially sustainable practice?
- Why is seasonal dewatering of domestic and/or small agricultural wells that might occur cyclically each summer considered beneficially sustainable, and who is benefitting? Certainly not the small landowner.

An additional issue with the requirement for MT exceedance for 24 consecutive months is that it may prevent the determination of an unreasonable result from lowering of groundwater levels. The Colusa GSP monitoring plan utilizes 8 of the 48 RMN groundwater level monitoring wells, or 17 percent, shown in Table 5-2, that have MT depths that are at or below the screened interval of the well. This means that the chronic lowering of groundwater level sustainability criteria at these wells can't be continuously measured, and the water levels in these wells will need to be either reported as not available or reported as being above the MT! The MT criteria in all but one of these 8 wells are set at the 20th percentile domestic well depth. These 8 wells are identified by a footnote 3 in Column F of AquAlliance Exhibit 1. AquAlliance Exhibit 4 is a modification of Figure 4-6 in the Final Colusa GSP that identifies the locations of these 8 wells.

These 8 wells monitor the shallow aquifer zone, shallower than 200 feet, and are distributed across the subbasin. It is likely that at least one or more ~~all four~~ of the required groups of 25% RMN monitoring wells will have at least one of these 8 wells. **<u>This suggests that in the Colusa Subbasin an undesirable result from the chronic lowering of groundwater level can never occur, regardless of how low groundwater levels decline.</u>** As an example, AquAlliance Exhibit 5 is a modification of Figure 3A-47 (pdf page 3319) that shows the hydrographs for the 21N03W34Q002-004M cluster of wells near the City of Artois. Well 21N03W34Q004M (CASGEM 25790) is one of the Colusa RMN wells, sixth up from the bottom in AquAlliance Exhibit 1. Horizontal lines are added to this figure at the approximate depths of 55 feet bgs for the management objective (MO) and 125 feet bgs for the MT, along with dashed lines for the well's screen interval at 60 to 70 feet bgs, AquAlliance Exhibit 1 (Columns E, F and C). The groundwater levels can be measured to confirm the MO sustainability, but whenever the level declines below 70 feet, no measurements of shallow groundwater are available in this well. Therefore, groundwater levels between 71 and the MT at 125 feet bgs will always be unmeasured, which means that the monitoring group with this well can never have the groundwater level in all 25% wells lower than their respective MTs.

c) The Colusa GSP requires without analysis or justification that before an unreasonable result can occur, the MT for a parameter must be continuously and simultaneously exceeded for 24 months (2 years) at 25% at representative monitoring wells for chronic lowering of groundwater levels, degradation of water quality, and depletion of interconnected surface waters, Table 5-1 (page 5-18, pdf 282). In addition to the problem discussed above with 8 wells being screened above their MT depths, the requirement that all wells or benchmarks in the monitoring group continuously exceed the MT before an undesirable result can be declared creates a condition where 20% or more of the domestic wells within the polygon around a monitoring well can be repeatedly dewatered each summer while the subbasin is considered sustainably managed. The current design of the sustainability criteria in the Colusa GSP doesn't require that any actions be taken to mitigate or stop cyclic annual dewatering of domestic or agricultural wells if one or more of the RMN wells cycles above and below the MT depth once every 24 months. What justifies minimum threshold sustainable criteria that allow cyclic annual dewatering of domestic and shallow agricultural wells? How could it possibly be considered a beneficially sustainable management practice?

d) The Colusa GSP finds that an undesirable result can occur only when a group of RMN monitoring wells or benchmarks simultaneously and continuously exceeds the MT for 24 months. This can result in expansive areas of the subbasin experiencing significant declines in groundwater levels, groundwater storage, water quality, and land surface elevations (subsidence). If the groundwater elevation at any one RMN well is above or lower for water quality than the MT for one measurement within a 24-month period, an undesirable result doesn't need to be declared. This could result in cyclic declines in groundwater levels, groundwater storage, groundwater water quality, surface water flows, and/or land elevations that allow areas of undesirable results to become too large and too costly for the GSAs to mitigate without significant funding from the state or federal government.

The Colusa Subbasin covers approximately 723,823 acres (page 2-1, pdf 75). The requirement that 25 percent of the RMN wells and 20% of the subsidence benchmarks must be included in a group could result in a significant impact to the sustainability of approximately 144,765 to 180,956 acres before any actions need to be taken to remedy the cause. Note that the acreages are approximate averages because the Colusa GSP doesn't provide a map of the Thiessen polygons around each monitoring station, give the number of acres in a polygon, or name the wells or benchmarks in the required groups, so the actual number of acres harmed may be fewer or greater than these values.

e) The Colusa GSP, without a clear explanation, has reduced the number of wells in RMN groundwater level wells screened in the deep aquifer zone, defined by DWR[5] as greater than 600 feet below the ground surface, from 17 (possibly 18) of the 48 RMN wells in the Draft GSP down to 2 (possibly 3) in the Final GSP. The deep aquifer zone is used for agricultural production and a portion of the recharge to the deep zone comes from the overlying aquifer zones.[6] Therefore, sustainability criteria and extensive monitoring of deep aquifer zone groundwater levels, changes in groundwater storage, and groundwater water quality need to be included in the GSP. The Final GSP didn't change the total number of RMN groundwater monitoring wells, 48, but it did remove 20 of the Draft GSP wells and replaced them with 20 new wells. The well substitutions appear to mostly remove wells monitoring the deeper aquifer zone with wells screened in shallower zones. Both the original draft wells and the new final wells appear to be at or near the same location, just monitoring different zones. AquAlliance Exhibits 1 and 2 list the RMN groundwater level wells for the Final Colusa GSP and the Draft Colusa GSP, respectively. The wells in bold font in both exhibits are those that have been changed from the draft to the final Colusa GSP. AquAlliance Exhibits 6 and 7 are modified Figures 4-6 from the draft and final Colusa GSP, respectively, that show the deep aquifer zone RMN groundwater level monitoring wells. For the Final Colusa GSP, the deep aquifer zone RMN groundwater level wells are now only in the southern portion of the subbasin. The Final Colusa GSP has no RMN groundwater level wells monitoring the deep aquifer zone in the northern two-thirds of the subbasin.

[5] See groundwater contour maps at https://data.cnra.ca.gov/dataset/northern-sacramento-valley-groundwater-elevation-change-maps

[6] See aquifer studies at:
https://www.countyofglenn.net/sites/default/files/Water_Advisory_Committee/StonyCreek2003ReportandAppendicies.pdf
https://www.buttecounty.net/Portals/26/Tuscan/LTAFinalReport.pdf
https://www.buttecounty.net/Portals/26/Tuscan/AnalysisofAquiferEffectsDuringLargeScaleAgriculturalPumping.pdf

The lack of monitoring and sustainability criteria for the deeper aquifer zone in the northern portion of the subbasin is particularly problematic because the area has experienced continued declines in groundwater levels for at least 10 years.[7] Sustainable management of the Colusa Subbasin requires that this critically important aquifer zone be monitored. SGMA doesn't have a cap or limit on the number of monitoring stations, so the 20 monitoring wells that were removed must be returned to expand the RMN to 68 wells to monitor groundwater levels and water quality.

f) The water balance in the Colusa GSP, Chapter 3.3, assumes that future groundwater pumping can be increased by 57,000 afy above 1990-2015 Historical baseline under the 2070 Climate Change Scenario with 93% of the increase, 53,000 afy, going to agricultural uses. The future condition without climate change will have a decrease in groundwater pumping of 3,000 afy with agriculture declining 5,000 afy and managed wetlands increasing 2,000 afy. AquAlliance Exhibit 8 is a modification of the Final Colusa GSP Groundwater Budget Table 3-12 with columns added that calculate the difference and the percentage difference between the 2070 Future Climate Change scenario and the Historical or Current condition baselines.

The 57,000 afy increase in groundwater production (AquAlliance Exhibit 8, Row 11, Column G) occurs with a 30,000 afy reduction in total deep percolation (Row 2, Column G). This reduction in recharge to groundwater is the result of an 18,000 afy reduction in deep percolation from precipitation (Row 3, Column G) and a 38,000 afy reduction from applied surface water (Row 4, Column G), but a 25,000 afy increase from applied groundwater (Row 5, Column G). The annual average reduction in applied surface water will apparently occur while the In-Lieu Groundwater Recharge Projects that total 86,000 afy are being implemented, Colusa GSP Table 6.2 and Table 1 of Appendix 6A (pages 6-7 and 6-8, pdf pages 307 and 308; and pdf 3690). This raises several questions:

- Why does the groundwater water balance assume an annual average reduction in applied surface water when the In-Lieu Groundwater Recharge Projects are intended to increase surface water use up to 86,000 afy as a remedy for the historical groundwater storage losses?

- Why does the groundwater budget assume a reduction in deep percolation from precipitation, when the surface water budget, Table 3-11, (pages 3-95 and 3-96, pdf 213 and 214) assumes an increase of 48,000 afy in precipitation (AquAlliance Exhibit 9, Row 6, Column G)?

- Why does a 25,000 afy increase in deep percolation occur with a 57,000 afy increase in groundwater pumping, approximately a 44% recharge? The historical average deep percolation is 72,000 afy from 502,000 afy groundwater production, an average recharge of approximately 14% (AquAlliance Exhibit 8, Row 5, Column B divided by Row 11, Column B). The future additional deep percolation recharge from applied groundwater is significantly greater than the baseline condition. What is the cause of this increase in deep percolation with climate change?

g) The water balance in the Colusa GSP assumes that with the 2070 Climate Change scenario the management of the subbasin will result in a decrease in groundwater discharging to surface water, a

[7] See groundwater level change maps at https://data.cnra.ca.gov/dataset/northern-sacramento-valley-groundwater-elevation-change-maps

change in net stream accretion of -90,000 afy (AquAlliance Exhibit 8, Row 18, Column G), or 56.3% below the 1990-2015 baseline of 160,000 afy (Row 18, Columns H and B). The loss in net stream accretion occurs because of an increase in seepage from streams with climate change of 47,000 afy (Row 7, Column G) and a reduction in groundwater discharging, accretion, to the streams of 43,000 afy (Row 15, Column G). In addition, seepage from the canals is assumed to increase 9,000 afy (Row 8, Column G). This decline in future stream flow raises several questions:

- How is the increase in seepage loss of 47,000 afy from streams that occurs with an increase in groundwater pumping of 57,000 afy considered sustainable management? Shouldn't this increase in seepage be considered an undesirable result to interconnected surface waters and an impact to the Public Trust?

- The historical net stream accretion, 160,000 afy (Row 18, Column B) occurred with groundwater pumping of 502,000 afy (Row 11, Column B), a ratio of net accretion to pumping of approximately 32% (Row 19, Column B). With the 2070 Climate Change scenario, the management plan will result in 70,000 afy of net stream accretion (Row 18, Column F), a ratio of net accretion to pumping of approximately 13% (Row 19, Column F) and a 56 percent decrease in net stream accretion, groundwater discharging to surface waters (Row 18, Column H). Why is this reduction in net stream accretion considered a beneficially sustainable management practice? Shouldn't this decrease in groundwater discharging to streams be considered an undesirable result to interconnected surface waters and an impact to the Public Trust?

- Why is an increase in groundwater pumping of 57,000 afy (Row 11, Column G) that results in a decrease in net stream accretion of 90,000 afy (Row 18, Column G), a ratio of additional loss of stream flow to additional pumping of approximately 158% (Row 19, Column G) considered a beneficially sustainable management? Shouldn't a decrease in stream flows that's significantly greater than the increase in groundwater production that causes the flow loss be considered an undesirable result to interconnected surface waters and an impact to the Public Trust?

h) The Colusa GSP requires that before an unreasonable result can occur in the depletion of interconnected surface waters (ICSW), the MT for groundwater levels in 25% of the 12 ICSW representative monitoring wells must be continuously and simultaneously exceeded for 24 months (Table 5-1 p. 5-18, pdf 282). This requirement for continuous and simultaneous exceedance for ICSW wells raises the same problems as with the RMN groundwater level monitoring wells (see comments b and c above). This issue is also relevant to the issues raised by CDFW that: (1) the Colusa GSP doesn't provide sufficient information on the surface water flows associated with monitored groundwater levels, and (2) why the ICSW sustainability criteria will protect beneficial uses and users of surface water, and groundwater dependent ecosystems (GDEs) (see CDFW comment, pdf 669 to 681).

There is also another problem with the MT values for ICSW monitoring wells. While the MO values in 9 of the ICSW monitoring wells are nearly the same as for the MOs in the same 9 RMN shallow groundwater level monitoring wells, the MTs for all of ICSW monitoring wells are shallower than the MTs for the RMN groundwater monitoring wells even though they are at the same location. Nine of the 12 ICSW monitoring wells are also part of the 48 RMN groundwater level monitoring wells. The remaining 4 ICSW monitoring wells appear to be near the same location as RMN groundwater level wells as part of a nested cluster of monitoring wells based on the latitude and longitude listed in Table 4-2 (pages 4-7 to 4-10, pdf 237 to 240). AquAlliance Exhibit 1 lists the ICSW wells along with their MO and MT values and the difference in depth between the ICSW MOs and MTs in Column M. At the 2 ICSW wells the MO values are shallower than the MO for the RMN well (last 4 wells bottom of page 1 of AquAlliance Exhibit 1). For all 12 of the ICSW wells the MTs differ from the MTs in the RMN groundwater level wells. The fact that the some of the MOs and all the MTs at 12 ICSW groundwater level monitoring wells differ from the RMN groundwater level monitoring wells at the same location raises several questions.

- Why and how are the GSP management actions for preventing depletion of interconnected surface water different from the actions to prevent the chronic lowering of groundwater level when the measurement is taken at the same location in the same aquifer zone? For example, ICSW well 22N3W24E003 (CASGEM 25758; the last well in AquAlliance Exhibit 1) is screened between depths of 50 and 60 feet, and has an MO of 23 feet bgs and an MT of 36 feet bgs. The adjacent RMN well 22N3W24E002 (CASGEM 38667) is screened between depths of 130 and 180 feet, and has an MO of 55 feet bgs and an MT of 109 feet bgs. Both wells are monitoring the shallow aquifer zone, less than 200 feet deep.
    - Why are the MOs and MTs different for the same aquifer zone?
    - Is there an extensive hydrogeologic layer spanning the area of the wells' polygons that separates the shallow aquifers being monitored by these two wells?
    - When the groundwater levels fall below the MT depth of 36 feet, do the depletion rates of the interconnected surface waters and length of stream depleted become constant, so that the increase in depth to groundwater doesn't matter? In other words, does the stream become disconnect from groundwater? If yes, what field evidence will confirm this?
    - Doesn't the decline in groundwater level cause the loss of stream flow to increase to a maximum rather than a minimum and that loss then continues even after the stream becomes disconnected[8]?

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[8] See these articles about how the disconnection of streams with groundwater results in maximum stream flow losses that spread as the groundwater depression enlarges.

Brunner P., Cook P. G., and Simmons C. T., 2009, Hydrogeologic controls on disconnection between surface water and groundwater, Water Resources Research, v. 45, W01422, pgs 1-13
https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2008WR006953

Brunner P., Cook P.G. and Simmons C.T., 2011, Disconnected Surface Water and Groundwater: From Theory to Practice, Ground Water, v. 49, no. 4, pgs 460-467.
https://libra.unine.ch/Publications/Philip_Brunner/25762

Cook P.G., Brunner P., Simmons C.T., Lamontagne S., 2010, What is a Disconnected Stream?, Groundwater 2010, Canberra, October 31, 2010 – November 4, 2010, pgs 4.
https://www.researchgate.net/profile/Philip-Brunner/publication/266251504_What_is_a_Disconnected_Stream/links/54dfa2c80cf29666378b9e57/What-is-a-Disconnected-Stream.pdf

- Why shouldn't the disconnection of the stream caused by increased groundwater pumping be considered an impact to the Public Trust?
- What management actions need to be taken when groundwater levels fall below 36 feet bgs in this well, versus actions when levels fall below 109 feet bgs?
- Won't management actions taken to prevent depletion of interconnected surface water also prevent the chronic lowering of groundwater levels?
- Is having two sets of sustainability criteria for monitoring groundwater levels in the same aquifer zone at the same location a reasonable management practice, or will it just cause confusion about what and when actions need to be taken to protect all beneficial uses and users?

i) The water balance in the Colusa GSP under the 2070 Climate Change scenario management plan assumes a groundwater storage loss of 7,000 afy (AquAlliance Exhibit 8, Table 3-12, Row 17, Column F), or 350,000 af of groundwater storage loss in the next 50 years, Figure 3-49 (page 3-110, pdf 228). This loss is in addition to a storage loss from 1990 to 2015 of 700,000 afy, a 28,000 afy loss for 25 years (AquAlliance Exhibit 8, Row 17, Column B) and Figure 3-29 (p. 3-66, pdf 184). This results in a total loss in storage at the end of the 5-year simulation period of approximately 1 million acre-feet since 1990. The Colusa GPS also assumes that for all scenarios the total range in storage loss in the future 50 years will be 800,000 afy (p. 3-109, pdf 227). Although the 2070 Climate Change scenario storage loss of 7,000 afy is an improvement in storage loss over the Historical baseline by 20,000 afy (AquAlliance Exhibit 8, Row 17, Column G), it's still a continuation of the loss in storage with the negative impacts associated with declines in groundwater level.

In Section 3.2.3, Estimate of Groundwater Storage, the Colusa GPS estimates a storage capacity of 10.3 million acre-feet (maf) for the shallow aquifer zone, the upper 200 feet of subbasin aquifer system, using the 2006 Bulletin 118 subbasin area (lines 28 to 30, page 3-65, pdf 183). The Colusa GSP describes the subbasin (5-21.52) as having an area of 723,823 acres (page 2-1, pdf 75). In AquAlliance Exhibit 1, Column L shows the average of the shallow aquifer thickness between the MO depth and the MT depth at 81.5 feet, which is the shallow aquifer zone's *margin of operational flexibility* (MOF) in Table 5-2 (pp. 5-24 and 5-25, pdf 288 and 289). Using the subbasin area, the assumption that shallow aquifer storage occurs within the upper 200 feet of the aquifer, and the specific yield estimate of 7.1 percent (0.071) (lines 28 to 30, p. 3-65, pdf 183), an average saturated thickness of the upper unconfined shallow aquifer of 198 feet is calculated.

The ratio of the shallow aquifer 81.5 feet of MO-MT difference to the 198 feet of saturated thickness, 0.4116, multiplied by the 10,300,000 acre-feet of total groundwater storage results in a MO-MT storage volume of approximately 4,240,000 acre-feet. In other words, the Colusa GSP groundwater level sustainability criterion uses a *margin of operational flexibility* that allows for a total reduction in

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Fox G.A. and Durnford D.S., 2003, Unsaturated hyporheic zone flow in stream/aquifer conjunctive systems, Advances in Water Resources, v. 26, pgs. 989-1000.
http://www.geol.lsu.edu/blanford/NATORBF/5%20Modeling%20Papers%20of%20Groundwater%20Flow%20of%20Stream&Aquifer%20Systems/Fox%20et%20al_Water%20Resources_2003.PDF

the shallow aquifer zone groundwater storage of 4.2 million acre-feet before an undesirable result is triggered.[9] This volume of allowable decline in groundwater storage raises several questions:

- As discussed above in Comment "b", the proposed groundwater level sustainability criterion for 8 of the 48 RMN monitoring wells appears to prevent any declaration of an undesirable result regardless of how much groundwater levels decline. Therefore, can an undesirable result for reduction in groundwater storage be declared without a declaration of an undesirable result from the decline in groundwater levels?

- The MOF allows for a storage loss of approximately 4.2 million acre-feet before an undesirable result occurs. This volume is approximately 6 times the 700,000 afy historical storage loss that occurred from 1990 to the start of SGMA (January 2015), 12 times the anticipated additional 350,000 af of groundwater storage loss in the 50 years after 2015, and 5 times the maximum 800,000 afy anticipated fluctuation in groundwater storage during the 50-year period after 2015. How may the minimum threshold sustainable criteria possibly be considered a beneficially sustainable management practice when they create a margin of operational flexibility with a volume that allows a loss in groundwater storage 6 times the historical loss and up to 12 times the anticipated future loss?

- The 4.2 million acre-feet volume of the margin of operational flexibility and the requirement that in a group of 25% of the RMN groundwater level wells each well must exceed the MT depth simultaneously and continuously for 24 months before an undesirable result is triggered suggests that an average loss in storage of 1 million acre-feet or greater can occur in 25% of the subbasin before an undesirable result in lowered groundwater levels occurs. This would be a volume of storage loss equivalent to the total estimated loss from 1990 to 2070. Why is a localized groundwater storage loss of this magnitude considered a beneficially sustainable management practice?

- To calculate the MOF storage loss more accurately in the shallow aquifer zone, information is needed on the area of each polygon in the shallow aquifer zone associated with each of the 21 shallow wells, along with the specifics on which 12 of the 48 RMN wells are being grouped together. Specific information on the polygon areas around the monitoring wells and the wells within each group is lacking in the Colusa GSP.

j) An assessment of how the Colusa GSP maintains sustainability and prevents impacts to all groundwater beneficial uses and users during periods of extended below normal water years can be made by evaluating the average difference between the MO and MT depths (MO-MT) and the amount of groundwater stored therein. The sustainability of the subbasin can be measured by dividing estimated total MO-MT storage volume, or MOF, by the annual average change in storage in Table 3-12, AquAlliance Exhibit 8 (Row 17). If management of the subbasin continues under the 2000-2018 Historical condition, -28,000 afy loss in storage (Row 17, Column B), it would take approximately 150 years to deplete the 4,240,000 af in the MOF. For the future 2070 Climate Change scenario at a -7,000 afy (Row 17, Column F), it would take approximately 600 years to deplete the

[9] If shallow and intermediate monitoring wells in Table 5-2 are included the MO-MT difference, the thickness is greater, 85 feet, and if all wells are included the MO-MT, the difference is 90 feet. Both increase the volume of the margin of operational flexibility.

total MOF volume. The number of years that it would take to deplete the MOF suggests that the **MT depths are too deep to be a valid threshold for sustainability** and protective of all beneficial uses and users, but are intended to protect only the largest groundwater users with the deepest wells.

k) An alternative assessment of how effective the *margin of operational flexibility* is at achieving sustainability would be to divide the MOF storage volume by the modeled annual rate of storage loss during extended periods of below normal water years, i.e., droughts. The Colusa GSP Figure 3-49 (page 3-110, pdf 228) shows the estimated cumulative change in storage for different scenarios. These drought rates of storage loss range from -90,000 afy to -168,000 afy with an average of -134,500 afy (AquAlliance Exhibit 10). For the maximum rate of drought storage loss of -168,000 afy under the future 2070 Climate Change scenario, depletion of the MOF volume would take from approximately 25 years of continuous loss (e.g., 4,240,000 af / 168,000 afy = 25.29 yrs). For the minimum rate of storage loss of -90,000 afy, total depletion of the MOF would take approximately 47 years. Using the estimated MOF storage volume for the saturated 198 feet of shallow aquifer (see Comment No. 9), an average volume of groundwater produced from a one-foot decline in groundwater level is approximately 52,000 acre-feet per foot (af/f) (10,300,00 af / 198 ft = 52,020 af/f). The extensive time needed to deplete the Colusa GSP MOF storage volume before an undesirable result can occur raises several questions:

- Why is the MOF storage volume set so that even at the maximum rate of annual storage loss estimated for droughts it would take 25 continuous years of groundwater decline before groundwater levels would exceed the MTs and an undesirable result would be triggered?
- Doesn't the fact that it takes 25 continuous years of groundwater decline at the maximum drought rate to exceed the MTs make the standard for 24 months of continuous MT exceedance a meaningless threshold? That is, an undesirable result would only occur after years 27 continuous years of drought, not 2 years.
- Why is the requirement that 25 continuous years of groundwater decline at the maximum drought rate considered a sustainable management practice that protects all beneficial uses and users as required by SGMA?

l) The sustainable management of groundwater as envisioned by SGMA likely requires that a temporary groundwater storage surplus be maintained to meet the needs of users during droughts and to protect the beneficial uses of streams, wildlife, and groundwater dependent ecosystem (WAT § 10721(w)). That is, subbasin management actions should provide for storing sufficient groundwater needed to counter the losses from a drought to protect and minimize drought impacts to all beneficial uses and users.

If that is the goal of SGMA, shouldn't the depth of the MTs be set at a depth caused by declining groundwater levels for a reasonable number of continuous years of drought after adjusting for the temporary storage surplus created during normal, above normal, and wet years? Shouldn't a GSP use a method based on anticipated loss during a drought, rather than the arbitrary method of the Colusa GSP that set the depths far below the historical maximum, which then results in several decades of continuous groundwater level declines and storage losses before an undesirable result is declared?

As an example of a drought-based methodology, AquAlliance Exhibit 10 shows the annual loss in groundwater storage that during the most recent simulated periods of drought lasting more than 3 years having an average annual loss of 134,500 afy. Using this average rate of annual drought storage loss for 3 years, the decline in groundwater level would be of approximately 8 feet ((3 yrs x 134,500 afy) / 52,000 af/f = 7.8 feet). Note, see Comment No. 9 for calculation of the 52,000 af/f storage volume per foot of groundwater level decline. This suggests that the depth of the MTs could be set at 10 feet or less below the MO depth to accommodate future periods of extended drought without causing undesirable impacts to all beneficial uses and users, in particular wells of domestic and small agricultural groundwater users. It should be remembered that declaration of an undesirable result would occur only after groundwater levels decline below the MT depth. This would allow a drought of 5 years under the Colusa GSP 24-month requirement before an undesirable result would be declared with possibly an additional 5 feet of groundwater decline and 104,000 af of storage loss. Perhaps because of the 24-month MT exceedance requirements, the MT depths should be set to allow only 1 year of drought storage loss with the assumption that an additional 2 years of drought can occur before an undesirable result is declared. This would make the sustainability management of the Colusa Subbasin groundwater levels consistent with the Historical baseline.

m) The surface water balance in the Colusa GSP assumes the 2070 Climate Change scenario will result in an increase in surface water inflows to the subbasin over the Historical baseline of 968,000 afy, and an increase in precipitation over the baseline of 48,000 afy (AquAlliance Exhibit 9, Rows 1 and 6, Column G). The sum of the Historical baseline inflow from other boundary streams is 78,000 afy (Row 5, Column B), and the sum of the outflow from other boundary streams is 56,000 afy (Row 33, Column B), a net gain of 22,000 afy for the subbasin. With the 2070 Climate Change scenario the inflow from other boundary streams is 92,000 afy (Row 5, Column F), and the outflow from other boundary streams is 10,000 afy (Row 33, Column F), a net gain of 82,000 afy for the subbasin. The future changes in the inflow and outflow volumes of surface water from other boundary streams to the Colusa Subbasin raise several questions:

- How will the surface water and groundwater budgets change should the expected increases in surface water and precipitation inflows and decreases in outflows to boundary streams not occur?

- What management actions need to be taken should the expected increases in surface water and precipitation inflows and decreases in outflows to boundary streams not occur?

- What stations and sustainability thresholds are in the Colusa GSP monitoring network that allow for measurements that identify when the surface water flows aren't meeting the water budget assumptions and should that then trigger undesirable result(s) and management action(s)?

- Why does the surface water budget assume that 48,000 afy of additional precipitation will result in a groundwater budget loss of 18,000 afy in deep percolation recharge from precipitation (AquAlliance Exhibit 8, Row 3, Column G)?

- Why is a decrease in surface water inflow to other boundary streams of 46,000 afy, or 82%, (-46,000 afy / 56,000 afy = -0.82 = -82%) (Row 33, Column G and H) not considered an impact to interconnected surface waters, and to the adjacent subbasin(s)?

- What management practices in the Colusa subbasin are causing the additional losses of surface water to other boundary streams, and can management actions remedy these losses to streams outside of the subbasin?

- What monitoring stations exist in the Colusa GSP monitoring network that provide measurements that identify the surface water inflows and outflows on the other boundary streams?

n) The groundwater balance in the Colusa GSP assumes that groundwater sustainability of the subbasin will be achieved in part because 86,000 afy of additional Central Valley Project (CVP) surface water will be available for In-Lieu Recharge projects, and that a funding plan will be developed and implemented that incentivizes the use of CVP water instead of pumping groundwater. The In-Lieu Recharge projects are approximately 15 percent of the 559,000 afy planned groundwater pumping with the 2070 Climate Change scenario (AquAlliance Exhibit 8, Row 11, Column F). The In-Lieu Recharge raises several questions:

- Why does the 2070 Climate Change groundwater budget expect a reduction in deep percolation of applied surface water by 38,000 afy from the Historical baseline (AquAlliance Exhibit 8, Row 4, Column G)? This seems to contradict the purpose of the In-Lieu Recharge projects.

- Will the application of 86,000 afy of In-Lieu surface water change other components of the groundwater budget? If yes, which ones and by how much?

- How much will the In-Lieu Recharge increase the average annual groundwater storage, and will it reduce the expected 350,000 acre-feet of storage loss over the next 50 years?

- Will In-Lieu Recharge reduce the expected increase in loss of surface water from stream seepage, and decrease stream gains from accretion? If yes, where and by how much?

o) The Colusa GSP fails to analyze, monitor, or consider the potential impacts to water quality caused by the allowable changes in groundwater levels and groundwater storage, except for one constituent, salinity. Although the Colusa GSP calls for coordination in management of water quality with other governmental agencies, the plan doesn't indicate what the MOs or MTs are for all the potential contaminants of concern in the Colusa subbasin, or what GSP management actions will be taken whenever a water quality impact is identified.

What is the role of the GSAs in protecting water quality for all beneficial uses and users? In particular, the protection of domestic water supply must be the primary concern for managing the subbasin. SGMA empowers the GSAs with the authority to control pumping rates and locations throughout the subbasin to protect all beneficial uses and users, an authority that other regulatory agencies don't possess. The Colusa GSP should provide a concise description of projects and management actions the GSAs will take to prevent degradation of the subbasin water quality for all potential contaminants and how the GSAs will remedy any degradation that occurs.

p) The Colusa GSP sets the MO and MT rates for inelastic subsidence at 0.25 feet per 5 years, and 0.50 feet per 5 years, respectively, Table 5-1 and Sections 5.4.5.1 and 5.4.5.2 (pp. 5-18, 5-28 and 5-29, pdf pages 282, 292 and 293). The current conditions in the subbasin appear to be exceeding these values. The latest October 2020 to October 2021 InSAR measurements of vertical displacement, or subsidence, in the Sacramento Valley measured declines in land surface elevation around Arbuckle and Artois (AquAlliance Exhibits 11 and 12).

The InSAR vertical displacement for one year in the Arbuckle vicinity ranged from -0.2 feet to -0.8 feet in one year, and around Artois, -0.1 feet to -0.4 feet in one year. This subsidence exceeds the annual average for the MT of -0.50 feet in 5 years (i.e., -0.1 feet in one year). This subsidence covers a relatively large area, but doesn't span an area covered by a minimum of 20% of the subsidence benchmarks, 13 of the 63 benchmarks, as required by the subsidence MT criterion, Table 5-1 (p. 5-18, pdf 282) - an area of approximately 144,765 acres or 20% of the 723,823-acre subbasin. Much of the remaining subbasin area is experiencing vertical displacement ranging from -0.1 to +0.1 feet (the gray areas). If these areas of vertical displacement are negative, then the area of subsidence is likely large enough to trigger an undesirable result. If the negative vertical displacement is less than -0.1 feet, then under the Colusa GSP sustainability criteria these centers of subsidence must grow significantly before an undesirable result occurs and actions need to be taken to prevent subsidence. The fact that the subsidence is centered around two urban areas is apparently of no concern to the Groundwater Sustainability Agencies.

The Colusa GSP needs to provide additional information and reasoning for: (1) why the existing subsidence isn't considered an undesirable result; (2) why the -0.1 feet per year of InSAR vertical displacement shouldn't be considered undesirable; (3) why 20% of the subbasin needs to be in significant subsidence before management actions need to be taken; (4) why subsidence impacts need to be averaged over 5 years when other MT are based on 2 years (24 months); (5) what critical infrastructure has already been harmed by the current areas of subsidence; (6) what amount of additional land subsidence will cause harm to other critical infrastructures; and (7) why the MT for land subsidence doesn't take into account the amount of differential settlement that critical infrastructures and domestic structures in the subbasin can tolerate.

q) The Colusa GSP sets the MO and MT for land subsidence without providing a current assessment of the sensitivity of local infrastructures to subsidence. The plan notes that *land subsidence can cause structural damage to wells, foundations, roads, bridges, and other infrastructure, as well as impacting surface water flows by reducing conveyance capacity and potentially changing flow gradients within canals, natural streams, and floodplains,* Section 3.2.6 (p. 3-73, pdf 191). In the discussion of the reasoning for the MT for land subsidence of 0.5 feet per 5 years, the plan states …. *the sensitivity of local infrastructure to land subsidence is not well understood at this time, the Subbasin has extensive networks of pipelines and open canals and drains owned by various surface water suppliers that are used to convey irrigation and drain water. These networks are likely the existing infrastructure most sensitive to land subsidence,* Section 5.4.5.1 (page 5-28 and 5-29, pdf 292 and 293). The plan proposes a future cooperative study to fill this data gap, Table 7-1 (page 7-4, pdf 400). However, the plan doesn't list an infrastructure subsidence sensitivity study as a Project and Management Action, Table 6-2 (pp. 6-7 to 6-12, pdf 307 to 312). The timeline for this infrastructure sensitivity study is apparently sometime between 2024 and 2042 (see GPS Studies in Figure 7-2, p. 7-22, pdf 418). The Colusa Subbasin GSAs aren't committed to leading or funding an infrastructure sensitivity study. Instead, the plan assumes that any infrastructure subsidence sensitivity study would be … *grant-funded, though local funding sources could also be used*, Section 7.1.2.15 (pp. 7-15 and 7-16, pdf 411 and 412).

The Colusa GSP assumes that the plan will manage … *groundwater conditions in the Subbasin to avoid exceedance of the rate of inelastic subsidence established by the minimum threshold is considered unlikely to cause a significant and unreasonable reduction in the viability of the use of critical infrastructure over the planning and implementation horizon of this GSP,* Section 5.4.5.1 (pp. 5-28 and 5-29, pdf 292 and 293). This assumption is made even though the MTs for the lowering of groundwater levels allow water levels to decline significantly below the historical depths and allow for a loss in groundwater storage that exceeds 4.2 million acre-feet, which is over 10 times the groundwater model estimated future storage loss of 350,000 af over 50 years (see comment 'i' above.

The Colusa GSP needs to provide additional information and reasoning for: (1) why the sustainability criteria for the lowering of groundwater levels that allows 4.2 million acre-feet of groundwater storage loss won't contribute to unreasonable amounts of inelastic land subsidence; (2) why the Colusa GSAs aren't taking the lead in identifying sensitive infrastructure in the subbasin, and (3) what management actions will be taken to remedy the damage to subbasin infrastructure from subsidence.

r) The Colusa GSP doesn't provide a requirement for the frequency of monitoring subsidence benchmarks or monitoring critical infrastructure, but instead leaves the responsibility of subsidence monitoring and analysis to DWR, the Sacramento Valley Subsidence Interbasin Working Group, and federal partners. The Colusa GSP expects … *that data collection needs identified by the interbasin working group would be grant-funded and implemented by state and federal agencies, such as DWR or USGS. If projects are identified to address or mitigate inelastic land subsidence, they would be led and implemented by local entities such as the counties, agricultural water districts and agencies, municipalities, and other public water suppliers using a variety of funding sources*, Section 7.1.2.14 (page 7-15, pdf 411).

The Colusa GSP needs to provide additional information and reasoning for: (1) why the GSAs are abstaining from conducting and/or funding the subsidence monitoring required by SGMA and instead assume that this is the responsibility of other agencies; (2) what happens when the other agencies don't accept the task or don't monitor subsidence as frequently as required by SGMA and the GSP; (3) what happens if the other local, state or federal agencies don't have the sources of funding necessary to mitigate the effects of inelastic land subsidence caused by groundwater production in the Colusa Subbasin; and (4) what are the procedures the GSAs will use for assigning the costs for subsidence mitigations to groundwater producers in the Colusa GSP should the assumed funding by others not materialize; (5) why didn't the GSP expose the sinkholes that were reported just east of Orland in the summer of 2021; (6) will individuals be placed in the position to prove that implementation of the GSP caused subsidence?

Conclusion

For all the reasons discussed in our comments on the Colusa Subbasin draft, final and Revised GSP, the Plan fails to meet SGMA's goal of water resource sustainability and protection of the water rights of all beneficial users and uses. In accordance with legal requirements to protect the Public Trust, the Plan also fails. It also appears that the GSP will foist the responsibility to demonstrate damage from undesirable results on the unsuspecting public, creating an impossible burden for all but the large water districts with deep pockets. Therefore, the Plan must be rejected by DWR and the SWRB.

Respectfully submitted,

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