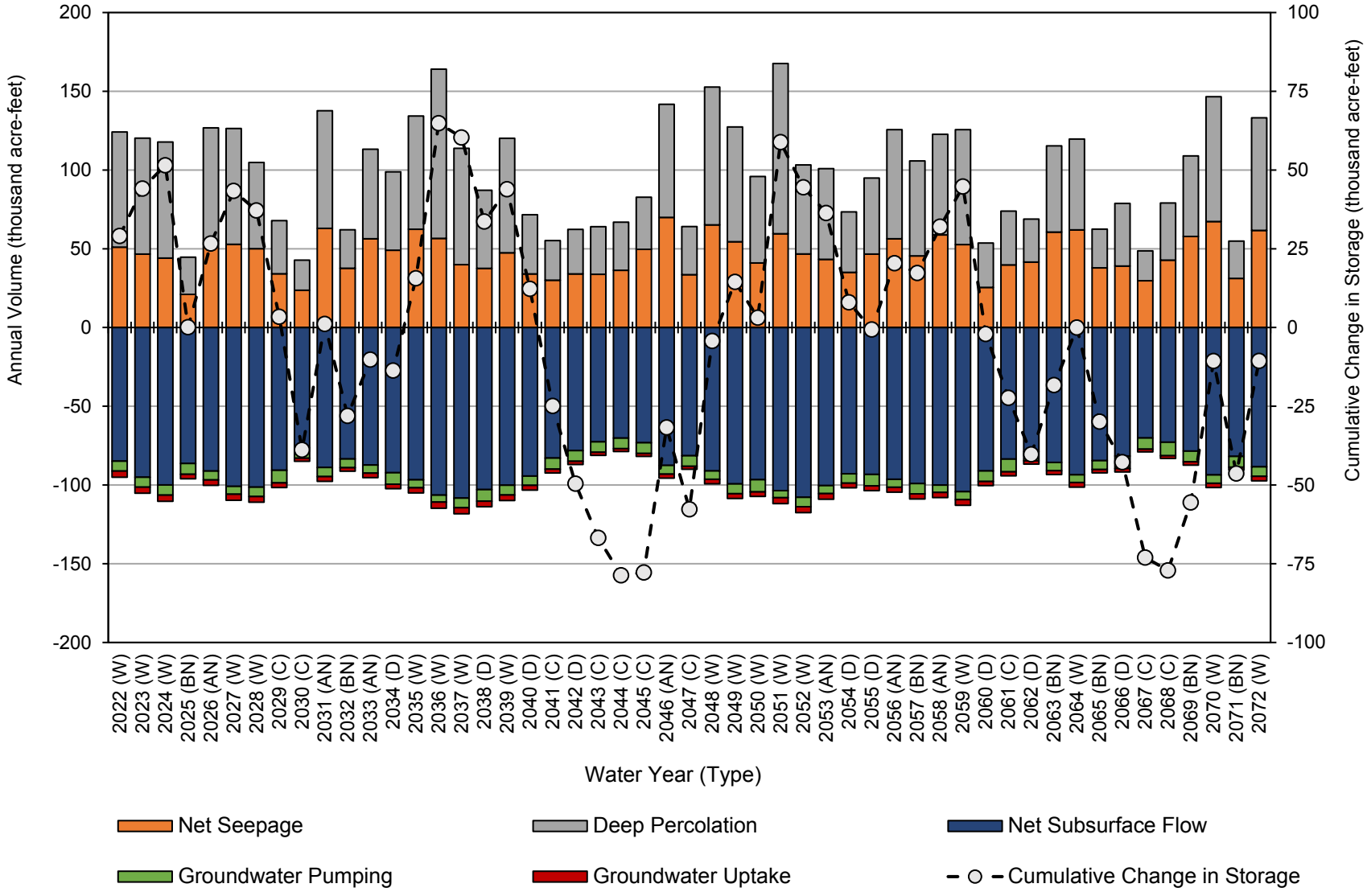

Figure 2-65 Bowman Subbasin Projected (Current Land Use) Water Budget Summary

Table 2-26. Bowman Subbasin Projected (Current Land Use) Water Budget Summary (acre-feet)

WATER YEAR (TYPE)	NET SEEPAGE	DEEP PERCOLATION	NET SUBSURFACE FLOWS	GROUND-WATER PUMPING	GROUND-WATER UPTAKE	ANNUAL GROUNDWATER STORAGE CHANGE	CUMULATIVE GROUNDWATER STORAGE CHANGE
2022 (W)	51,000	73,000	-85,000	-6,400	-3,900	29,000	29,000
2023 (W)	47,000	74,000	-95,000	-6,300	-3,800	15,000	44,000
2024 (W)	44,000	74,000	-100,000	-6,500	-4,000	7,400	52,000
2025 (BN)	21,000	24,000	-86,000	-6,900	-2,900	-51,000	100
2026 (AN)	55,000	72,000	-91,000	-5,600	-3,500	27,000	27,000
2027 (W)	53,000	74,000	-100,000	-5,100	-3,800	17,000	43,000
2028 (W)	50,000	55,000	-100,000	-5,900	-3,700	-6,200	37,000
2029 (C)	34,000	34,000	-91,000	-8,000	-3,000	-34,000	3,400
2030 (C)	24,000	19,000	-76,000	-6,700	-2,000	-42,000	-39,000
2031 (AN)	63,000	75,000	-89,000	-5,800	-3,000	40,000	1,100
2032 (BN)	38,000	24,000	-83,000	-5,600	-2,200	-29,000	-28,000
2033 (AN)	56,000	57,000	-87,000	-5,100	-2,900	18,000	-10,000
2034 (D)	49,000	50,000	-92,000	-7,300	-2,800	-3,500	-14,000
2035 (W)	62,000	72,000	-97,000	-5,100	-3,200	29,000	16,000
2036 (W)	57,000	110,000	-110,000	-4,500	-3,900	49,000	65,000
2037 (W)	40,000	74,000	-110,000	-6,200	-3,900	-4,500	60,000
2038 (D)	38,000	50,000	-100,000	-7,400	-3,500	-27,000	34,000
2039 (W)	47,000	73,000	-100,000	-6,200	-3,500	10,000	44,000
2040 (D)	34,000	38,000	-94,000	-5,800	-3,000	-32,000	12,000
2041 (C)	30,000	25,000	-83,000	-7,100	-2,500	-37,000	-25,000
2042 (D)	34,000	28,000	-78,000	-6,800	-2,100	-25,000	-50,000
2043 (C)	34,000	30,000	-73,000	-6,700	-1,900	-17,000	-67,000
2044 (C)	36,000	31,000	-70,000	-6,700	-1,800	-12,000	-79,000
2045 (C)	50,000	33,000	-73,000	-6,800	-1,800	910	-78,000
2046 (AN)	70,000	72,000	-88,000	-5,600	-2,500	46,000	-32,000
2047 (C)	34,000	31,000	-81,000	-6,700	-1,900	-26,000	-58,000
2048 (W)	65,000	88,000	-91,000	-5,300	-2,900	53,000	-4,300
2049 (W)	54,000	73,000	-99,000	-6,200	-3,000	19,000	15,000
2050 (W)	41,000	55,000	-97,000	-7,800	-2,900	-11,000	3,100
2051 (W)	60,000	110,000	-100,000	-4,500	-3,800	56,000	59,000
2052 (W)	47,000	57,000	-110,000	-6,000	-3,800	-14,000	45,000
2053 (AN)	43,000	58,000	-100,000	-5,100	-3,600	-8,200	36,000
2054 (D)	35,000	38,000	-93,000	-5,900	-2,900	-28,000	8,000
2055 (D)	47,000	48,000	-93,000	-7,300	-3,000	-8,600	-630
2056 (AN)	56,000	69,000	-96,000	-5,100	-3,100	21,000	20,000
2057 (BN)	45,000	60,000	-99,000	-6,500	-3,300	-3,100	17,000
2058 (AN)	59,000	64,000	-100,000	-4,700	-3,200	15,000	32,000

WATER YEAR (TYPE)		NET SEEPAGE	DEEP PERCOLATION	NET SUBSURFACE FLOWS	GROUND-WATER PUMPING	GROUND-WATER UPTAKE	ANNUAL GROUNDWATER STORAGE CHANGE	CUMULATIVE GROUNDWATER STORAGE CHANGE
2059 (W)		53,000	73,000	-100,000	-5,100	-3,600	13,000	45,000
2060 (D)		25,000	28,000	-91,000	-6,700	-2,700	-47,000	-2,000
2061 (C)		40,000	34,000	-84,000	-8,100	-2,500	-20,000	-22,000
2062 (D)		42,000	27,000	-79,000	-6,000	-2,100	-18,000	-40,000
2063 (BN)		61,000	55,000	-86,000	-5,200	-2,500	22,000	-18,000
2064 (W)		62,000	58,000	-94,000	-4,900	-2,900	18,000	-19
2065 (BN)		38,000	25,000	-85,000	-5,600	-2,100	-30,000	-30,000
2066 (D)		39,000	40,000	-82,000	-7,900	-2,200	-13,000	-43,000
2067 (C)		30,000	19,000	-70,000	-7,100	-1,700	-30,000	-73,000
2068 (C)		43,000	36,000	-73,000	-8,600	-1,700	-4,100	-77,000
2069 (BN)		58,000	51,000	-79,000	-6,700	-2,100	22,000	-56,000
2070 (W)		67,000	79,000	-94,000	-5,300	-2,700	45,000	-11,000
2071 (BN)		31,000	24,000	-82,000	-6,900	-1,900	-36,000	-46,000
2072 (W)		62,000	72,000	-88,000	-6,100	-2,800	36,000	-11,000
Average (2022-2072)		46,000	53,000	-90,000	-6,200	-2,900	-210	
2022-2072	W	53,000	74,000	-98,000	-5,700	-3,500	20,000	29,000
	AN	57,000	67,000	-93,000	-5,300	-3,100	23,000	11,000
	BN	42,000	38,000	-86,000	-6,200	-2,400	-15,000	-23,000
	D	38,000	39,000	-89,000	-6,800	-2,700	-22,000	-11,000
	C	35,000	29,000	-77,000	-7,200	-2,100	-22,000	-51,000

2.3.8 Projected (Future Land Use) Water Budget Summary

This section presents the results of the Projected (Future Land Use) scenario. The Future Land Use scenario assumes a static (held constant over the entire projected period) land use condition reflecting an anticipated future development or land use condition that is expected to exist at the end of the 50-year GSP planning horizon. The future land use condition was developed through discussion with local stakeholders and consultation with the Tehama County Planning Department. The future land use condition includes an increase in urban area reflective of the recent rate of urban increase experienced for the County.

Land use areas are used to distinguish the water use sector in which water is consumed, as required by the GSP Regulations. **Figure 2-66** and **Table 2-27** summarize the land use areas over the projected (future land use) period (2022-2072) in the Bowman Subbasin by water use sector, as defined by the GSP Regulations (23 CCR § 351(al)). In the Bowman Subbasin, water use sectors include agricultural, urban, and native vegetation land uses. The urban water use sector covers all urban, residential, industrial, and semi-agricultural[7] land uses. Agricultural, urban, and native vegetation land uses covered approximately 6,060 acres, 2,200 acres, and 114,400 acres, respectively, between 2022 and 2072.

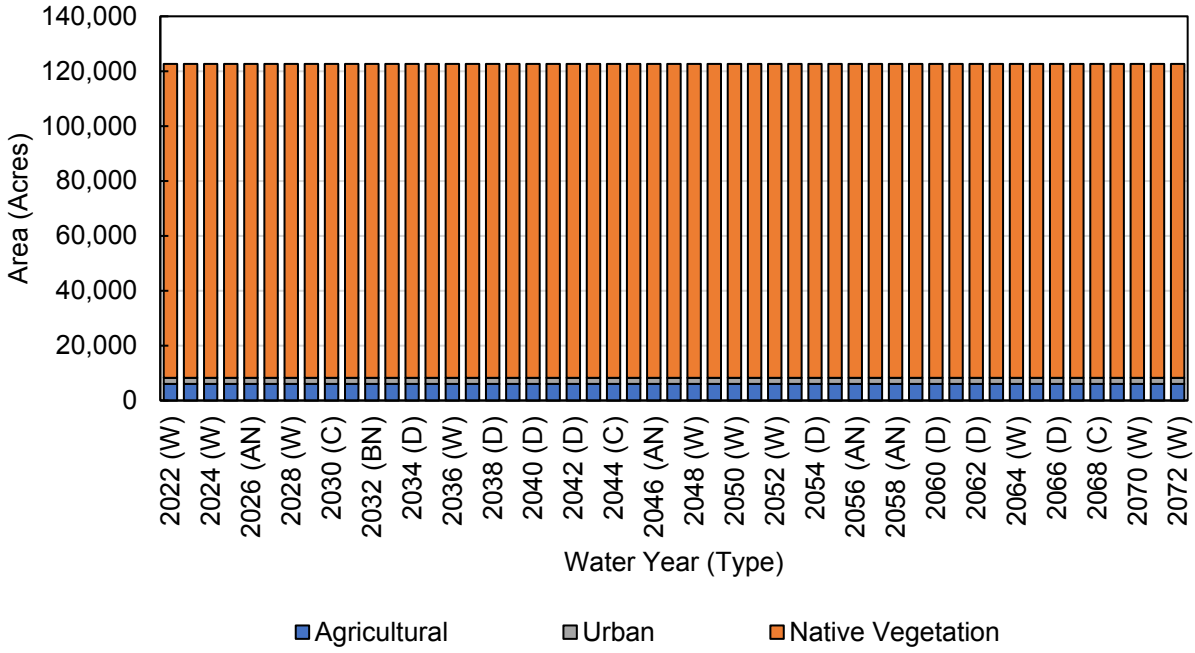

Figure 2-66. Bowman Subbasin Future Land Use Areas, by Water Use Sector

[7] As defined in the DWR crop mapping metadata, semi-agricultural land use subclasses include farmsteads, livestock feed lot operations, dairies, poultry farms, and miscellaneous semi-agricultural land use incidental to agriculture (small roads, ditches, non-planted areas of cropped fields (DWR, 2016b).

Table 2-27. Bowman Subbasin Future Land Use Areas, by Water Use Sector (acres)

PROJECTED PERIOD (FUTURE LAND USE)	AGRICULTURAL	URBAN[1]	NATIVE VEGETATION	TOTAL
2022 -2072	6,060	2,200	114,400	122,660

[1] Area includes land classified as urban, residential, industrial, and semi-agricultural.

Agricultural land uses are further detailed in **Figure 2-67** and **Table 2-28**. In the future, a majority of the agricultural area in the Bowman Subbasin is projected to consist of pasture and grain. Irrigated agricultural areas within the Bowman Subbasin are projected to remain relatively constant at these acreages during the entire projected period.

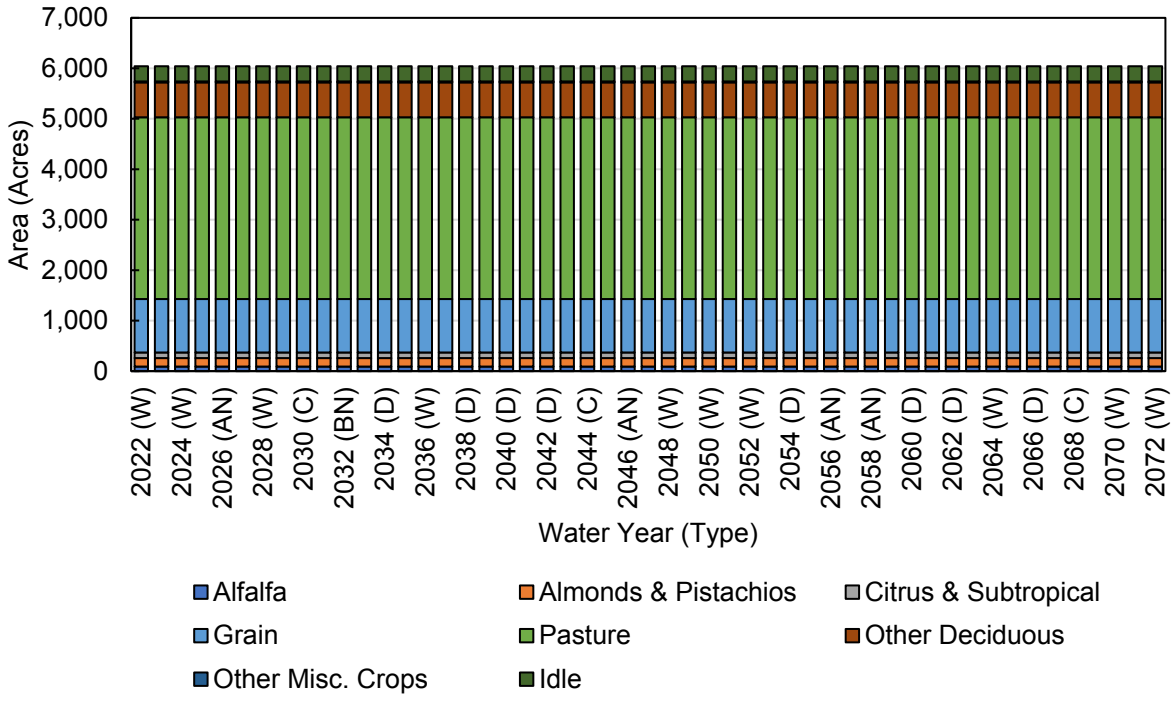

Figure 2-67. Bowman Subbasin Projected Agricultural Land Use Areas

Table 2-28. Bowman Subbasin Projected Agricultural Land Use Areas (acres)

PROJECTED PERIOD (FUTURE LAND USE)	ALFALFA	ALMONDS & PISTACHIOS	CITRUS & SUB-TROPICAL	GRAIN	PASTURE	PONDED (RICE, REFUGE)	OTHER DECIDUOUS	OTHER MISC. CROPS	IDLE	TOTAL
2022 - 2072	90	170	110	1,060	3,600	20	690	20	300	6,060

2.3.9.1 Projected (Future Land Use) Surface Water System Water Budget Summary

Annual inflows, outflows, and change in SWS root zone storage during the projected (future land use) water budget period (2022-2072) are summarized in **Figure 2-68** and **Table 2-29**. Inflows in **Figure 2-68** are shown as positive values, while outflows are shown as negative values. Review of the variability in component volumes across years provides insight into the impacts of hydrology on the SWS water budget.

Of particular note in the projected (future land use) SWS water budget results is the volume of precipitation that makes up the largest part of the Subbasin SWS inflows averaging about 300 taf per year over the projected period. By comparison, other SWS inflows in the Subbasin are relatively smaller. Surface water inflows average about 83 taf per year. Groundwater extraction and uptake represents a relatively small SWS inflow averaging about 9.2 taf per year, and groundwater discharge to surface water is negligible over the projected (current land use) water budget period.

Among the outflows from the Subbasin SWS, ET of precipitation makes up a large fraction of the total Subbasin SWS outflows averaging about 160 taf per year over the projected (future land use) period. The surface water outflows total about 120 taf per year on average, a value that corresponds with the large volumes of precipitation and surface water inflow (a total of about 380 taf per year). By comparison, other SWS outflows in the Subbasin are relatively smaller, with values for infiltration (seepage) of surface water and deep percolation of precipitation totaling about 48 taf and 43 taf per year on average, respectively. ET of applied water, and deep percolation of applied water are about 11 and 7.3 taf per year on average, respectively. The outflows of ET of groundwater uptake and evaporation from surface water average about 2.8 and 0.85 taf per year, respectively.

Detailed results for the projected (current land use) SWS water budget are presented in **Appendix 2-K**.

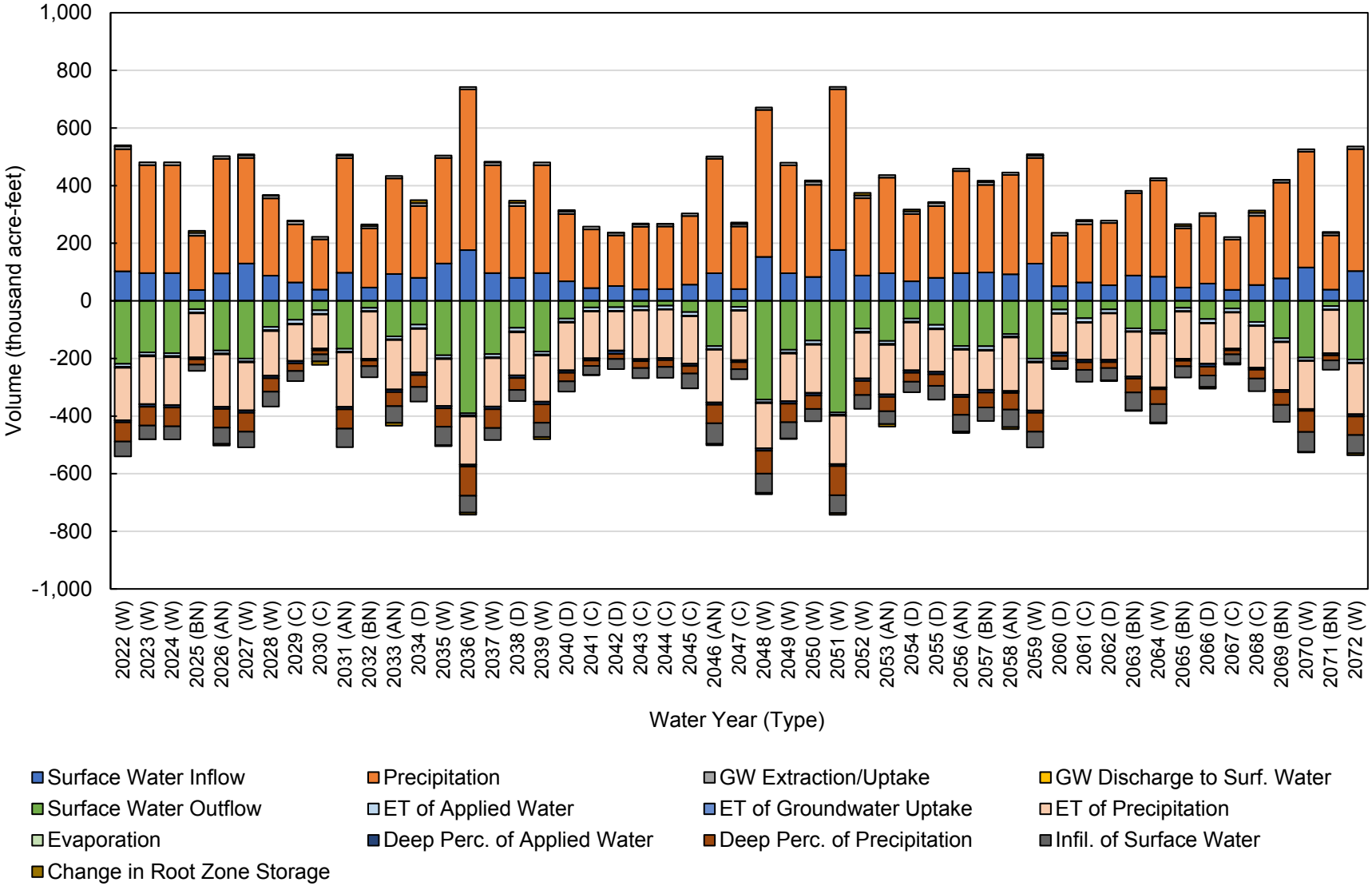

Figure 2-68. Bowman Subbasin Surface Water System Projected (Future Land Use) Water Budget, 2022-2072

Table 2-29. Bowman Subbasin Surface Water System Projected (Future Land Use) Water Budget, 2022-2072 (acre-feet)

WATER YEAR (TYPE)	INFLOWS				OUTFLOWS								
	SURFACE WATER INFLOW	PRECIPI-TATION	GROUND-WATER EXTRACTION / UPTAKE	GROUND-WATER DISCHARGE	SURFACE WATER OUTFLOW	ET OF APPLIED WATER	ET OF GROUND-WATER UPTAKE	ET OF PRECIPI-TATION	EVAPO-RATION[1]	DEEP PERC. OF APPLIED WATER	DEEP PERC. OF PRECIPI-TATION	INFIL. OF SURFACE WATER	CHANGE IN ROOT ZONE STORAGE
2022 (W)	100,000	420,000	10,000	0	220,000	10,000	3,800	180,000	740	6,600	66,000	52,000	-3,400
2023 (W)	96,000	370,000	10,000	0	180,000	10,000	3,800	170,000	810	8,300	65,000	48,000	640
2024 (W)	96,000	370,000	11,000	0	180,000	10,000	3,900	170,000	810	8,300	65,000	45,000	0
2025 (BN)	38,000	190,000	9,900	0	29,000	12,000	2,800	150,000	810	5,800	18,000	22,000	-7,300
2026 (AN)	96,000	400,000	9,200	0	170,000	10,000	3,400	180,000	860	7,100	65,000	56,000	5,800
2027 (W)	130,000	370,000	9,000	0	200,000	9,800	3,700	170,000	790	7,600	66,000	54,000	-3,500
2028 (W)	87,000	270,000	9,700	0	91,000	11,000	3,600	160,000	950	7,700	47,000	51,000	-1,700
2029 (C)	64,000	200,000	11,000	0	66,000	13,000	2,900	130,000	1,000	7,800	26,000	35,000	-2,200
2030 (C)	39,000	170,000	8,800	0	33,000	13,000	1,900	120,000	840	5,200	14,000	25,000	12,000
2031 (AN)	98,000	400,000	8,900	0	170,000	9,900	2,900	190,000	860	7,800	67,000	65,000	-4,200
2032 (BN)	46,000	200,000	8,000	0	25,000	11,000	2,100	160,000	820	5,200	19,000	39,000	-6,400
2033 (AN)	93,000	330,000	8,200	0	120,000	10,000	2,800	170,000	850	8,000	49,000	58,000	9,900
2034 (D)	80,000	250,000	10,000	0	83,000	12,000	2,700	150,000	960	8,300	41,000	51,000	-10,000
2035 (W)	130,000	370,000	8,400	0	190,000	10,000	3,200	160,000	790	7,500	64,000	64,000	3,200
2036 (W)	180,000	560,000	8,500	0	390,000	7,200	3,800	170,000	650	6,400	100,000	59,000	7,300
2037 (W)	96,000	370,000	10,000	0	190,000	10,000	3,800	170,000	810	8,300	65,000	42,000	-2,300
2038 (D)	80,000	250,000	11,000	0	94,000	12,000	3,400	150,000	970	8,500	41,000	39,000	-8,200
2039 (W)	97,000	370,000	9,700	0	180,000	11,000	3,400	160,000	810	8,500	64,000	49,000	8,200
2040 (D)	68,000	230,000	8,900	0	62,000	11,000	2,900	170,000	900	7,400	30,000	35,000	-4,600
2041 (C)	44,000	200,000	9,600	0	23,000	12,000	2,400	160,000	920	6,400	19,000	31,000	540

WATER YEAR (TYPE)	INFLOWS				OUTFLOWS								
	SURFACE WATER INFLOW	PRECIPI-TATION	GROUND-WATER EXTRACTION / UPTAKE	GROUND-WATER DISCHARGE	SURFACE WATER OUTFLOW	ET OF APPLIED WATER	ET OF GROUND-WATER UPTAKE	ET OF PRECIPI-TATION	EVAPO-RATION[1]	DEEP PERC. OF APPLIED WATER	DEEP PERC. OF PRECIPI-TATION	INFIL. OF SURFACE WATER	CHANGE IN ROOT ZONE STORAGE
2042 (D)	52,000	180,000	9,00 0	0	22,000	13,000	2,000	140,000	960	11,000	18,000	35,000	-500
2043 (C)	40,000	220,000	8,800	0	20,000	12,000	1,900	170,000	840	6,300	24,000	35,000	-2,200
2044 (C)	41,000	220,000	8,700	0	17,000	12,000	1,800	170,000	840	6,700	24,000	37,000	-20
2045 (C)	56,000	240,000	8,800	0	39,000	13,000	1,800	170,000	880	6,700	26,000	51,000	260
2046 (AN)	96,000	400,000	8,300	0	160,000	10,000	2,500	180,000	860	7,200	64,000	72,000	4,900
2047 (C)	41,000	220,000	8,800	0	21,000	12,000	1,800	170,000	840	6,200	24,000	35,000	-5,100
2048 (W)	150,000	510,000	8,300	0	340,000	9,500	2,800	160,000	760	8,100	79,000	67,000	4,500
2049 (W)	96,000	370,000	9,400	0	170,000	11,000	2,900	160,000	800	8,200	64,000	56,000	2,100
2050 (W)	83,000	320,000	11,000	0	140,000	12,000	2,800	170,000	940	8,100	47,000	42,000	-4,000
2051 (W)	180,000	560,000	8,400	0	390,000	7,300	3,700	170,000	650	6,600	100,000	62,000	6,400
2052 (W)	88,000	270,000	9,900	0	96,000	11,000	3,700	160,000	950	7,800	49,000	48,000	-8,900
2053 (AN)	96,000	330,000	8,800	0	140,000	10,000	3,500	170,000	860	8,300	49,000	45,000	8,800
2054 (D)	68,000	230,000	9,000	0	62,000	11,000	2,800	170,000	900	7,200	31,000	36,000	-6,800
2055 (D)	80,000	250,000	10,000	0	83,000	13,000	2,900	150,000	960	8,400	40,000	48,000	-3,700
2056 (AN)	96,000	350,000	8,300	0	160,000	10,000	3,000	160,000	820	7,400	62,000	58,000	4,700
2057 (BN)	98,000	300,000	9,900	0	160,000	12,000	3,200	140,000	970	8,800	51,000	47,000	-4,600
2058 (AN)	92,000	340,000	8,100	0	120,000	9,000	3,100	190,000	770	5,700	58,000	61,000	7,000
2059 (W)	130,000	370,000	8,800	0	200,000	9,900	3,500	170,000	800	7,400	65,000	54,000	-3,900
2060 (D)	51,000	180,000	9,500	0	30,000	13,000	2,600	130,000	960	10,000	18,000	27,000	420
2061 (C)	64,000	200,000	11,000	0	60,000	14,000	2,500	130,000	1,000	8,000	26,000	41,000	-4,400
2062 (D)	54,000	220,000	8,300	0	30,000	12,000	2,100	160,000	950	7,100	20,000	43,000	2,700

WATER YEAR (TYPE)		INFLOWS				OUTFLOWS								
		SURFACE WATER INFLOW	PRECIPI-TATION	GROUND-WATER EXTRACTION / UPTAKE	GROUND-WATER DISCHARGE	SURFACE WATER OUTFLOW	ET OF APPLIED WATER	ET OF GROUND-WATER UPTAKE	ET OF PRECIPI-TATION	EVAPO-RATION[1]	DEEP PERC. OF APPLIED WATER	DEEP PERC. OF PRECIPI-TATION	INFIL. OF SURFACE WATER	CHANGE IN ROOT ZONE STORAGE
2063 (BN)		88,000	290,000	7,800	0	96,000	9,800	2,400	150,000	860	6,700	48,000	62,000	1,800
2064 (W)		84,000	330,000	7,900	0	100,000	9,100	2,800	190,000	750	5,900	52,000	64,000	3,900
2065 (BN)		46,000	200,000	7,900	0	24,000	11,000	2,100	160,000	820	5,300	19,000	39,000	-7,300
2066 (D)		60,000	230,000	10,000	0	63,000	13,000	2,200	140,000	970	9,600	30,000	40,000	5,700
2067 (C)		38,000	170,000	9,000	0	27,000	12,000	1,700	130,000	840	4,900	14,000	31,000	4,900
2068 (C)		55,000	240,000	10,000	0	73,000	12,000	1,700	150,000	780	5,700	31,000	44,000	-8,000
2069 (BN)		78,000	330,000	9,000	0	130,000	12,000	2,100	170,000	840	6,800	44,000	59,000	-730
2070 (W)		120,000	400,000	8,200	0	200,000	9,800	2,600	170,000	750	5,800	73,000	69,000	1,700
2071 (BN)		39,000	190,000	8,900	0	18,000	12,000	1,800	150,000	790	6,400	17,000	32,000	-3,100
2072 (W)		100,000	420,000	9,000	0	200,000	10,000	2,700	180,000	740	7,000	64,000	63,000	6,600
Average (2022-2072)		83,000	300,000	9,200	0	120,000	11,000	2,800	160,000	850	7,300	46,000	48,000	-70
2022-2072	W	110,000	390,000	9,300	0	200,000	9,900	3,400	170,000	790	7,500	67,000	55,000	930
	AN	95,000	370,000	8,500	0	150,000	10,000	3,000	180,000	840	7,400	59,000	59,000	5,300
	BN	62,000	240,000	8,800	0	69,000	11,000	2,400	160,000	840	6,400	31,000	43,000	-3,900
	D	66,000	220,000	9,600	0	59,000	12,000	2,600	150,000	950	8,600	30,000	39,000	-2,800
	C	48,000	210,000	9,500	0	38,000	12,000	2,000	150,000	880	6,400	23,000	36,000	-460

[1] Diversions for some years were estimated based on average monthly data, resulting in a generally constant evaporation volume for some years.

2.3.8.1 Projected (Future Land Use) Groundwater System Water Budget Summary

Summarized results for major components of the projected (future land use) water budget as they relate to the GWS are presented in **Figure 2-69** and **Table 2-30**. Deep percolation represents the largest inflow averaging nearly 53 taf per year while net seepage represents an inflow of about 47 taf per year. Net subsurface flows (combined subsurface flows with adjacent subbasins and upland areas) represent the largest net outflow totaling about -91 taf per year of outflow from the Bowman Subbasin on average. Groundwater pumping (on average -6.4 taf per year) and groundwater (root water) uptake directly from shallow groundwater (on average -2.8 taf per year) represent smaller outflows from the GWS.

Overall, the water budget results for the projected (future land use) period indicate a cumulative change in groundwater storage of about -15 taf, which equals an average annual change in groundwater storage of about -0.30 taf per year. These changes in storage estimates equate to decreases in storage in the Subbasin of about 0.1 acre-feet per acre over the 51 years across the entire Subbasin (approximately 122,425 acres). **Figure 2-69** provides a conceptual illustration of the projected water budget. **Figure 2-70** highlights the cumulative change in groundwater storage that would occur during anticipated multi-year wet and dry periods and over the entire projected period.

Detailed results for the projected (future land use) GWS water budget are presented in **Appendix 2-K**.

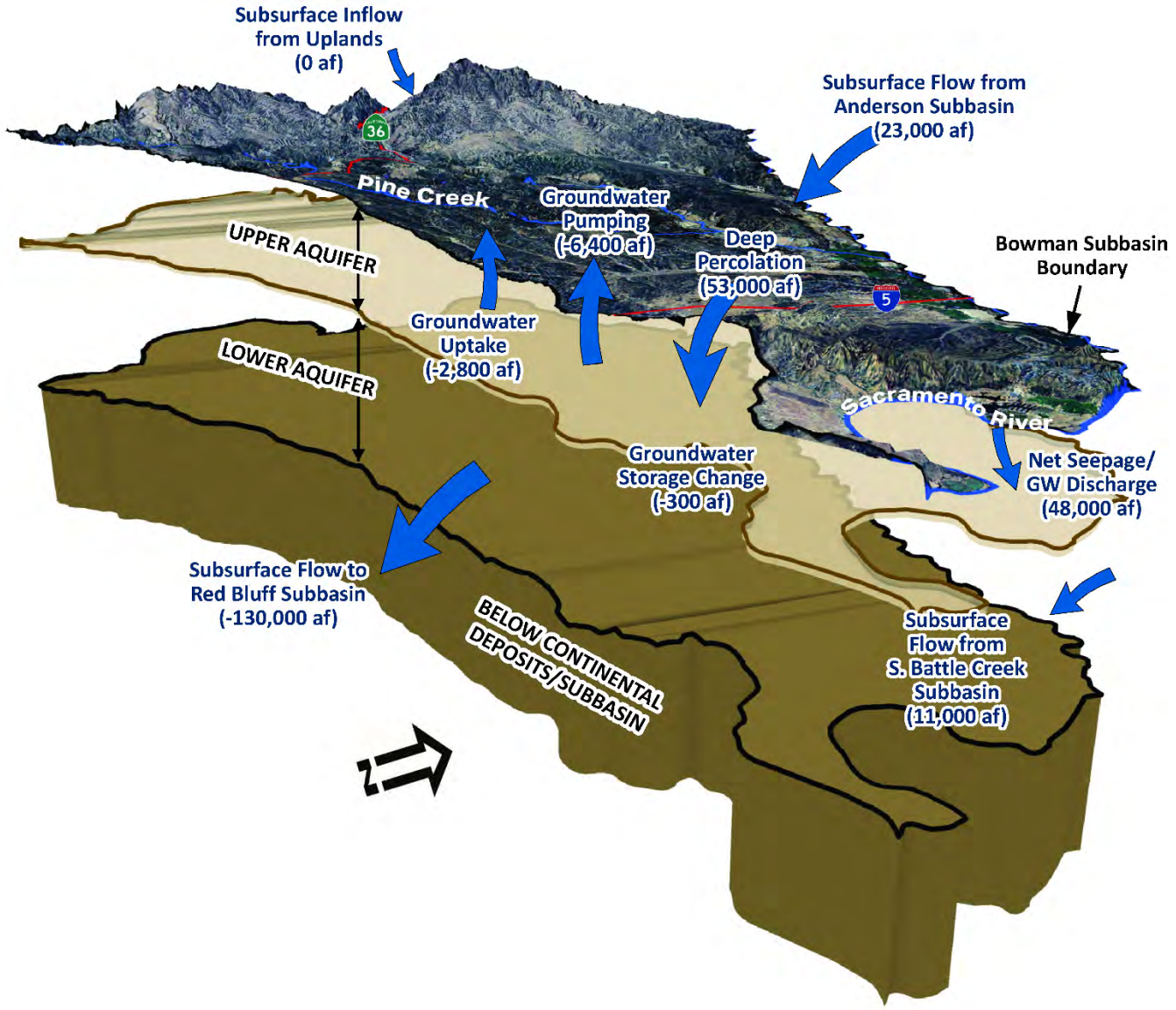

Figure 2-69. Diagram of the Bowman Subbasin Projected (Future Land Use) Average Annual Water Budget, 2022-2072

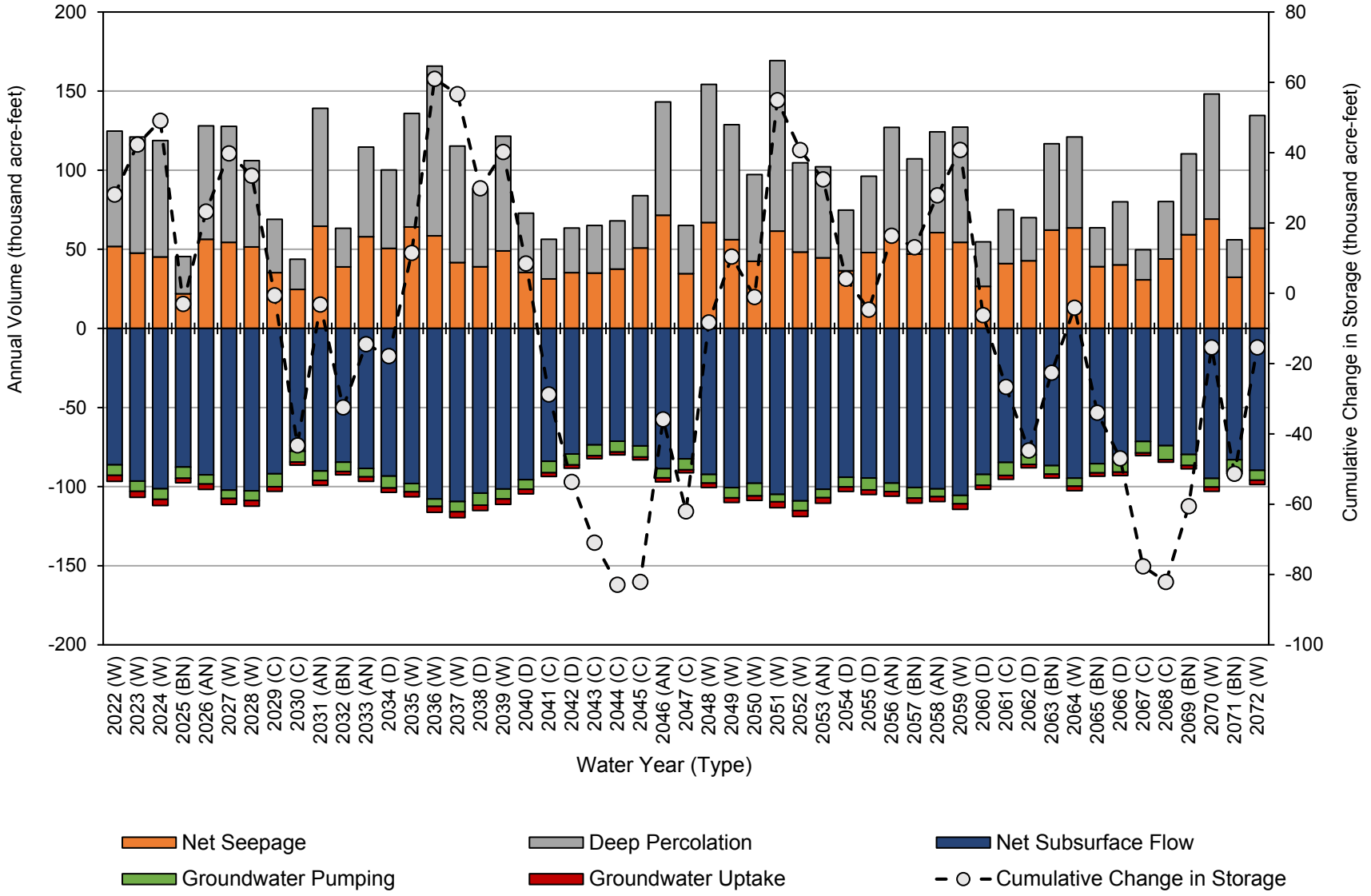

Figure 2-70. Bowman Subbasin Projected (Future Land Use) Water Budget Summary

Table 2-30. Bowman Subbasin Projected (Future Land Use) Water Budget Summary (acre-feet)

WATER YEAR (TYPE)	NET SEEPAGE	DEEP PERCOLATION	NET SUBSURFACE FLOWS	GROUND-WATER PUMPING	GROUND-WATER UPTAKE	ANNUAL GROUNDWATER STORAGE CHANGE	CUMULATIVE GROUNDWATER STORAGE CHANGE
2022 (W)	52,000	73,000	-86,000	-6,600	-3,800	28,000	28,000
2023 (W)	48,000	73,000	-96,000	-6,500	-3,800	14,000	42,000
2024 (W)	45,000	74,000	-100,000	-6,700	-3,900	6,800	49,000
2025 (BN)	22,000	24,000	-88,000	-7,100	-2,800	-52,000	-3,000
2026 (AN)	56,000	72,000	-93,000	-5,800	-3,400	26,000	23,000
2027 (W)	54,000	73,000	-100,000	-5,300	-3,700	17,000	40,000
2028 (W)	51,000	55,000	-100,000	-6,100	-3,600	-6,300	33,000
2029 (C)	35,000	34,000	-92,000	-8,200	-2,900	-34,000	-580
2030 (C)	25,000	19,000	-78,000	-6,900	-1,900	-43,000	-43,000
2031 (AN)	65,000	75,000	-90,000	-6,000	-2,900	40,000	-3,200
2032 (BN)	39,000	24,000	-85,000	-5,800	-2,100	-29,000	-32,000
2033 (AN)	58,000	57,000	-88,000	-5,400	-2,800	18,000	-14,000
2034 (D)	51,000	50,000	-93,000	-7,600	-2,700	-3,400	-18,000
2035 (W)	64,000	72,000	-98,000	-5,300	-3,200	29,000	11,000
2036 (W)	59,000	110,000	-110,000	-4,700	-3,800	50,000	61,000
2037 (W)	42,000	74,000	-110,000	-6,400	-3,800	-4,400	57,000
2038 (D)	39,000	49,000	-100,000	-7,600	-3,400	-27,000	30,000
2039 (W)	49,000	73,000	-100,000	-6,300	-3,400	10,000	40,000
2040 (D)	35,000	37,000	-96,000	-6,100	-2,900	-32,000	8,500
2041 (C)	31,000	25,000	-84,000	-7,300	-2,400	-37,000	-29,000
2042 (D)	35,000	28,000	-79,000	-7,000	-2,000	-25,000	-54,000
2043 (C)	35,000	30,000	-74,000	-6,900	-1,900	-17,000	-71,000
2044 (C)	37,000	30,000	-71,000	-6,900	-1,800	-12,000	-83,000
2045 (C)	51,000	33,000	-74,000	-7,000	-1,800	810	-82,000
2046 (AN)	72,000	72,000	-89,000	-5,800	-2,500	46,000	-36,000
2047 (C)	35,000	30,000	-82,000	-6,900	-1,800	-26,000	-62,000
2048 (W)	67,000	87,000	-92,000	-5,500	-2,800	54,000	-8,300
2049 (W)	56,000	73,000	-100,000	-6,400	-2,900	19,000	10,000
2050 (W)	42,000	55,000	-98,000	-8,000	-2,800	-11,000	-1,100
2051 (W)	62,000	110,000	-100,000	-4,700	-3,700	56,000	55,000
2052 (W)	48,000	56,000	-110,000	-6,200	-3,700	-14,000	41,000
2053 (AN)	45,000	58,000	-100,000	-5,300	-3,500	-8,300	32,000
2054 (D)	36,000	38,000	-94,000	-6,100	-2,800	-28,000	4,200
2055 (D)	48,000	48,000	-95,000	-7,500	-2,900	-8,800	-4,700
2056 (AN)	58,000	69,000	-98,000	-5,300	-3,000	21,000	16,000
2057 (BN)	47,000	60,000	-100,000	-6,700	-3,200	-3,300	13,000
2058 (AN)	61,000	64,000	-100,000	-4,900	-3,100	15,000	28,000
2059 (W)	54,000	73,000	-110,000	-5,300	-3,500	13,000	41,000

WATER YEAR (TYPE)		NET SEEPAGE	DEEP PERCOLATION	NET SUBSURFACE FLOWS	GROUND-WATER PUMPING	GROUND-WATER UPTAKE	ANNUAL GROUNDWATER STORAGE CHANGE	CUMULATIVE GROUNDWATER STORAGE CHANGE
2060 (D)		27,000	28,000	-92,000	-6,900	-2,600	-47,000	-6,200
2061 (C)		41,000	34,000	-85,000	-8,300	-2,500	-20,000	-27,000
2062 (D)		43,000	27,000	-80,000	-6,200	-2,100	-18,000	-45,000
2063 (BN)		62,000	55,000	-87,000	-5,400	-2,400	22,000	-23,000
2064 (W)		64,000	57,000	-95,000	-5,100	-2,800	18,000	-4,100
2065 (BN)		39,000	25,000	-86,000	-5,900	-2,100	-30,000	-34,000
2066 (D)		40,000	40,000	-83,000	-8,200	-2,200	-13,000	-47,000
2067 (C)		31,000	19,000	-71,000	-7,300	-1,700	-31,000	-78,000
2068 (C)		44,000	36,000	-74,000	-8,800	-1,700	-4,400	-82,000
2069 (BN)		59,000	51,000	-80,000	-6,900	-2,100	22,000	-61,000
2070 (W)		69,000	79,000	-95,000	-5,500	-2,600	45,000	-15,000
2071 (BN)		32,000	24,000	-83,000	-7,100	-1,800	-36,000	-51,000
2072 (W)		63,000	71,000	-90,000	-6,300	-2,700	36,000	-15,000
Average (2022-2072)		47,000	53,000	-91,000	-6,400	-2,800	-300	
2022-2072	W	55,000	74,000	-100,000	-5,900	-3,400	20,000	
	AN	59,000	66,000	-94,000	-5,500	-3,000	23,000	
	BN	43,000	37,000	-87,000	-6,400	-2,300	-15,000	
	D	39,000	38,000	-91,000	-7,000	-2,600	-22,000	
	C	36,000	29,000	-79,000	-7,500	-2,000	-22,000	

2.3.9 Projected Water Budgets with Climate Change

Additional projected scenarios were developed to model potential climate change scenarios. Climate change scenarios were developed using the DWR guidance for the 2030 and 2070 central tendencies. Additional detail about the development and results of these scenarios can be found in **Appendices 2-J and 2-K**. The climate change scenarios were implemented following DWR's guidance related to the 2030 and 2070 central tendency climate change scenarios and associated adjustment factors applied to model inputs such as precipitation, ET, and surface water inflows. In the Tehama IHM area, the DWR climate change guidance and adjustment factors tend to result in increases in precipitation, ET, and streamflows.

2.3.9.1 Projected (Current Land Use) Water Budget

A comparison of the major components of the projected (current land use) water budget as they relate to the GWS are presented in **Table 2-31**. Net seepage becomes less negative under climate change scenarios, indicating less groundwater flow to SWS. However, the decrease in the net volume of groundwater discharging to surface water (less negative net seepage) is partly a result of greater streamflow entering the Subbasin under the climate change scenarios and resulting in greater stream seepage. Deep percolation and net subsurface flows remain nearly unchanged under climate change scenarios. Groundwater pumping increases under climate change scenarios, becoming a greater outflow from the groundwater system.

Table 2-31. Comparison of Annual Projected (Current Land Use) GWS Water Budgets with Climate Change Adjustments (acre-feet)

GWS WATER BUDGET COMPONENT	PROJECTED (CURRENT LAND USE)		
	NO CLIMATE CHANGE ADJUSTMENT	CLIMATE CHANGE (2030)	CLIMATE CHANGE (2070)
Net Seepage	46,000	47,000	48,000
Deep Percolation	53,000	53,000	51,000
Net Subsurface Flows	-90,000	-91,000	-89,000
Groundwater Extractions (Pumping and Uptake)	-9,100	-9,300	-9,800
Annual Groundwater Storage Change	***-210***	***-240***	***-420***

Note: positive values indicate inflows/increasing storage, negative values indicate outflows/decreasing storage.

2.3.9.2 Projected (Future Land Use) Water Budget

A comparison of the major components of the projected (future land use) water budget as they relate to the GWS are presented in **Table 2-32**. Overall, the climate change scenarios to not appear to change the overall Subbasin GWS water budget in a considerable way. Net seepage increases very minimally under both 2030 and 2070 climate change scenarios and deep percolation decreases by a small amount. Net subsurface flows also do not change much under climate change scenarios. Groundwater extraction increases minimally by about 200 to 700 acre-feet per year under climate change scenarios.

Table 2-32. Comparison of Annual Projected (Future Land Use) GWS Water Budgets with Climate Change Adjustments (acre-feet)

GWS WATER BUDGET COMPONENT	PROJECTED (FUTURE LAND USE)		
	NO CLIMATE CHANGE ADJUSTMENT	CLIMATE CHANGE (2030)	CLIMATE CHANGE (2070)
Net Seepage	47,000	48,000	49,000
Deep Percolation	53,000	53,000	51,000
Net Subsurface Flows	-91,000	-92,000	-90,000
Groundwater Extractions (Pumping and Uptake)	-9,200	-9,500	-9,900
Annual Groundwater Storage Change	***-300***	***-340***	***-530***

Note: positive values indicate inflows/increasing storage, negative values indicate outflows/decreasing storage.

2.3.10 Projected Groundwater Storage Change by Aquifer

This section presents the projected groundwater storage change in the Upper Aquifer and Lower Aquifer under Current Land Use and Future Land Use conditions with and without the climate change conditions. Note that the total water budget numbers presented below by aquifer may differ from the sum of the average annual values because of rounding. Additional detail about the development and results of these scenarios can be found in **Appendices 2-J and 2-K**.

2.3.10.1 Projected (Current Land Use) Storage Change

A comparison of the groundwater storage change, including by primary aquifer, under the projected (current land use) conditions with different climate change assumptions is presented in **Table 2-33**. The water budget results suggest reduction of storage is only slightly greater under climate chance scenarios, with most of the storage change occurring in the Upper Aquifer. Overall projected storage change in the Subbasin is small and differs little between the different climate change conditions. The projected average annual storage change decreases range from -210 to -420 acre-feet per year and are equivalent to very minimal change on a per-acre basis over the 51-year projected period. Projected annual storage changes in the Upper Aquifer range from annual storage decreases of -320 to -380 acre-feet per year with and without climate change conditions. Storage changes in the Lower Aquifer range from an increase of about 110 acre-feet per year without climate change to a small decrease in storage of -33 acre-feet per year on average with 2070 climate change. The small amounts of change in the entire Subbasin, including individual aquifers, is very small and within the range of uncertainty of the water budget results.

Table 2-33. Comparison of Projected (Current Land Use) Aquifer-Specific GWS Water Budgets with Climate Change Adjustments

PROJECTED (CURRENT LAND USE)		AVERAGE ANNUAL CHANGE IN STORAGE			CUMULATIVE CHANGE IN STORAGE		
		UPPER AQUIFER	LOWER AQUIFER	TOTAL	UPPER AQUIFER	LOWER AQUIFER	TOTAL
No Climate Change Adjustment	acre-feet	-320	110	-210	-16,000	5,600	-11,000
	acre-feet per acre	*0.00*	*0.00*	*0.00*	*-0.13*	*0.05*	*-0.09*
Climate Change 2030	acre-feet	-330	91	-240	-17,000	4,600	-12,000
	acre-feet per acre	*0.00*	*0.00*	*0.00*	*-0.14*	*-0.04*	*-0.10*
Climate Change 2070	acre-feet	-380	-33	-420	-20,000	-1,700	-21,000
	acre-feet per acre	*0.00*	*0.00*	*0.00*	*-0.16*	*-0.01*	*-0.17*

Note: positive values indicate increasing storage, negative values indicate decreasing storage.

2.3.10.2 Projected (Future Land Use) Water Budget

A comparison of the groundwater storage change under the projected (future land use) conditions with different climate change assumptions is presented in **Table 2-34**. As with the projected (current land use) water budget results, the results suggest reduction of storage is only slightly greater under climate chance scenarios, with most of the storage change occurring in the Upper Aquifer. Overall projected storage change in the Subbasin is small and differs little between the different climate change conditions. The projected average annual storage change decreases range from -300 to -530 acre-feet per year and are equivalent to very minimal change on a per-acre basis over the 51-year projected period. Projected annual storage changes in the Upper Aquifer range from annual storage decreases of -340 to -400 acre-feet per year with and without climate change conditions. Storage changes in the Lower Aquifer range from an increase of about 35 acre-feet per year without climate change to a small decrease in storage of -120 acre-feet per year on average with 2070 climate change. The small amounts of change in the entire Subbasin, including individual aquifers, is very small and within the range of uncertainty of the water budget results.

Table 2-34. Comparison of Projected (Future Land Use) Aquifer-specific GWS Water Budgets with Climate Change Adjustments

PROJECTED (CURRENT LAND USE)		AVERAGE ANNUAL CHANGE IN STORAGE			CUMULATIVE CHANGE IN STORAGE		
		UPPER AQUIFER	LOWER AQUIFER	TOTAL	UPPER AQUIFER	LOWER AQUIFER	TOTAL
No Climate Change Adjustment	acre-feet	-340	35	-300	-17,000	1,800	-15,000
	acre-feet per acre	*0.00*	*0.00*	*0.00*	*-0.14*	*0.01*	*-0.12*
Climate Change 2030	acre-feet	-350	11	-340	-18,000	580	-17,000
	acre-feet per acre	*0.00*	*0.00*	*0.00*	*-0.15*	*0.00*	*-0.14*
Climate Change 2070	acre-feet	-400	-120	-530	-21,000	-6,200	-27,000
	acre-feet per acre	*0.00*	*0.00*	*0.00*	*-0.17*	*-0.05*	*-0.22*

Note: positive values indicate increasing storage, negative values indicate decreasing storage.

2.3.11 Uncertainty in Water Budget Estimates

2.3.11.1 Uncertainty in SWS Water Budget

Uncertainties associated with each SWS water budget component have been computed or estimated following the process described by Clemmens and Burt (1997). In summary:

1. The uncertainty of each independently-estimated water budget component (excluding the closure term) is calculated or estimated as a percentage that approximately represents a 95 percent confidence interval for the average annual component volume of the component. Uncertainty percentages are based on the accuracy of measurement devices, the uncertainty of supporting calculations and estimation procedures, and professional judgement.
2. Assuming random, normally-distributed error, the standard deviation is calculated for each independently-estimated component as the average uncertainty on a volumetric basis (uncertainty percentage multiplied by the average annual component volume) divided by two.
3. The variance is calculated for each independently-estimated component as the square of the standard deviation.
4. The variance of the closure term is estimated as the sum of variances of all independently-estimated components.
5. The standard deviation of the closure term is estimated as the square root of the sum of variances.
6. The 95 percent confidence interval of the closure term is estimated as twice the estimated standard deviation.

Estimated uncertainties were calculated following the above procedure for the Subbasin water budget and all GSA water budgets. **Table 2-35** provides a summary of typical uncertainty values associated with major SWS inflows and outflows, along with the sources of these uncertainty values. For surface water flows, deliveries, and diversions, the uncertainty is estimated based on typical accuracy of streamflow gages and measurement devices. For IDC root zone water budget inflows and outflows, the uncertainty is based on typical accuracies given in technical literature and the cumulative estimated accuracy of all inputs used to calculate the components. These uncertainties provide a basis for evaluating confidence in water budget results and help to identify data needs that may be addressed during GSP implementation.

Table 2-35. Estimated Uncertainty of Major Water Budget Components

FLOWPATH DIRECTION (RELATIVE TO SWS)	WATER BUDGET COMPONENT	DATA SOURCE	ESTIMATED UNCERTAINTY (%)	SOURCE
Inflows	Surface Water Inflows	Measurement	5%[1]	Accuracy of USGS streamflow gages, with adjustment for infiltration and evaporation of inflows upstream/downstream of nearest measurement site.
	Deliveries	Measurement	6%	Required delivery measurement accuracy for Reclamation contractors, per the USGS 2017 Standard Criteria for Agricultural Water Management Plans)
	Water Rights Diversions	Measurement/ Estimate	10%	Required diversion measurement accuracy, per California Senate Bill 88.
	Precipitation	Calculation	20%[2]	Clemmens, A.J. and C.M. Burt, 1997.
	Groundwater Extraction	Calculation	20%	Typical uncertainty when calculated for Land Surface System water budget closure. The uncertainty of the accounting center closure is a product of the combined uncertainty of all other inflows and outflows, and the relative magnitude of each component.
Outflows	Surface Water Outflows	Measurement	15%	Estimated streamflow measurement accuracy with adjustment for infiltration and evaporation.
	Evaporation	Calculation	20%	Clemmens and Burt, 1997; typical accuracy of calculation based on CIMIS reference ET and free water surface evaporation coefficient.

FLOWPATH DIRECTION (RELATIVE TO SWS)	WATER BUDGET COMPONENT	DATA SOURCE	ESTIMATED UNCERTAINTY (%)	SOURCE
	ET of Applied Water	Calculation	10%	Clemmens and Burt, 1997; typical accuracy of total irrigation water consumption on irrigated land, parsed into ET of Applied Water and ET of Precipitation by daily root zone water budget component based on reference ET, precipitation, surface energy balance crop coefficients, and annual land use.
	ET of Precipitation	Calculation	10%[2]	Clemmens and Burt, 1997; accuracy of total water consumption on irrigated land, parsed into ET of Applied Water and ET of Precipitation by daily root zone water budget component based on reference ET, precipitation, surface energy balance crop coefficients, and annual land use.
	Infiltration of Applied Water	Calculation	20%[2]	Estimated accuracy of daily IDC root zone water budget based on annual land use and NRCS soils characteristics. Similar accuracy anticipated for monthly results.
	Infiltration of Precipitation	Calculation	20%[2]	Estimated accuracy of daily IDC root zone water budget based on annual land use, NRCS soils characteristics, and CIMIS precipitation.
	Infiltration of Surface Water	Calculation	15%	Typical accuracy of daily seepage calculation using NRCS soils characteristics and measured streamflow data compared to field measurements.

[1] Higher uncertainty of 10-20 percent is typical for estimated surface water inflows, including ungaged inflows from small watersheds into creeks that enter the Subbasin.

[2] IDC root zone water budget inflows and outflows. The uncertainty of these water budget components is based on typical accuracies given in technical literature and the cumulative estimated accuracy of all inputs used to calculate the components

2.3.11.2 GWS Water Budget Uncertainty

Uncertainty associated with the GWS water budget results estimated using the Tehama IHM depends in part on the model inputs relating to the SWS with additional sources of uncertainty associated with model inputs relating to the GWS, including aquifer and streambed properties, specification of boundary conditions, and other factors. The uncertainty estimates associated with SWS water budget components that are also inputs or outputs of the GWS water budget are noted above. The overall uncertainty of other water budget components simulated for the GWS, including subsurface flows, groundwater discharging to surface water, and change in groundwater storage are estimated to be slightly higher, in the range of 15 to 30 percent. These GWS water budget components are subject to higher uncertainty as a result of limitations in available input data and simplification required in modeling of the subsurface heterogeneity. However, the uncertainty in GWS water budget results derived from a numerical model such as the Tehama IHM depends to a considerable degree on the calibration of the model and can vary by location and depth within the Subbasin. The Tehama IHM is a product of local refinement and improvements made to the SVSim model and calibration at a more local scale. The Tehama IHM simulates the integrated groundwater and surface water system and metrics relating to the calibration of the model indicate the model is reasonably well calibrated in accordance with generally accepted professional guidelines and is sufficient for GSP-related applications. The calibration and sensitivity of the model and different model parameters are presented in **Appendix 2-J**.

2.3.12 Estimate of Sustainable Yield

GSP Regulations require the GSP quantify the sustainable yield for the Subbasin. Sustainable yield is defined as "the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result" (CWC Section 10721(w)). Historical and projected model results show that the conditions in the Subbasin under the historical and anticipated future land use conditions and hydrology, including with potential climate change conditions (2030 and 2070), will not cause the occurrence of undesirable results in the Subbasin over the 50-year GSP planning period based on sustainability indicator Minimum Thresholds (MTs) developed for the Subbasin.

The Bowman Subbasin has historically pumped on average about 6,100 acre-feet per year of groundwater. An additional 3,000 acre-feet of groundwater is estimated to be taken up and consumed directly by plants reflecting a total historical groundwater extraction volume of about 9,100 acre-feet per year on average. Observed groundwater level conditions and simulated water budget results suggest there has been little or no historical long-term change in groundwater storage in the Subbasin. Although some of the water budget components change under the different projected scenarios as a result of changes in land use and climate conditions being simulated, total groundwater extraction (combination of groundwater pumping and uptake) within the Subbasin does not change considerably with estimated increases in groundwater extraction of less than a thousand acre-feet per year. Under the projected future land use with 2070 climate change, groundwater extractions total only slightly more at about 9,900 acre-feet per year on average. The groundwater extraction water budget component is relatively small in comparison to the net seepage, deep percolation, and subsurface flow water budget components. Under all of the projected

scenarios, the change in storage is simulated to be very small or zero recognizing typical uncertainty associated with water budget estimates.

Accordingly, for the purpose of the GSP, the sustainable yield is estimated to be 10,000 acre-feet per year, which is equal to the volume of groundwater extracted annually in the Subbasin (by pumping and by uptake) under the projected model scenario with future land use and 2070 climate change conditions and considering the level of uncertainty associated with water budget estimates. Assuming potential uncertainty of 25 percent associated with the water budget estimates, an associated range of values for the estimated sustainable yield would be 7,500 to 12,500 acre-feet per year. It is possible that the true sustainable yield is higher as no model scenarios were developed to test the maximum possible volume of groundwater extraction. The sustainable yield estimate provided here is consistent with the sustainability goal for the Subbasin and will be reviewed as the Subbasin implements the GSP, including through periodic review and updates to the Tehama IHM and water budget results and ongoing monitoring of Subbasin conditions as required by GSP Regulations.

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FINAL REPORT

Bowman Subbasin

Sustainable Groundwater Management Act

Groundwater Sustainability Plan

(Chapter 3 – Sustainable Management Criteria)

January 2022

Prepared For:

Tehama County Flood Control and Water Conservation District

Prepared By:

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BMP	Best Management Practices
CASGEM	California Statewide Groundwater Elevation Monitoring
DMS	Data Management System
DO	Dissolve Oxygen
DQO	Data Quality Objective
DTW	Depth to Water
DWR	Department of Water Resources
EC	Electrical Conductivity
ft/yr	feet per year

GDE	Groundwater Dependent Ecosystem
GSA	Groundwater Sustainability Agency
GSE	Ground Surface Elevation
GSP	Groundwater Sustainability Plan
GWE	Groundwater Elevation
InSAR	Interferometric Synthetic Aperture Radar
MAs	Management Actions
Mg/L	Mlligrams per Liter
MOs	Measurable Objectives
MTs	Minimum Thresholds
NAVD88	North American Vertical Datum of 1988
NDVI	Normalized Difference Vegetation Index
ORP	Oxidation-Reduction Potential
PBO	Plate Boundary Observatory
PMAs	Projects and Management Actions
QA	Quality Assurance
QC	Quality Control
RMS	Representative Monitoring Sites
RP	Reference Point
RPE	Reference Point Elevation
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SMCL	Secondary Maximum Containment Level
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
UNAVACO	University NAVSTAR Consortium

3 SUSTAINABLE MANAGEMENT CRITERIA

This chapter of the Groundwater Sustainability Plan (GSP or Plan) defines sustainability goals, measurable objectives, interim milestones, minimum thresholds, undesirable results, and the monitoring network for each sustainability indicator within the Plan Area encompassed by the Bowman Subbasin GSP.

This is the fundamental chapter that defines sustainability in the Plan area, and it addresses significant regulatory requirements pertaining to the Sustainable Management Criteria (SMC) and corresponding monitoring network. The measurable objectives (MOs), minimum thresholds (MTs), and undesirable results presented in this chapter define the future sustainable conditions in the Plan area and commit Tehama County to actions that will achieve these future conditions.

Sustainable Management Criteria are the quantitative metrics which collectively consist of sustainability goals, MOs, interim milestones, MTs, and undesirable results. The SMC definitions require considerable analysis and evaluation of many factors. This chapter presents the data and methods used to develop the SMC and demonstrates how they relate to beneficial uses and users. The SMC presented in this chapter are based on current available data and applications of the best available science.

The Groundwater Sustainability Agency (GSA) will periodically evaluate this GSP, assess changing conditions in the Plan area that may warrant modifications of the GSP or management objectives, and may adjust components accordingly. The GSA will focus their evaluation on the efficacy of actions under the GSP to meet the Plan's management objectives and the sustainability goal of the Plan area.

This chapter is organized to address all the Sustainable Groundwater Management Act (SGMA) regulations regarding SMC and is organized in accordance with Department of Water Resources' (DWR) GSP annotated outline. This chapter includes a description of:

- How locally defined significant and unreasonable conditions were developed
- How MTs were developed, including:
    - The information and methodology used to develop MTs
    - The relationship between MTs and relationship of these MTs to other sustainability indicators
    - The effect of MTs on neighboring basins
    - The effect of MTs on beneficial uses and users
    - How MTs are related to relevant federal, state, or local standards
    - The method for quantifying measurable MTs
- How MOs were developed, including:
    - The methodology for setting MOs
    - Interim milestones
- How undesirable results were developed, including:
    - The criteria defining when and where the effect of the groundwater conditions cause undesirable results based on a quantitative description of the combination of MTs exceedances
    - The potential causes of undesirable results
    - The effect of these undesirable results on the beneficial uses and users

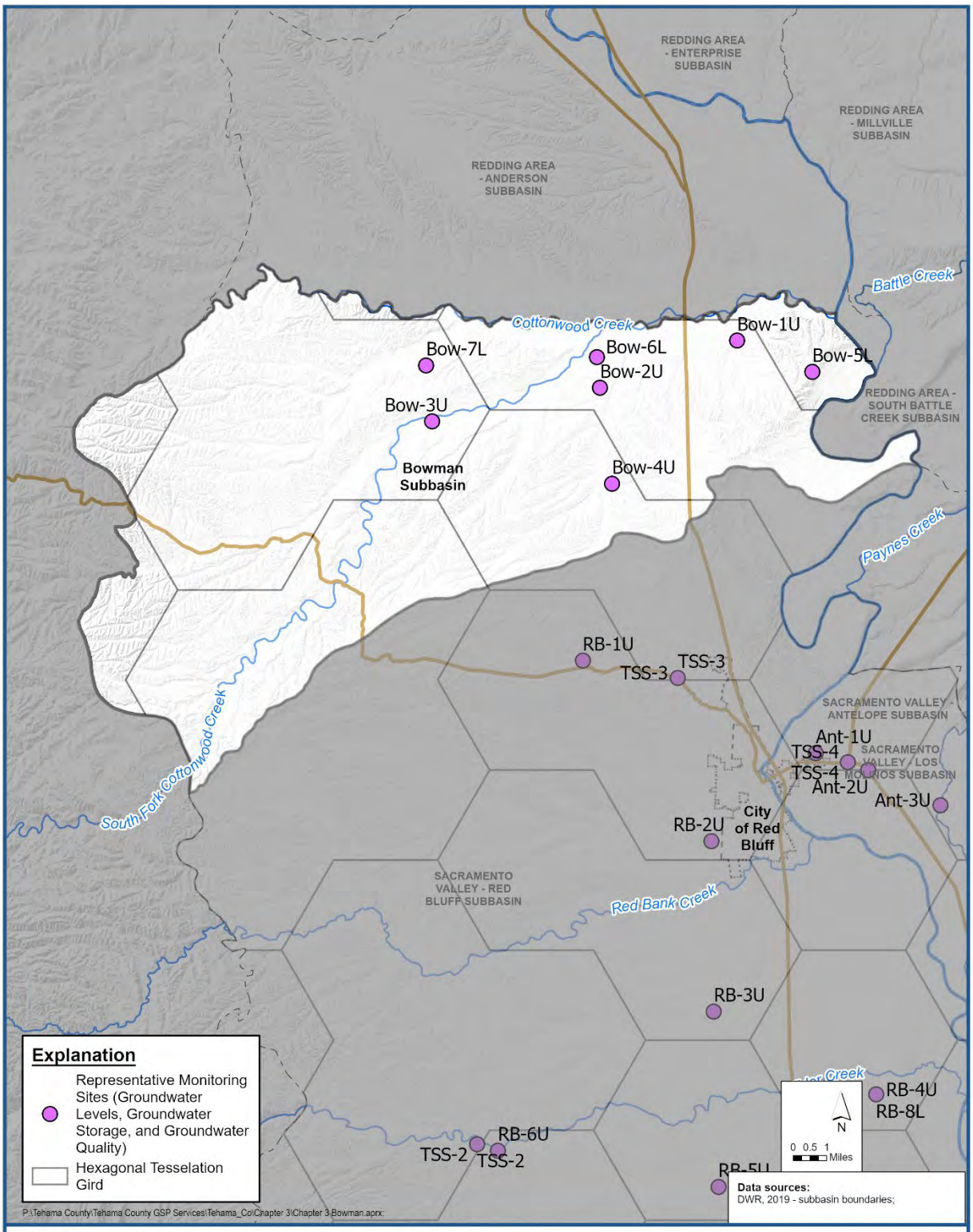
The SMC presented in this chapter were developed using information from stakeholder and public input, public meetings, hydrogeologic and groundwater dependent ecosystem analysis, and meetings with GSA representatives. The general process for establishing SMC includes:

- GSA public meetings that outlined the GSP development process and introduced stakeholders to the SMC.
- Conducting GSA public meetings to present proposed methodologies to establish MTs and MOs and receive additional public input.
- Reviewing public input on preliminary SMC methodologies with GSA representatives.
- Providing a Draft GSP for public review and comment.
- Establishing and modifying MTs, MOs, and definition of undesirable results based on feedback from public meetings, public/stakeholder review of the Draft GSP, and input from GSA staff/technical representatives.

To ensure the Plan area meets its sustainability goal by 2042, the GSA has proposed projects and management actions (PMAs) to address undesirable results which are described in **Section 4**. The projects expected to be implemented can include recharge basins, flood water on agricultural land, and in-lieu recharge. Projects and management actions may include revised well permit ordinances and demand reduction efforts. The overarching sustainability goal and the absence of significant and unreasonable levels of undesirable results are expected to be achieved by 2042 through implementation of the PMAs. The sustainability goals will be maintained through proactive monitoring and management by the GSA as described in this and the following chapters. **Table 3-1** presents a summary of the six (6) undesirable results and whether each has occurred, is occurring, or is expected to occur in the future without GSP implementation. The table also presents a summary of the proposed PMAs that have been developed to address each of the undesirable results that may be presently occurring or have historically occurred in the Subbasin. Representative Monitoring Sites (RMS) are identified for monitoring of interim milestones, MOs, and MTs for each sustainability indicator and are shown in **Figure 3-1.**

Conditions within the Subbasin will be considered sustainable when all the following goals are met:

1. Long-term aggregate groundwater use is equal to the Subbasin's estimated sustainable yield.
2. The average annual rate of groundwater storage change within the Subbasin, averaged across RMS wells is generally stable when groundwater storage is equivalent to 2015 baseline conditions.
3. Groundwater levels are maintained at elevations necessary to avoid undesirable results. Lowering groundwater levels potentially leading to significant and unreasonable depletions of available water supply for beneficial use could occur if groundwater levels decline to levels that result in the loss of water availability for well users.
4. Groundwater quality will exhibit trends consistent with the existing Basin Plan and proposed Basin Plan Amendment and exhibit groundwater quality concentrations that significantly impact beneficial users of groundwater.
5. Subsidence is maintained at current levels or below current levels to avoid undesirable results such as impacts to critical infrastructure and inelastic subsidence.
6. Interconnected surface waters are maintained at levels needed to avoid impacts to beneficial users and the degradation of groundwater dependent ecosystems.
7. Sustainability goals for seawater intrusion are not provided because this undesirable result is highly unlikely to occur in the Subbasin (the Subbasin is approximately 90 miles away from the Pacific Ocean and not connected to a coastal aquifer).



Representative Monitoring Sites **Figure 3-1**

Groundwater Sustainability Plan
Bowman Subbasin

Table 3-1. Summary of Undesirable Results Applicable to the Plan Area

Sustainability Indicator	Historical Period	Existing Condition	Future Conditions Without GSP Implementation	Projects and Management Actions Implemented to meet the GSP Sustainability Goal
Chronic Lowering of Groundwater Elevations	No	No	No	TBD
Reduction of Groundwater Storage	No	No	No	TBD
Seawater Intrusion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Degraded Water Quality	Limited	Limited	Limited	TBD
Land Subsidence	No	No	No	TBD
Depletion of Interconnected Surface Water	Data Gap	Data Gap	TBD	TBD

3.1 Sustainability Goal (Reg §354.24)

The sustainability goal for the Subbasin has three (3) sections:

1. A description of the sustainability goal,
2. A discussion of the measures that will be implemented to ensure the Subbasin will operate within the sustainable yield, and
3. An explanation of the Subbasin's pathway to achieve the sustainability goal within 20 years of GSP implementation and maintained through the planning and implementation horizon (through 2072)

3.1.1 Goal Description

The goal of this GSP is to develop PMAs that result in the sustainable management of the groundwater resources of the Subbasin for long-term community, financial, and environmental benefits of residents and businesses in the Subbasin. This GSP outlines the approach to achieve sustainable management of groundwater resources within 20 years, while maintaining the unique cultural, community, and agricultural aspects of the Subbasin. The GSA's sustainability goal is to ensure that by 2042, and thereafter within the planning and implementation horizon of this GSP (50 years to 2072), the Subbasin is operated within its sustainable yield and does not exhibit undesirable results considered significant and unreasonable.

3.1.2 Description of Measures

Meeting this goal requires achieving a balance of water demand with available water supply, while protecting groundwater quality, by the end of the GSP implementation timeframe, carrying through the SGMA planning and implementation horizon.

3.1.3 Description of Measures and Explanation of How the Goal Will Be Achieved in 20 Years

To ensure the Subbasin meets its sustainability goal by 2042, the GSA proposed several PMAs, described in Chapter 4, to address any undesirable results that may occur. The overarching sustainability goal as well as the absence of undesirable results are expected to be achieved by 2042 through implementation of the PMAs. The sustainability goal will be maintained through proactive monitoring and management by the GSA as described in this GSP.

3.2 Measurable Objectives and Interim Milestones *(Reg. § 354.30)*

Measurable objectives, as well as interim milestones that represent the path to sustainability in five (5)-year increments, are detailed below. Measurable objectives represent the expected groundwater extraction operating conditions for the Subbasin. If the GSA successfully manages groundwater extraction that results in the achievement of the MOs described, the Subbasin will be operating sustainably. A description of the MOs and how they were established are provided, along with recognition of the anticipated fluctuations in basin conditions around the established MOs. In addition, this section describes how the GSP helps to meet each measurable objective, how each measurable objective is intended to achieve the sustainability goal for the Plan area for the long-term beneficial uses, and how the interim milestones are intended to reflect the anticipated progress toward the MOs during the 2022 to 2042 Implementation Period.

The GSP regulations (California Code Water Code - Division 6 - Conservation, Development, and Utilization of State Water Resources, Part 2.75 - Groundwater Management, Chapter 3 - Groundwater Management Plans) define MOs as specific, quantifiable goals for the maintenance or improvement of specific groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin.

Per GSP Regulations (354.30):

1. Measurable objectives shall be established, "…including interim milestones in increments of five (5) years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon." (354.30.a)
2. "Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metric and monitoring sites as are used to define the MTs." (354.30.b)
3. "Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty." (354.30.c)
4. "…a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators…" may be established where "…the Agency can demonstrate

that the representative value is a reasonable proxy for multiple individual MOs as supported by adequate evidence." (354.30.d)

5. "Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five (5) years." (354.30.e)

The MOs developed for each applicable sustainability indicator in this GSP are based on the current understanding of the Plan Area and Basin Setting as discussed in detail in Chapter 2.

3.2.1 Measurable Objectives for Chronic Lowering of Water Levels

3.2.1.1 Description of Measurable Objectives

Measurable objectives for groundwater levels were established by analyzing historical groundwater level data and determining approximately how many domestic wells may be negatively impacted at different measurable thresholds. Both annual (variability from year to year) and seasonal variability were considered in the development of MOs. Groundwater elevation SMC were developed based on historic measurements and a sustainability goal of preventing negative impacts to domestic wells. Measurable objectives were set at each of the monitoring sites (**Table 3-2 to Table 3-3 and Figure 3-2 to Figure 3-3**). These sites were selected to provide an even distribution of coverage over the Subbasin and based on each individual well's ability to capture the general groundwater trend for other wells in their vicinity.

Specifically, to determine MOs, historical water elevations and projected water level trends were analyzed. The Subbasin aims to become sustainable by 2042 and therefore, MOs were set to spring 2042 projected elevations minus 5 feet for wells with a decreasing projected trend and at spring 2015 water levels minus five (5) feet for wells with an increasing projected trend in water elevations or with no trend. These MOs allow for operational flexibility while maintaining sustainability within the Subbasin.

Groundwater level hydrographs showing MOs for each groundwater level sustainability indicator well are provided in **Appendix 3-B.** Measurable objectives for each groundwater level monitoring well in the upper and lower aquifers are summarized in **Tables 3-2 and 3-3.**

Table 3-2. Measurable Objectives and Interim Milestones for the Chronic Lowering of Groundwater Elevations – Upper Aquifer

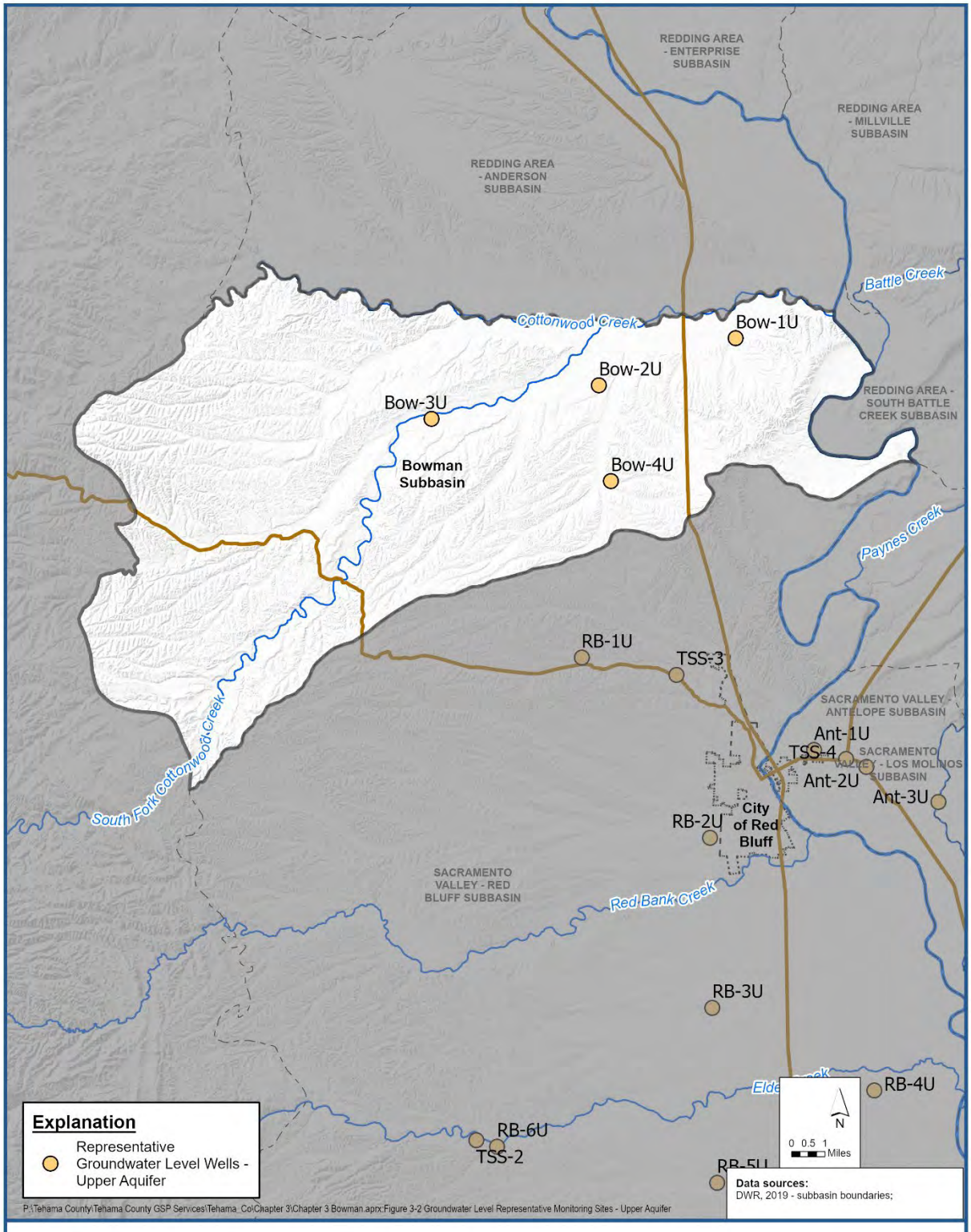
WELL NAME	STATE WELL NUMBER (SWN)	INTERIM MILESTONE 5 YEARS (FT NAVD88)	INTERIM MILESTONE 10 YEARS (FT NAVD88)	INTERIM MILESTONE 15 YEARS (FT NAVD88)	MEASURABLE OBJECTIVE (FT NAVD88)
Bow-1U	29N03W18M001M	391.8	389.9	388.1	386.3
Bow-2U	29N04W28D001M	399.1	397.8	396.4	395.1
Bow-3U	29N05W33A004M	490.9	488.9	486.9	484.9
Bow-4U	28N04W04P001M	412.2	409.7	407.3	404.8

Table 3-3. Measurable Objectives and Interim Milestones for the Chronic Lowering of Groundwater Elevations - Lower Aquifer

WELL NAME	SWN	INTERIM MILESTONE 5 YEARS (FT NAVD88)	INTERIM MILESTONE 10 YEARS (FT NAVD88)	INTERIM MILESTONE 15 YEARS (FT NAVD88)	MEASURABLE OBJECTIVE (FT NAVD88)
Bow-5L	29N03W21	342.6	341.2	339.9	338.5
Bow-6L	29N04W20A002M	400.9	399.4	398.0	396.6
Bow-7L	29N05W21H001M	472.1	467.5	462.8	458.2

3.2.1.2 Interim Milestones (Reasonable Margin of Safety for Operational Flexibility)

Interim milestones at five (5), ten (10), and fifteen (15) years are summarized in **Table 3-2 and Table 3-3** above**.** Interim milestones demonstrate progress towards achieving sustainability as represented by the MOs. The 2021 spring measurement was used as the starting point in the development of interim milestones for all the wells except Bow-2 (lower). For Bow-2 (lower) the most recent spring measurement available for use was from 2020. The interim milestones were set to split the difference between the MOs and the starting point.



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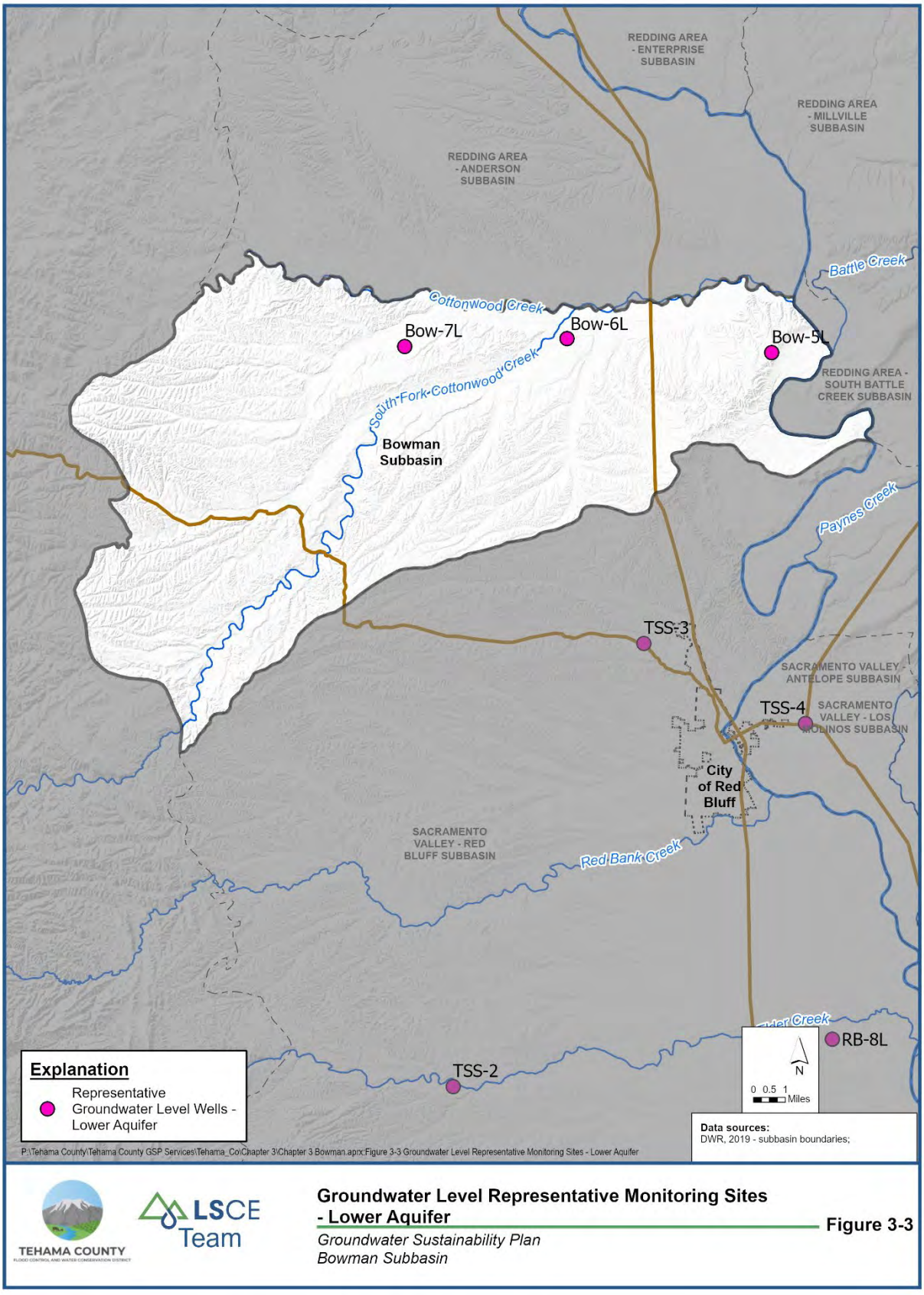
Groundwater Level Representative Monitoring Sites - Upper Aquifer **Figure 3-2**

Groundwater Sustainability Plan
Bowman Subbasin


REDDING AREA - ENTERPRISE SUBBASIN
REDDING AREA - MILLVILLE SUBBASIN
REDDING AREA - ANDERSON SUBBASIN
Battle Creek
Cottonwood Creek
Bow-7L
Bow-6L
Bow-5L
South Fork Cottonwood Creek
REDDING AREA - SOUTH BATTLE CREEK SUBBASIN
Bowman Subbasin
Paynes Creek
TSS-3
SACRAMENTO VALLEY - ANTELOPE SUBBASIN
TSS-4
SACRAMENTO VALLEY - LOS MOLINOS SUBBASIN
City of Red Bluff
SACRAMENTO VALLEY - RED BLUFF SUBBASIN
Red Bank Creek
RB-8L
TSS-2
N
0 0.5 1 Miles
Explanation
Representative Groundwater Level Wells - Lower Aquifer
Data sources:
DWR, 2019 - subbasin boundaries;
P:\Tehama County\Tehama County GSP Services\Tehama_Co\Chapter 3\Chapter 3 Bowman.aprx:Figure 3-3 Groundwater Level Representative Monitoring Sites - Lower Aquifer
TEHAMA COUNTY
LSCE Team
Groundwater Level Representative Monitoring Sites - Lower Aquifer
Figure 3-3
Groundwater Sustainability Plan
Bowman Subbasin

3.2.1.3 Path to Achieve and Maintain the Sustainability Goal

Considering historic trends, projected groundwater extraction, and planned PMAs it appears that the subbasin will be on a reasonable path to maintain the sustainability goal with stable groundwater elevation. Recent water levels remain above the MOs. Since recent groundwater levels are higher than the MOs, a recovery of groundwater elevation is not needed to reach the sustainability goal. The interim milestones serve to maintain the existing sustainable conditions. The sustainability goal for groundwater elevation is to prevent a negative impact on no more than 20% of the domestic wells within the upper aquifer. Planned PMAs in conjunction with coordination of SMC with adjacent subbasins will ensure the MOs for groundwater elevations are met.

The combination of interim milestones and MOs reflect how the GSA anticipates achieving and maintaining sustainability. It should be noted that future projections require assumptions about future hydrologic conditions, including the sequence of wet, average, and dry climatic years. The future climatic assumptions for the Implementation Period (through 2042) used in this GSP incorporate sequences of wet, average, and dry years that represent overall long-term average historical climatic conditions over the Implementation Period, without any prolonged periods of extremely dry or extremely wet years.

3.2.1.4 Impact of Selected Measurable Objectives on Adjacent Basins

The MOs established for the Subbasin provide a good basis for evaluation of anticipated impacts on adjacent subbasins from implementation of the GSP. This is because MOs are set to reflect the average groundwater levels to be maintained during the Sustainability Period. Ultimately, the potential for impacts on adjacent subbasins will be primarily a function of average water levels in the Subbasin during the Sustainability Period, average water levels in adjacent subbasins during the Sustainability Period, and natural groundwater flow conditions that would be expected to occur at Plan area boundaries. The average groundwater levels expected for the Plan area are reflected in the Measurable Objectives. Tehama County is also the GSA for the surrounding Red Bluff Subbasin. The MOs for these surrounding subbasins were set in a concurrent fashion using the same methodology as the Bowman Subbasin. Therefore, no adverse impact on adjacent basins is likely to occur. Measurable objectives for Bowman subbasin were also compared to Anderson subbasin to ensure no negative impacts would occur.

3.2.2 Measurable Objectives for Reduction in Groundwater Storage

3.2.2.1 Description of Measurable Objectives

The MOs for storage were established using the chronic lowering of groundwater elevations MOs. They are set to the amount of groundwater storage that exists when the groundwater elevations are at their MOs.

3.2.2.2 Interim Milestones (Reasonable Margin of Safety for Operational Flexibility)

Interim milestones at five (5), ten (10), and fifteen (15) years are summarized in **Table 3-2 and Table 3-3** for groundwater levels and are calculated as the difference between MOs and MTs split in five (5)-year increments.

3.2.2.3 Path to Achieve and Maintain the Sustainability Goal

The combination of interim milestones and MOs reflect how the basin will achieve and maintain sustainability. Since groundwater levels serve as a practical proxy for evaluating reduction in groundwater

storage, achieving, and maintaining sustainability relative to this indicator is similar to that described above in the groundwater level section.

3.2.2.4 Impact of Selected Measurable Objectives on Adjacent Basins

The groundwater model used for Bowman also encompasses the neighboring subbasin, Red Bluff. Projections for future water levels in the Bowman Subbasin were generated while accounting for conditions at these surrounding subbasins. Therefore, no adverse impact to surrounding subbasins is anticipated.

3.2.3 Measurable Objectives for Subsidence

3.2.3.1 Description of Measurable Objectives

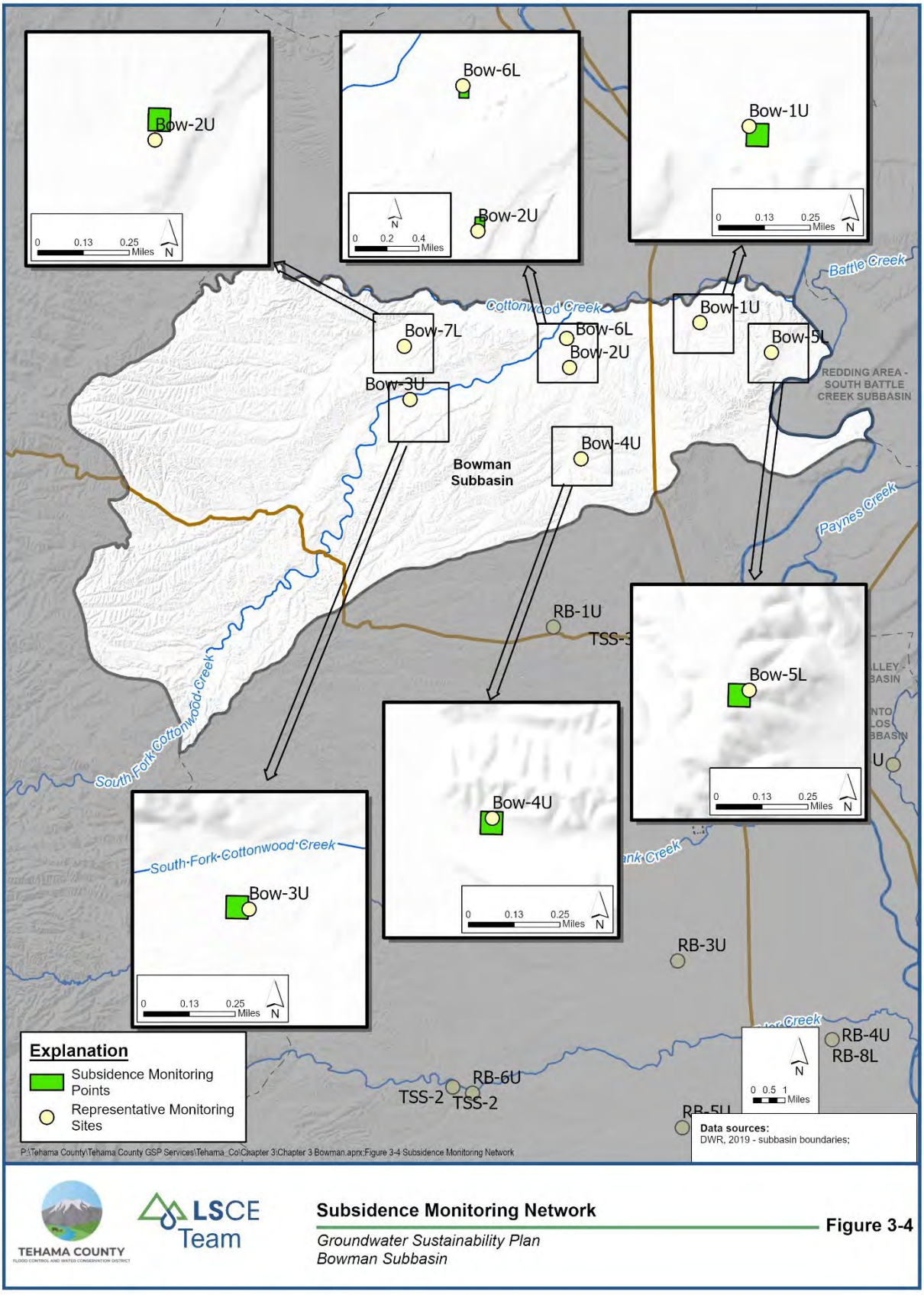
The MOs for subsidence represent target subsidence rates in the Subbasin. The MOs were set to vertical displacements of 0.25 feet ever five (5) years or one foot over 20 years at each (zero inelastic subsidence, in addition to any measurement error) in each InSAR pixel. If InSAR data are used, the measurement error is 0.1 feet and any measurement 0.1 feet or less would not be considered inelastic subsidence. Prior to determining this value, subsidence data from three (3) different sources (PBO, DWR, InSAR) was analyzed for historical and current trends. The MOs were set by examining the vertical displacement observed at the pixels from June 2015 to September 2019. The current subsidence monitoring InSAR pixels are shown on **Figure 3-4**. Based on the existing monitoring system the subsidence MOs are shown in **Table 3-4**. Note historical ground elevations for these pixels are presented in Appendix 3-C InSAR Subsidence Timeseries Data.

Table 3-4. Measurable Objectives and Interim Milestones for Subsidence

INSAR PIXEL	INTERIM MILESTONE 5 YEARS (FT)	INTERIM MILESTONE 10 YEARS (FT)	INTERIM MILESTONE 15 YEARS (FT)	MEASURABLE OBJECTIVE (FT)
DXF1N61	-0.25	-0.5	-0.75	-1.0
DXAA6E6	-0.25	-0.5	-0.75	-1.0
DWYYXU2	-0.25	-0.5	-0.75	-1.0
DWIASYT	-0.25	-0.5	-0.75	-1.0
DXNZ5CY	-0.25	-0.5	-0.75	-1.0
DXI0T98	-0.25	-0.5	-0.75	-1.0
DXFN2X3	-0.25	-0.5	-0.75	-1.0

3.2.3.2 Interim Milestones (Reasonable Margin of Safety for Operational Flexibility)

Interim milestones at five (5), ten (10), and fifteen (15) years are summarized in **Table 3-4.**


Bow-2U
Bow-6L
Bow-2U
Bow-1U
Battle Creek
Cottonwood Creek
Bow-7L
Bow-6L
Bow-2U
Bow-1U
Bow-5L
Bow-3U
REDDING AREA - SOUTH BATTLE CREEK SUBBASIN
Bow-4U
Bowman Subbasin
Paynes Creek
RB-1U
TSS-3
Bow-5L
South Fork Cottonwood Creek
Bow-4U
South Fork Cottonwood Creek
Bow-3U
RB-3U
RB-4U
RB-8L
RB-6U
TSS-2
TSS-2
0 0.13 0.25 Miles N
0 0.2 0.4 Miles N
0 0.5 1 Miles N
Explanation
Subsidence Monitoring Points
Representative Monitoring Sites
Data sources:
DWR, 2019 - subbasin boundaries;
P:\Tehama County\Tehama County GSP Services\Tehama_Co\Chapter 3\Chapter 3 Bowman.aprx:Figure 3-4 Subsidence Monitoring Network
TEHAMA COUNTY
LSCE Team
Subsidence Monitoring Network
Figure 3-4
Groundwater Sustainability Plan
Bowman Subbasin

3.2.3.3 Path to Achieve and Maintain the Sustainability Goal

Historic trends and planned groundwater extraction and PMAs provide a reasonable path to maintain the sustainability goal with levels of subsidence that will not exceed historical trends. As discussed in the basin setting, subsidence has not been an issue for the Bowman Subbasin. Even so, continued monitoring at InSAR pixel locations will highlight and help to mitigate any increases in subsidence through PMAs. The interim milestones served to maintain the existing sustainable conditions. The sustainability goal for subsidence is to prevent a trend of increasing rates of subsidence. Planned PMAs will ensure the MOs for subsidence are met.

3.2.3.4 Impact of Selected Measurable Objective on Adjacent Basins

The anticipated effect of the subsidence MOs on each of the neighboring subbasins is not expected to be significant because of the following factors:

- The Subbasin has not been subject to large levels of subsidence in the past
- The neighboring subbasin of Red Bluff is also managed by the same GSA and sustainability efforts are to be coordinated between subbasins to avoid adverse impacts

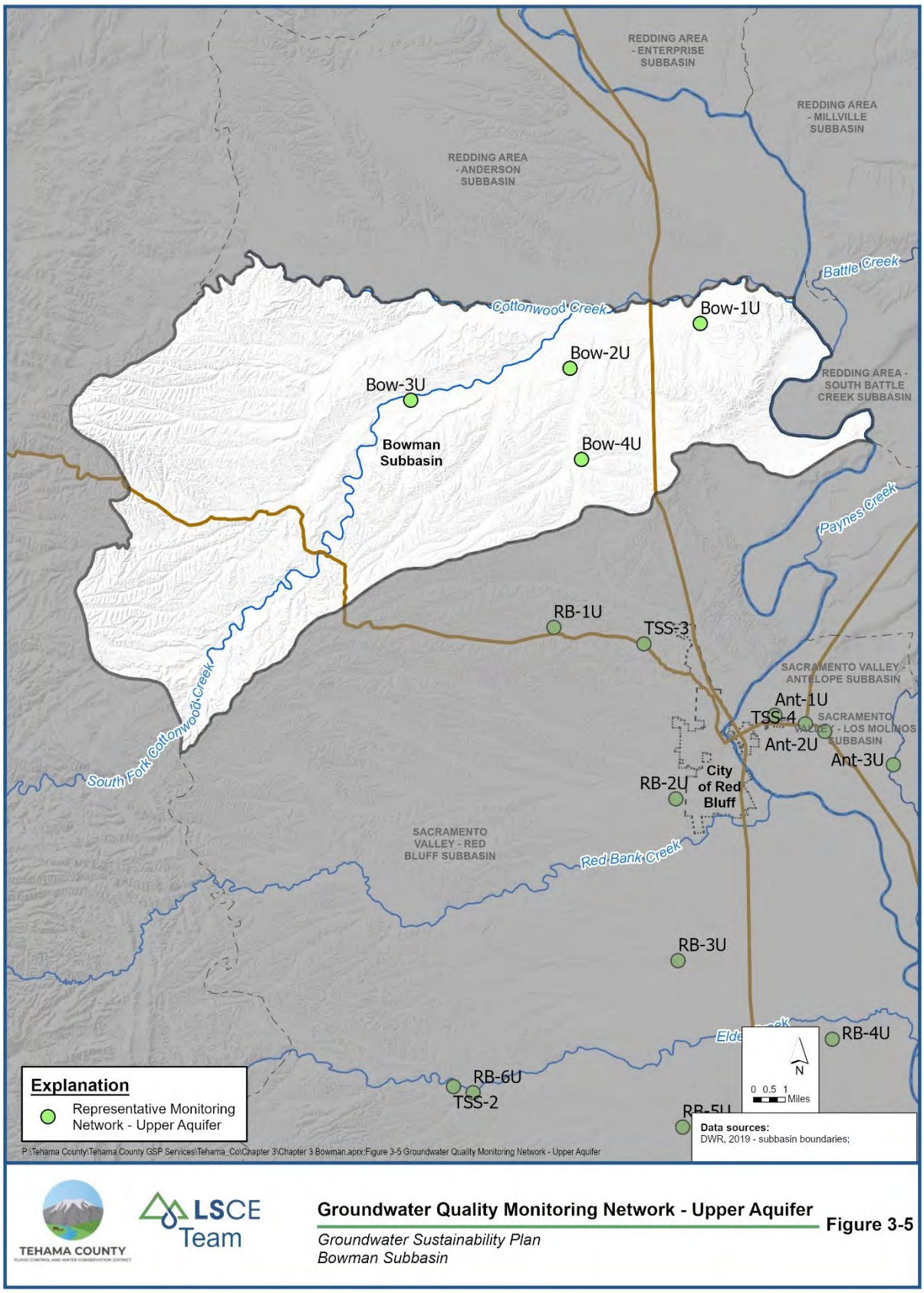
3.2.4 Measurable Objectives for Degraded Water Quality

3.2.4.1 Description of Measurable Objectives

The MOs for minimizing the degradation of groundwater quality are based on groundwater sample concentrations meeting water quality objectives and groundwater quality at concentrations similar to historical observations in the groundwater basin. Based on the review of groundwater quality in Chapter 2, the constituent being evaluated for all beneficial users is total dissolved solids (TDS). The basis for establishing the measurable objective is to minimize the additional contribution and migration of TDS. Measurable objectives for wells in the monitoring network are summarized in **Table 3-5** and shown on **Figure 3-5.** All water quality monitoring wells are constructed in the upper aquifer as TDS is not a concern in the lower aquifer and more pumping occurs from the upper aquifer. The MOs for groundwater quality are concentrations of TDS that are generally representative of secondary drinking water standards for urban and domestic beneficial and tolerable for most crops grown in the Subbasin without blending with surface water supplies. The measurable objective is established at 500 mg/L which represents recommended secondary drinking water standards.

Table 3-5. Measurable Objectives and Interim Milestones for Groundwater Quality

WELL NAME	STATE WELL NUMBER (SWN)	INTERIM MILESTONE 5 YEARS (TDS MG/L)	INTERIM MILESTONE 10 YEARS (TDS MG/L)	INTERIM MILESTONE 15 YEARS (TDS MG/L)	MEASURABLE OBJECTIVE (TDS MG/L)
Bow-1U	29N03W18M001M	225.5	317.0	408.5	500.0
Bow-2U	29N04W28D001M	TBD	TBD	TBD	500.0
Bow-3U	29N05W33A004M	256.5	337.5	418.5	500.0
Bow-4U	28N04W04P001M	245.5	330.5	415.5	500.0



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Groundwater Quality Monitoring Network - Upper Aquifer **Figure 3-5**

Groundwater Sustainability Plan
Bowman Subbasin

3.2.4.2 Interim Milestones (Reasonable Margin of Safety for Operational Flexibility)

Recent water quality data was not available in the Subbasin for establishing baseline conditions and calculating interim milestones over the GSP implementation period. To establish baseline water quality, samples were collected from RMS wells and were analyzed for TDS. Details of sampling activities and lab results are included in **Appendix 3-D**. Interim milestones were established using available lab results. This table will be updated as more results become available. Interim Milestones are summarized in **Table 3-5.**

3.2.4.3 Path to Achieve and Maintain the Sustainability Goal

The GSP monitoring program for groundwater quality will provide the GSA with a comprehensive understanding of groundwater quality in the Subbasin and identify areas with degraded water quality. This data will be used by the GSA to develop future PMAs, as necessary, to address areas with degraded water quality.

3.2.4.4 Impact of Selected Measurable Objectives on Adjacent Basins

Currently, the state of migration of TDS is unknown and therefore it is not possible to quantify the impact from the MOs on adjacent subbasins. As more data is collected, the impact to adjacent subbasins will be reassessed.

3.2.5 Measurable Objectives for Interconnected Surface Waters

3.2.5.1 Description of Measurable Objectives

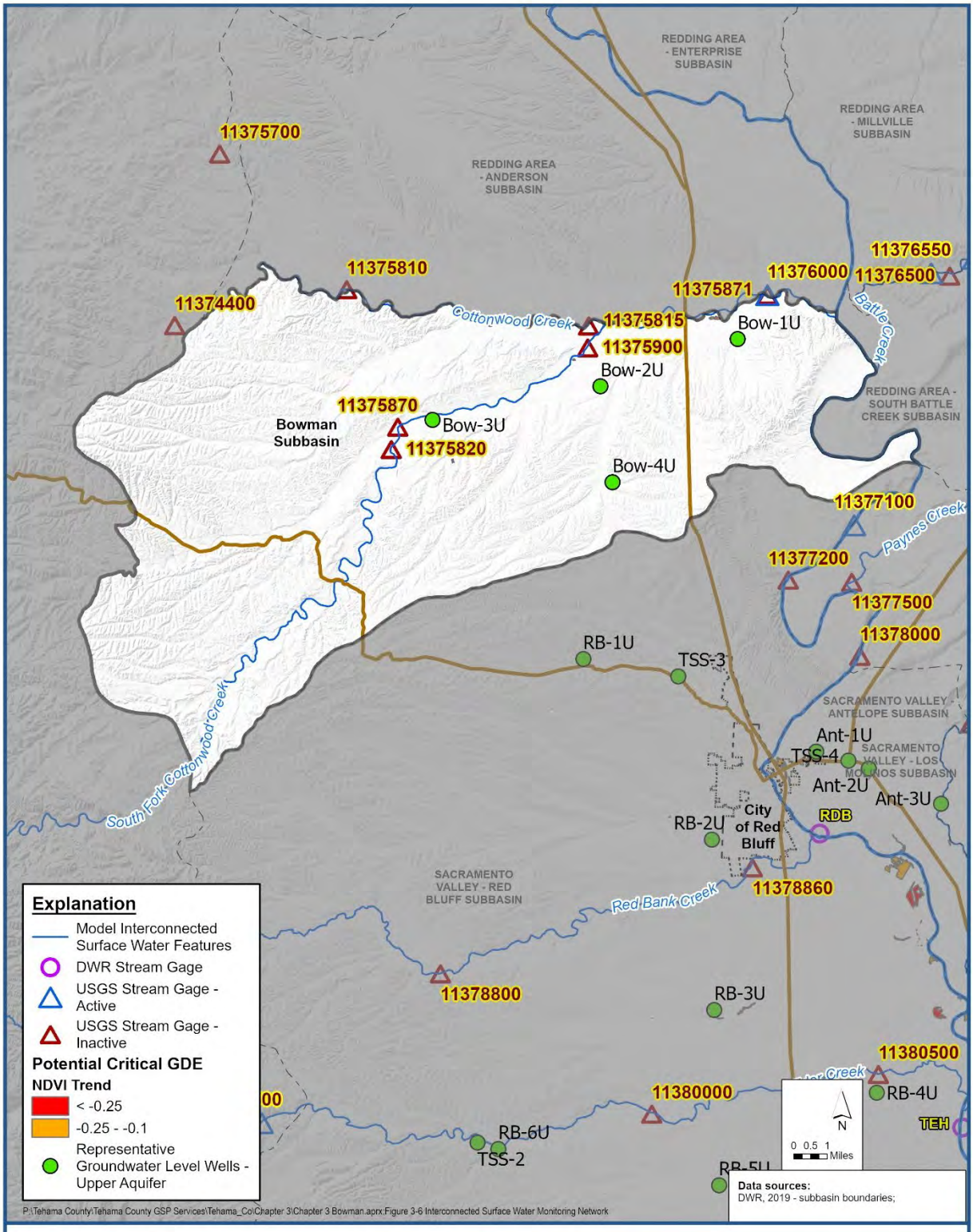
Interim MOs (**Table 3-6**) have been established for this indicator due to extensive data gaps which are discussed in **Section 3.7.8.7.** The MOs for the chronic lowering of groundwater elevations will be used as a proxy for interconnected surface waters. Wells within one mile of interconnected surface water features will be used for monitoring groundwater levels (**Figure 3-6**). Future shallow groundwater monitoring proposed in this plan will provide data to characterize stream-aquifer interaction and establish MOs for interconnected surface water. Until sufficient data is available, it is assumed that existing surface water – groundwater interactions will not considerably change when sustainable groundwater levels occur in the Subbasin.

3.2.5.2 Interim Milestones (Reasonable Margin of Safety for Operational Flexibility)

Temporary interim milestones have been established for this indicator due to extensive data gaps which are discussed in **Section 3.7.8.7**. The interim milestones for the chronic lowering of groundwater elevations will be used as a proxy for interconnected surface waters. Wells within one (1) mile of interconnected surface water features will be used for monitoring groundwater levels.

Table 3-6. Initial Measurable Objectives and Interim Milestones for Interconnected Surface Water

WELL NAME	SWN	INTERIM MILESTONE 5 YEARS (FT NAVD88)	INTERIM MILESTONE 10 YEARS (FT NAVD88)	INTERIM MILESTONE 15 YEARS (FT NAVD88)	MEASURABLE OBJECTIVE (FT NAVD88)
Bow-1U	29N03W18M001M	391.7	389.9	388.1	386.3
Bow-2U	29N04W28D001M	399.1	397.8	396.4	395.1
Bow-3U	29N05W33A004M	490.9	488.9	486.9	484.9
Bow-4U	28N04W04P001M	412.2	409.7	407.3	404.8



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Interconnected Surface Water Monitoring Network — **Figure 3-6**

Groundwater Sustainability Plan
Bowman Subbasin

3.2.5.3 Path to Achieve and Maintain the Sustainability Goal

No MOs have been established for this indicator due to extensive data gaps which are discussed in **Section 3.7.8.7**. For the interim, MOs for the chronic lowering of groundwater elevations will be used as a proxy for interconnected surface waters. Wells within one mile of interconnected surface water features will be used for monitoring groundwater levels.

3.2.5.4 Impact of Selected Measurable Objectives on Adjacent Basins

No MOs have been established for this indicator due to extensive data gaps which are discussed in **Section 3.7.8.7**. For the interim, MOs for the chronic lowering of groundwater elevations will be used as a proxy for interconnected surface waters. Wells within one (1) mile of interconnected surface water features will be used for monitoring groundwater levels. As data gaps are bridged and more data becomes available, the GSA will continue to evaluate the MOs and their potential impacts on adjacent subbasins.

3.3 Minimum Thresholds (*Reg. § 354.28)*

The regulations define undesirable results as occurring when significant and unreasonable effects are caused by groundwater conditions occurring throughout the Plan area for a given sustainability indicator. Significant and unreasonable effects occur when MTs are exceeded for one or more sustainability indicators. Minimum thresholds refer to a numeric value for each sustainability indicator used to define undesirable results. A GSP must establish MTs that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site. The numeric value used to define the MTs shall represent a point in the Subbasin that, if exceeded may cause significant and unreasonable undesirable results. A GSA may establish a representative MTs, such as groundwater elevation (GWE) to serve as the value for multiple sustainability indicators, if the GSA can demonstrate the representative value is a reasonable proxy for multiple individual MTs, as supported by adequate evidence. Minimum thresholds are not required for sustainability indicators that are not present and not likely to occur in the Subbasin.

The description of MTs shall include the following:

1. The information and criteria relied upon to establish and justify the MTs for each sustainability indicator. The justification for the MTs shall be supported by information provided in the basin setting, and other data or models as appropriate and qualified by uncertainty in the understanding of basin setting.
2. The relationship between the MTs for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each MTs will avoid undesirable results from each sustainability indicator.
3. How MTs have been selected to avoid causing undesirable results in adjacent basins or affecting adjacent basin's ability to achieve sustainability goals.
4. How MTs may affect the interests of beneficial users and users of groundwater or land uses and property interests.
5. How state, federal, or local standards relate to the relevant sustainability indicator. If the MTs differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.
6. How each MTs will be quantitatively measured, consistent with the monitoring network requirements.

3.3.1 Minimum Thresholds for Chronic Lowering of Groundwater Elevations

3.3.1.1 Description of Minimum Threshold

Groundwater levels will be measured at existing or new monitoring wells to gauge if MTs are being met. The groundwater level monitoring will be conducted in accordance with the monitoring plan outlined in Section 3.11. Furthermore, the groundwater level monitoring will meet the requirements of the technical and reporting standards included in the GSP regulations. As noted in Section 3.11, the current groundwater monitoring network includes four (4) wells in the Upper Aquifer and three (3) well in the Lower Aquifer (**Figure 3-2 and Figure 3-3**).

The GSP regulations provide that the "MTs for chronic lowering of groundwater elevations shall be the groundwater level indicating a depletion of supply at a given location that may lead to undesirable results." Chronic lowering of groundwater elevations in the Subbasin cause significant and unreasonable declines if they are sufficient in magnitude to lower the rate of production of pre-existing groundwater wells below that necessary to meet the minimum required to support overlying beneficial use(s) where alternative means of obtaining sufficient water resources are not technically or financially feasible. In addition, GWEs will be managed at levels above the MTs to ensure the major aquifers in the Subbasin are not depleted in a manner to cause significant and unreasonable impacts to other sustainability indicators.

The MTs are intended to protect against significant and unreasonable levels of chronic groundwater storage declines, water quality degradation, subsidence in areas where critical infrastructure is located. These MTs are also being utilized as initial MTs for interconnected surface waters and are intended to protect against negative impacts to GDEs and the depletion of interconnected surface waters. The development of MTs for chronic lowering of groundwater elevations included a review of historical groundwater levels and the projected water levels trends in 2042. Minimum thresholds were established based on these historical and projected data and the GSA's consideration of undesirable results. The MTs for chronic lowering of groundwater elevations are based on documented screen intervals of key wells located both in the upper and lower aquifers in the Subbasin. The MTs were set to the following:

- Upper Aquifer: Spring groundwater elevation where less than 10 - 20% (on average) of domestic wells could potentially be impacted.
- Lower Aquifer: Spring groundwater elevation minus 20 to 120 feet

RMS wells and the subsequent MTs are listed in **Table 3-7 and Table 3-8**. Groundwater level hydrographs from which the MTs were developed are provided in **Appendix 3-B.**

Table 3-7. Minimum Thresholds and Interim Milestones for the Chronic Lowering of Water Elevations – Upper Aquifer

WELL NAME	SWN	INTERIM MILESTONE 5 YEARS (FT NAVD88)	INTERIM MILESTONE 10 YEARS (FT NAVD88)	INTERIM MILESTONE 15 YEARS (FT NAVD88)	MEASURABLE OBJECTIVE (FT NAVD88)	MINIMUM THRESHOLD (FT NAVD88)
Bow-1U	29N03W18M001M	391.7	389.9	388.1	386.3	318.5
Bow-2U	29N04W28D001M	399.1	397.8	396.4	395.1	372.5
Bow-3U	29N05W33A004M	490.9	488.9	486.9	484.9	419.6
Bow-4U	28N04W04P001M	412.2	409.7	407.3	404.8	377.5

Table 3-8. Minimum Threshold and Interim Milestones for the Chronic Lowering of Water Elevations - Lower Aquifer

WELL NAME	SWN	INTERIM MILESTONE 5 YEARS (FT NAVD88)	INTERIM MILESTONE 10 YEARS (FT NAVD88)	INTERIM MILESTONE 15 YEARS (FT NAVD88)	MEASURABLE OBJECTIVE (FT NAVD88)	MINIMUM THRESHOLD (FT NAVD88)
Bow-5L	29N03W21	342.6	341.2	339.9	338.5	294.0
Bow-6L	29N04W20A002M	400.9	399.4	398.0	396.6	351.8
Bow-7L	29N05W21H001M	472.1	467.5	462.8	458.2	417.6

3.3.1.2 Quantitative Measurement

The quantitative measurement for chronic lowering of groundwater elevations will be the annual spring measurements taken at the RMS wells. The data obtained will be appended to existing data to generate hydrographs for the wells. These hydrographs will be analyzed for changing trends in water elevations and compared to established MTs to ensure they are not exceeded.

3.3.1.3 Existing Local, State, or Federal Standards

No federal, other state, or local standards exist for chronic lowering of groundwater elevations.

3.3.1.4 Avoidance of Undesirable Results

A prolonged period of extracting groundwater greater than the sustainable yield can cause chronic lowering of groundwater elevations in the Subbasin and could cause an undesirable result in the future. Impacts of declining groundwater levels would be considered undesirable results if 25% or more of the RMS wells are below the MTs for two (2) consecutive annual spring measurements. Effects of the Beneficial Uses and Users of Groundwater

The primary detrimental effect to beneficial users from allowing a multi-year (more than two (2) years m in 25% or more of the RMS wells) exceedance would be loss of well capacity, increased costs due to higher pumping lifts, lack of groundwater extraction due to groundwater levels declining below the pump setting, or subsidence impacts on well structures and above ground infrastructure.

3.3.2 Minimum Thresholds for Reduction in Groundwater Storage

3.3.2.1 Description of Minimum Threshold

GSP Regulation §354.28 (c)(2) states that the MTs for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be calculated based on historical trends, water year type and projected water use in the Subbasin. Reduction in groundwater storage is not a parameter that can be directly measured; rather, change in storage is calculated from change in groundwater levels and aquifer material storage coefficients. Change in groundwater storage will be regularly estimated based on either the Subbasin water budget or monitoring results derived from analysis of groundwater elevations and aquifer properties. The MTs for groundwater storage is set to the amount of groundwater storage when groundwater elevations are at their measurable objective.

3.3.2.2 Quantitative Measurement

The MTs for reduction in groundwater storage is a single value of average groundwater elevation over the entire Subbasin. Therefore, the potential conflict between MTs at different locations in the Subbasin is not applicable. The reduction in groundwater storage MTs was selected to avoid undesirable results for other sustainability indicators as outlined below:

1. Chronic lowering of groundwater elevations. Since groundwater elevation will be used for estimating changes in groundwater storage, the reduction in groundwater storage would not cause undesirable results for this sustainability indicator.

2. Degraded water quality. Exceedances of the MTs for declines in groundwater storage is not expected to lead to a degradation of groundwater quality.
3. Subsidence. Future average groundwater levels and changes in long-term aquifer storage will be stable and will not induce any additional subsidence within the Subbasin.
4. Interconnected surface water. Groundwater elevations will also be used for interconnected surface waters for the interim. Therefore, the MTs for groundwater storage is not anticipated to cause undesirable results for this indicator. The GSA will work to bridge the data gaps for this indicator and continue to reassess any potential impacts from the storage MTs.

Groundwater levels will be measured at existing and new monitoring wells. The groundwater level monitoring will be conducted in accordance with the monitoring plan outlined in Section 3.11. Furthermore, the groundwater level monitoring will meet the requirements of the technical and reporting standards included in the SGMA regulations. As noted in Section 3.11, the current groundwater monitoring network includes four (4) wells in the Upper Aquifer and three (3) well in the Lower Aquifer. The change in groundwater elevations from year to year will be determined and multiplied by the storage coefficients associated with the specific aquifer being measured and multiplied by the areal extent of the Subbasin to derive the annual change in storage.

3.3.2.3 Existing Local, State, or Federal Standards

No federal, other state, or local standards exist for reduction in groundwater storage.

3.3.2.4 Avoidance of Undesirable Results

A prolonged period of extracting groundwater in excess of the sustainable yield can cause groundwater storage declines when coupled with reductions in imported water supplies and could lead an undesirable result in the future. Conditions that may lead to an undesirable result include the following:

- Over-pumping of groundwater. High rates of extractions from the aquifers can cause excessive drawdowns that can lead to undesirable results by dropping monitoring well levels below the MTs.
- Extensive, unanticipated drought and associated drastic curtailments of imported surface water supplies. Minimum thresholds were established based on historical groundwater elevation and reasonable estimates of future groundwater elevations. Extensive, unanticipated droughts and associated curtailment of imported water supplies will likely lead to excessively low groundwater elevations and undesirable results.

3.3.2.5 Effects of the Beneficial Uses and Users of Groundwater

The practical effect of the reduction in groundwater storage undesirable result encourages no net change in groundwater elevation and storage during long-term average hydrologic conditions. Therefore, during average, long-term hydrologic conditions, beneficial uses, and users will have access to the same amount of groundwater in storage that currently exists, and the undesirable result will not have a significant negative effect on the beneficial users and uses of groundwater. Pumping during dry years will temporarily lower groundwater elevations, reduce the amount of groundwater in storage and could result in short-term impacts from a reduction in groundwater in storage on all beneficial uses and users of groundwater. However, the GSP is designed to promote conjunctive use in the Subbasin and acknowledges the sustainable yield as an average value that can experience annual variations in storage.

3.3.3 Minimum Thresholds for Subsidence

3.3.3.1 Description of Minimum Threshold

GSP regulations state that the MTs for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Information used to establish the land subsidence MTs include:

- Historical land surface elevation data from GPS locations in the Subbasin and satellite imagery of subsidence.

Subsidence monitoring in and adjacent to the Subbasin includes different data collection programs:

- PBO UNAVCO continuous subsidence monitoring stations
- 2017 GPS survey of the Sacramento Valley Subsidence Network (DWR)
- InSAR satellite-based subsidence monitoring

Data collected by the programs listed above was evaluated against water levels observed at the monitoring network wells. The compiled data was also compared to observe historical trends against current conditions. This analysis showed that the Subbasin had experienced minimal levels of subsidence historically and there was no indication of changes in that trend in current conditions. Past subsidence is likely elastic. Minimum thresholds were set at InSAR pixel locations near water level monitoring network wells based on these trends. The InSAR pixel MTs was established by calculating the vertical displacement from June 2015 to September 2019 and doubling the value. These pixels and their corresponding monitoring wells are depicted in **Figure 3-4**. InSAR vertical displacement data is currently provided by DWR. The GSP anticipates that DWR will continue to provide this data in the future for use in GSP updates. The MTs for subsidence are set to two feet over 20 years (i.e., no more than 0.5 feet of cumulative subsidence over a five (5)-year period (beyond the measurement error), solely due to lowering of groundwater elevations.

These measurable thresholds are listed in **Table 3-9**.

Table 3-9. Minimum Thresholds and Interim Milestones for Subsidence

INSAR PIXEL	INTERIM MILESTONE 5 YEARS (FT)	INTERIM MILESTONE 10 YEARS (FT)	INTERIM MILESTONE 15 YEARS (FT)	MEASURABLE OBJECTIVE (FT)	MINIMUM THRESHOLD (FT)
DXF1N61	-0.25	-0.5	-0.75	-1.0	-2.0
DXAA6E6	-0.25	-0.5	-0.75	-1.0	-2.0
DWYYXU2	-0.25	-0.5	-0.75	-1.0	-2.0
DWIASYT	-0.25	-0.5	-0.75	-1.0	-2.0
DXNZ5CY	-0.25	-0.5	-0.75	-1.0	-2.0
DXI0T98	-0.25	-0.5	-0.75	-1.0	-2.0
DXFN2X3	-0.25	-0.5	-0.75	-1.0	-2.0

3.3.3.2 Quantitative Measurement

The quantitative metric for assessing compliance will be to continue to use vertical displacement data from InSAR at the individual pixels (**Table 3-9**) which will be downloaded annually. This data will be appended to existing data and plotted. Both quantitative and qualitative assessments of the data will be performed to assess if any trends are apparent, and if the annual subsidence is greater than the MTs.

3.3.3.3 Existing Local, State, or Federal Standards

No federal, other state, or local standards exist for currently exist for subsidence reduction.

3.3.3.4 Avoidance of Undesirable Results

Undesirable results are considered to occur at a 50% exceedance of a MTs over a five (5)-year period that is irreversible and is caused by lowering of groundwater elevations.

Conditions that may lead to an undesirable result of a significant and unreasonable amount for land subsidence arise due to groundwater extraction that causes reductions in the viability of the use of water conveyance and flood control infrastructure over the planning and implementation horizon of this GSP.

3.3.3.5 Effects of the Beneficial Uses and Users of Groundwater

The subsidence MTs are set to prevent subsidence that could lead to significant and unreasonable results. Unchecked subsidence can impact critical water conveyance and flood control infrastructure. Damages to water conveyance systems impacts all agricultural and urban users retrieving water from such systems. The impact is primarily manifested in increased cost and loss of flexibility in water conveyance operations. Higher levels of subsidence can also damage public infrastructure such as roadways and highways causing impacting populations outside of immediate beneficial users. Damages such as these can result in costly repairs and long-term traffic issues. Subsidence also has the capacity to increase flooding by causing damage to flood control infrastructure and creation of low elevation land. Potential impact on residents in flood prone areas may cause extensive financial hardships to those affected.

3.3.4 Minimum Thresholds for Groundwater Quality

3.3.4.1 Description of Minimum Threshold

The MTs for degraded water quality is protective of existing and potential beneficial uses and users in the Subbasin. SGMA's water quality objective focuses on a constituent's contribution due to activities at the land surface rather than on the presence of naturally occurring constituents. Based on the review of groundwater quality in Chapter 2, the constituent of concern for beneficial users in the Subbasin is TDS. TDS is being monitored as an overall indicator of groundwater quality within the Subbasin. The basis for establishing a MTs is to minimize the additional contribution and migration of high concentrations of TDS. The MTs for TDS is 750 milligrams per liter (mg/L). This threshold is lower than the California State Water Resources Control Board (SWRCB) upper secondary maximum containment level (SMCL) of 1,000 mg/L as set by SWRCB for taste and odor. Minimum thresholds for all wells are summarized in **Table 3-10.**

Table 3-10. Minimum Thresholds, Measurable Objectives, and Interim Milestones for Groundwater Quality

WELL NAME	INTERIM MILESTONE 5 YEARS (TDS MG/L)	INTERIM MILESTONE 10 YEARS (TDS MG/L)	INTERIM MILESTONE 15 YEARS (TDS MG/L)	MEASURABLE OBJECTIVE (TDS MG/L)	MINIMUM THRESHOLD (TDS MG/L)
Bow-1U	225.5	317.0	408.5	500.0	750.0
Bow-2U	TBD	TBD	TBD	500.0	750.0
Bow-3U	256.5	337.5	418.5	500.0	750.0
Bow-4U	245.5	330.5	415.5	500.0	750.0

3.3.4.2 Quantitative Measurement

Groundwater quality will be monitored on an annual basis at representative monitoring wells (listed in **Table 3-10**). All measurements will comply with the Sampling and Analysis Plan and Quality Project Plan and be recorded in the GSA's data management system. The monitoring network and monitoring protocols are described in **Section 3.11** (Monitoring Network and Monitoring Protocols for Data Collection). **Table 3-10** includes each well being monitored in the GSP monitoring program for groundwater quality, along with the MTs, measurable objective, and interim milestones. The MTs of 750 milligrams per liter (mg/L) are tolerable for most crops grown in the Subbasin without blending with surface water supplies. However, the GSA will continue to monitor TDS concentrations and changes in spatial or temporal trends to ensure MTs are not being exceeded and undesirable results are not being experienced by beneficial users.

3.3.4.3 Existing Local, State, or Federal Standards

The MTs for TDS is based on current background data in the Subbasin and set at 750 mg/L. This threshold is lower than the SWRCB upper secondary maximum containment level (SMCL) set by SWRCB for taste and odor of 1,000 mg/L.

3.3.4.4 Avoidance of Undesirable Results

Undesirable results will have occurred when:

- at least 25% of RMS exceed the MTs for water quality for two (2) consecutive years at each well where it can be established that GSP implementation is the cause of the exceedance

Changes in land use practices involving increased leaching of TDS into the groundwater system or increased extractions leading to dropping water levels and migrations of elevate TDS waters can lead to undesirable results. Through the monitoring network, the GSA aims to prevent such outcomes by analyzing long-term trends in water quality and deploying appropriate projects and managements to mitigate or deter undesirable results.

3.3.4.5 Effects of the Beneficial Uses and Users of Groundwater

The effect of degraded groundwater quality on agricultural beneficial users is manifested in crop damage and reduced yields, and a reduction in the use of land for irrigated agriculture if the sole water supply is groundwater.

Urban and domestic beneficial uses are impacted if degraded water is the only source for potable use. The impacts include the need to use alternative sources of water that may be more expensive than groundwater and potential undesirable aesthetic qualities without pre-treatment of the degraded water prior to use.

3.3.5 Minimum Thresholds for Interconnected Surface Water Depletions

3.3.5.1 Description of Minimum Threshold

Minimum thresholds are interim and will be the same water levels used in for the chronic lowering of groundwater elevations described in **Section 3.3.1.1.** Extensive data gaps are discussed in **Section 3.7.8.7.** The GSA will continue to evaluate new monitoring information and determine these thresholds later. For the interim, MTs for the chronic lowering of groundwater elevations will be used as a proxy for interconnected surface waters. Wells within one mile of interconnected surface water features will be used. The MTs are summarized in **Table 3-11**.

Table 3-11. Initial Minimum Thresholds and Interim Milestones for Interconnected Surface Water Depletions

WELL NAME	SWN	INTERIM MILESTONE 5 YEARS (FT NAVD88)	INTERIM MILESTONE 10 YEARS (FT NAVD88)	INTERIM MILESTONE 15 YEARS (FT NAVD88)	MEASURABLE OBJECTIVE (FT NAVD88)	MINIMUM THRESHOLD (FT NAVD88)
Bow-1U	29N03W18M001M	391.7	389.9	388.1	386.3	318.5
Bow-2U	29N04W28D001M	399.1	397.8	396.4	395.1	372.5
Bow-3U	29N05W33A004M	490.9	488.9	486.9	484.9	419.6
Bow-4U	28N04W04P001M	412.2	409.7	407.3	404.8	377.5

3.3.5.2 Quantitative Measurement

No MTs have been established for this indicator due to data gaps. For the interim, MTs for the chronic lowering of groundwater elevations will be used as a proxy for interconnected surface waters. Wells within one mile of interconnected surface water features will be used.

3.3.5.3 Existing Local, State, or Federal Standards

No current local, other state, or federal standards currently exist for this indicator.

3.3.5.4 Avoidance of Undesirable Results

Undesirable results have not been established for this indicator due to data gaps. For the interim, MTs for the chronic lowering of groundwater elevations will be used as a proxy for interconnected surface waters. Wells within one (1) mile of interconnected surface water features will be used.

3.3.5.5 Effects of the Beneficial Uses and Users of Groundwater

No MTs have been established for this indicator due to data gaps. For the interim, MTs for the chronic lowering of groundwater elevations will be used as a proxy for interconnected surface waters. Wells within one mile of interconnected surface water features will be used.

3.3.6 Relationship Between the Established Minimum Threshold and Sustainability Indicator(s)

The monitoring sites described in **Tables 3- 2** through **Table 3-9** are in locations that reflect a wide cross section of Subbasin groundwater conditions. These locations are representative of the overall Subbasin conditions because they are spatially distributed throughout the Subbasin both vertically (across the upper and lower aquifers) and laterally. The GSA determined that use of the minimum elevation thresholds at each of the listed wells will help avoid the undesirable results of chronic lowering of groundwater elevations because it should preserve access to adequate water resources for beneficial users within the Subbasin.

Groundwater elevation MTs can influence other sustainability indicators. The groundwater elevation MTs were selected to avoid undesirable results for other sustainability indicators.

1. Change in groundwater storage. A significant and unreasonable condition for change in groundwater storage is a decrease in the total volume of groundwater that can be withdrawn without causing undesirable results. The sustainable yield of the Subbasin can be affected by excess pumping leading to the chronic lowering of groundwater elevations. Minimum thresholds have been set at levels to avoid a decline in sustainable yield. This Subbasin has not yet been fully developed and MTs reflect this lack of development. However, the MTs also account for the maintenance of groundwater storage.
2. Degraded water quality. Preserving groundwater quality is important to the groundwater resource. A significant and unreasonable condition of degraded water quality is exceeding regulatory limits for constituents of concern in groundwater due to actions proposed in the GSP. Water quality could be affected by low groundwater elevations if they caused deeper, poor-quality groundwater (saline groundwater located below the base of freshwater) to flow upward into existing wells.
3. Subsidence. A significant and unreasonable condition for subsidence is any measurable permanent subsidence that results in severe impacts to the operations of existing infrastructure to a degree that would require design and construction projects to mitigate the impact. Subsidence is caused by dewatering and compaction of clay-rich sediments in response to lowering groundwater levels. Continued exceedances of water level MTs could result in subsidence over time. Minimum thresholds have been established based on historical data and GSA consideration of unreasonable and significant results and are not expected to lead to increased levels of subsidence.
4. Depletion of interconnected surface waters. Due to data gaps, MTs for interconnected surface waters have been established at groundwater level monitoring wells within one (1) mile of these sites. Chronic lowering of groundwater can sever the connection between groundwater and surface water. Water level declines can also result in the depletion of these surface waters. Interim MTs have been established at groundwater level monitoring sites in the vicinity of interconnected surface waters. Once data gaps are filled, MTs will be established at new monitoring sites to prevent undesirable results.

3.3.7 Minimum Thresholds Impacts to Adjacent Basins

The MTs established at the Bowman Subbasin are not expected to impact the surrounding subbasins. The county is also developing the GSP for Red Bluff and the MTs in that subbasin were developed in conjunction with those in Bowman. Furthermore, the MTs for Bowman were compared to those for the Anderson subbasin, and the established minimum thresholds are similar to those developed for Anderson. Bowman and its adjacent subbasins are accounted for when establishing MTs. Due to this interconnectedness and

comparison of the GSPs, MTs in Bowman are not likely to have adverse impacts on adjacent subbasins. Instead, the co-development of the GSPs will result in cooperative sustainability goals.

3.3.8 Minimum Thresholds Impacts on Beneficial Users

The MTs established for the sustainability indicators that are present in the Subbasin may have several effects on beneficial users and land use in the Subbasin. The Bowman Subbasin has not been fully developed and its extraction potential has yet to be realized. Therefore, although in some cases MTs may be set at water levels not previously experienced in the Subbasin, they are not anticipated to cause adverse impacts to most sectors.

Historical water level trends, future water level projections, and domestic well water levels were all considered when establishing MTs. No more than 20% of Upper aquifer wells are expected to go dry under MTs conditions set for the Upper aquifer This impact does not apply to the MTs set for the lower aquifer. If MTs are met for two (2) consecutive year readings, PMAs will be triggered to raise water levels.

3.4 Undesirable Results *(Reg. § 354.26)*

According to GSP Regulations, the GSP's description of undesirable results is to include the following:

1. The cause of groundwater conditions occurring throughout the basin that would lead to or has led to the undesirable results based on information described in the basin setting, and other data or models as appropriate.
2. The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of MTs exceedances that cause significant and unreasonable effects in the basin.
3. Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.

Under SGMA, undesirable results occur when the effects caused by groundwater conditions occurring throughout the basin cause significant and unreasonable impacts from any of the six (6) sustainability indicators on beneficial users of groundwater. That is "significant and unreasonable occurrence of any of the six (6) sustainability indicators constitutes an undesirable result". These sustainability indicators are:

1. Chronic lowering of groundwater elevations,
2. Reduction of groundwater storage,
3. Seawater intrusion,
4. Degraded water quality,
5. Land subsidence, and
6. Depletion of interconnected surface water

A summary of criteria used to define undesirable results is provided below in **Table 3-12**, and detailed discussion of each sustainability indicator is provided in subsequent sections of this chapter.

Table 3-12. Summary of Minimum Thresholds, Measurable Objectives, and Undesirable Results

SUSTAINABILITY INDICATOR	MINIMUM THRESHOLD	MEASURABLE OBJECTIVE	UNDESIRABLE RESULT
Chronic Lowering of Groundwater Elevations	**Upper Aquifer:** Spring groundwater elevation where less than 10% or less than 20% of domestic wells could potentially be impacted. **Lower Aquifer:** Spring groundwater elevation minus 20 to 120 feet	**Upper & Lower Aquifer:** Spring 2015 groundwater elevation minus 5 feet (for wells with increasing or no groundwater trends) or projected Spring 2042 groundwater elevation minus 5 feet for wells with declining groundwater elevations	25% of groundwater elevations measured at same RMS wells exceed the associated MTs for 2 consecutive measurements.
Reduction of Groundwater Storage	**Upper & Lower Aquifer:** Amount of groundwater in storage when groundwater elevations are at their MTs	**Upper & Lower Aquifer:** Amount of groundwater storage when groundwater elevations are at their measurable objective	Same as chronic lowering of groundwater levels
Land Subsidence	Two feet over 20 years (i.e., no more than 0.5 feet of cumulative subsidence over a five-year period (beyond the measurement error), solely due to lowering of groundwater elevations	One foot over 20 years (Zero inelastic subsidence, in addition to any measurement error). If InSAR data are used, the measurement error is 0.1 feet and any measurement 0.1 feet or less would not be considered inelastic subsidence	50% of RMS exceed the MTs over a 5-year period that is irreversible and is caused by lowering of groundwater elevations
Seawater Intrusion	Not Applicable	Not Applicable	Not Applicable
Degraded Water Quality	**Upper & Lower Aquifer:** TDS concentration of 750 mg/L at all RMS wells	**Upper & Lower Aquifer:** California lower limit secondary MCL concentration for TDS of 500 mg/L measured at RMS wells	At least 25% of RMS exceed the MTs for water quality for 2 consecutive years at each well where it can be established that GSP implementation is the cause of the exceedance
Depletion of Interconnected Surface Water	Same as chronic lowering of groundwater levels (Initial)	Same as chronic lowering of groundwater levels (Initial)	25% of groundwater elevations measured at RMS wells drop below the associated threshold during 2 consecutive years in the Upper Aquifer.

3.4.1.1 Groundwater Elevation

Significant and unreasonable levels of the chronic lowering of groundwater elevations is defined as a fraction of the groundwater elevations measured in the GSP monitoring well network that are less than the MTs values. For the Bowman Subbasin, this fraction is estimated as 25% of groundwater elevations measured at same RMS wells exceed the associated MTs for two (2) consecutive measurements.

3.4.1.2 Groundwater Storage

Undesirable results for the levels of groundwater storage would occur when 25% of groundwater elevations measured at same RMS wells exceed the associated MTs for two (2) consecutive measurements. For the Bowman Subbasin, this exceedance will result significant and undesirable levels of groundwater level declines that could impact the use of existing wells and beneficial users of groundwater. The significant and unreasonable decline in storage would result in limiting the volume of groundwater available for agriculture, municipal, industrial, and domestic uses without any PMAs to mitigate the impact by new and deeper wells.

3.4.1.3 Subsidence

For the Bowman Subbasin, historical data indicates minimal levels of subsidence has occurred and this trend has not changed when analyzing current conditions. Therefore, undesirable results are considered to occur at a 50% of RMS exceed the MTs over a five (5)-year period that is irreversible and is caused by lowering of groundwater elevations.

3.4.1.4 Groundwater Quality

Water quality degradation will lead to an undesirable result when at least 25% of RMS wells exceed the MTs for water quality for two (2) consecutive years at each well where it can be established that GSP implementation is the cause of the exceedance. This result will be considered unreasonable and significant if it causes reduction in the long-term viability of domestic, agriculture, municipal wells, or environmental uses over the planning and implementation of the GSP.

3.4.1.5 Interconnected Surface Waters

Initial undesirable results for depletion of interconnected surface water were developed for this GSP due to data gaps. These interim undesirable results mirror those established for chronic lowering of groundwater elevations. Therefore, undesirable results will occur when 25% of groundwater elevations measured at RMS wells drop below the associated threshold during two (2) consecutive years in the Upper Aquifer. Potential Effects on the Beneficial Users of Groundwater

For agricultural beneficial users of groundwater, the most significant undesirable results are groundwater levels, groundwater storage, groundwater quality, and subsidence. The undesirable results for interconnected surface waters will not have a direct impact on agriculture. Undesirable results for any of the sustainability indicators of concern will limit the ability of agricultural users to extract groundwater and irrigate crops.

For domestic beneficial users of groundwater, the most significant undesirable results are groundwater levels, groundwater storage, and groundwater quality. Undesirables results for any of these three (3) sustainability indicators could potentially restrict the ability of households to use water for domestic purposes. Subsidence and interconnected surface waters will not have direct impact on domestic users.

For environmental beneficial uses of groundwater in the Subbasin, the most significant undesirable results are subsidence and the depletion of interconnected surface water. Significant subsidence can damage flood control infrastructure which can cause damage to the surrounding environment through landslides and soil loss. The depletion of interconnected surface waters could damage groundwater dependent ecosystems and other vegetation and native species reliant on these surface water sources.

3.5 Management Areas

Management areas have not been established in the Subbasin.

3.6 Monitoring Network

This section describes the proposed monitoring network, including GSA monitoring objectives monitoring protocols, and data reporting requirements. This section has been prepared in accordance with GSP Regulations. The monitoring network has been developed to collect enough data to characterize groundwater and related surface water conditions in the Subbasin and evaluate changing conditions and GSP implementation. The monitoring network has been designed to collect data to allow for the analysis of short- and long-term trends, seasonal variations and estimate annual changes in aquifer storage. The monitoring sites have been distributed across the Subbasin to provide a comprehensive analysis of current and ongoing conditions within the plan area. This widespread distribution coupled with the monitoring frequency will allow the GSA to chart its progress towards the established sustainability goals and ensure real time tracking of any impacts on beneficial users. Specifically, the monitoring program will allow the GSA to quantify changes in groundwater storage, elevations, and quality and assess the efficacy of any implemented management programs. This data will facilitate changes to management programs to maintain continued progress towards the GSA's sustainability objectives.

The GSP regulations require monitoring networks to be developed to promote the collection of a data set of enough quality, frequency, and spatial distribution to characterize groundwater and related surface water conditions in the Subbasin and to evaluate changing conditions that occur through implementation of the GSP. The monitoring network should accomplish the following:

- Demonstrate progress towards achieving MOs described in the GSP;
- Monitor impacts to the beneficial uses and users of groundwater;
- Monitor changes in groundwater conditions relative to MOs and MTs; and
- Quantify annual changes in water budget components

The MTs and MOs for the network are described above.

GSP regulations require that if management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the Subbasin setting sustainable management criteria specific to that area. At this time, management areas have not been defined for the Subbasin. If management areas are developed in the future, the monitoring network will be reevaluated to ensure that there is sufficient monitoring to evaluate conditions.

3.6.1 Description of Monitoring Network (*Reg. § 354.34*)

The GSP monitoring network is composed of aquifer specific wells that are screened in the Upper or Lower Aquifers. The network will not include composite wells that span both the Upper and Lower aquifers. The network will enable the collection of data to assess sustainability indicators, the effectiveness of PMAs to achieve sustainability and evaluate the MOs of each applicable sustainability indicator (i.e., chronic

lowering of groundwater elevations, reduction in groundwater storage, degraded water quality, land subsidence, interconnected surface water depletion). The Subbasin is isolated from the Pacific Ocean; therefore, this GSP does not provide monitoring for seawater intrusion sustainability indicators.

Within the Bowman Subbasin, 33 monitoring wells were found to have water level data. However, for the purposes of the GSP monitoring program, a subset of these wells was identified that represent geographical variation along with a historical data record if possible. This effort resulted in the selection of four (4) wells in the Upper Aquifer and three (3) well in the Lower Aquifer as documented in **Table 3-13** (the selection process is described further below). The GSA has complete well construction information for these wells, which allows the GSA to determine the aquifer being monitored with certainty. Furthermore, composite wells that span both the upper and lower aquifers were not selected for this GSP monitoring program to provide aquifer specific data. The same representative monitoring wells were selected as part of the groundwater quality monitoring network **(Table 3-13).** As previously described in this Chapter, subsidence monitoring will be conducted using InSAR satellite data. Six (6) pixels from the satellite data have been selected for subsidence monitoring. Currently, the groundwater level monitoring network is serving as a proxy for interconnected surface waters, using only wells within 1 mile of the sites of concern. This proxy network was established due to extensive data gaps in the availability of monitoring sites. This data gap is discussed further in Section 3.7.8.7.

These wells are distributed throughout the Bowman Subbasin to provide ample coverage of the entire area. This coverage allows for the collection of data to evaluate groundwater gradients and flow directions over time and the annual change in storage. Furthermore, the monitoring frequency of the wells will allow for the monitoring of seasonal highs and lows. Because wells were chosen with the existing length of historical data record in mind, future groundwater data will be able to be compared to historical data.

Table 3-13. Proposed Monitoring Network

WELL NAME	LATITUDE	LONGITUDE	AQUIFER	GROUNDWATER ELEVATION	GROUNDWATER STORAGE	GROUNDWATER QUALITY	SUBSIDENCE	INTER-CONNECTED SW
Bow-1U SWN: 29N03W18M001M	40.3672	-122.255	Upper	X	X	X		X
Bow-2U SWN: 29N04W28D001M	40.345354	-122.332	Upper	X	X	X		X
Bow-3U SWN: 29N05W33A004M	40.329012	-122.426	Upper	X	X	X		X
Bow-4U SWN: 28N04W04P001M	40.304065	-122.323	Upper	X	X	X		X
Bow-5L SWN: 29N03W21	40.354478	-122.212	Lower	X	X			
Bow-6L SWN: 29N04W20A002M	40.358539	-122.334	Lower	X	X			
Bow-6L SWN: 29N05W21H001M	40.353213	-122.43	Lower	X	X			
DXF1N61	40.3534	-122.4278					X	
DXAA6E6	40.3462	-122.3314					X	
DWYYXU2	40.3291	-122.4267					X	
DWIASYT	40.3039	-122.3235					X	
DXNZ5CY	40.3669	-122.2544					X	
DXI0T98	40.3579	-122.3337					X	
DXFN2X3	40.3543	-122.2124					X	

3.6.2 Groundwater Elevation Monitoring Network

The MTs and MOs for the chronic lowering of groundwater elevations sustainability indicator are evaluated by monitoring groundwater levels. The SGMA GSP Regulations require a network of monitoring wells to demonstrate groundwater occurrence, flow direction and hydraulic gradients between principal aquifer and surface water features.

The objectives of the groundwater level monitoring program include the following:

- Improve the understanding of the occurrence and movement of groundwater; monitor local and regional groundwater levels including seasonal and long-term trends; and identify vertical hydraulic head differences in the aquifer system and aquifer-specific groundwater conditions, especially in areas where short-term and long-term development of groundwater resources are planned;
- Detect the occurrence of, and factors attributable to, natural recharge (e.g., direct infiltration of precipitation), irrigation, and surface water seepage to groundwater or recharge project and management actions (recharge basins, aquifer storage and recovery) that affect groundwater levels and trends;
- Identify appropriate monitoring sites to further evaluate groundwater-surface water interaction, and recharge/discharge mechanisms, including whether groundwater utilization is affecting surface water flows;
- Establish a monitoring network to aid in the assessment of changes in groundwater storage; and
- Generate data to better estimate groundwater basin conditions and assess local current and future water supply availability and reliability; update analyses as additional data become available.

Figures 3-2 and **3-3** illustrate the locations of the wells selected for monitoring of groundwater levels in the upper and lower aquifers, respectively. **Tables 3-14** and **3-15** list the well identification, location, monitoring frequency, well construction data (which includes well depth, perforation intervals, and ground surface elevation (GSE)), and measurement years, and number of measurements for the Upper and Lower Aquifer, respectively.

In order to assist local agencies with the preparation of their GSP's, DWR released a series of best management practices (BMPs). The BMPs document for monitoring networks provides guidance on determining an appropriate number of monitoring wells. The method developed by Hopkins (1984) was applied to the Bowman Subbasin. This methodology states that for districts pumping more than 10,000 ac-ft/yr per 100 square miles, they should have one (1) monitoring wells for every 25 square miles. The Bowman Subbasin is approximately 192 square miles, yielding one (1) monitoring well at the minimum per aquifer. Additional wells were added based on informational needs resulting from PMAs and historical trends in groundwater levels.

After computing the appropriate number of monitoring wells for the Subbasin based on the Hopkins method, a hexagonal tessellation was generated in ArcPro for the Bowman and three (3) nearby subbasins (Antelope, Los Molinos, and Red Bluff) **(Figure 3-1)**. Portions of eight (8) different hexagons overlapped with the Bowman Subbasin.

All available wells with complete construction data and aquifer assignment were then mapped onto this grid. Water level data from each well was evaluated on the following criteria:

- evidence of recent monitoring
- length of historical record
- overlap with model timeframe

The wells were then plotted against the hexagons and each hexagon was examined separately for both the upper and lower aquifers. Wells were selected based on the evaluation criteria listed above. When possible, preference was given to wells that not only met the criteria but were also apart of either the California State Groundwater Elevation Monitoring (CASGEM) or Tehama County Monitoring Network. The final selection of wells for the monitoring network is presented in **Tables 3-14 and 3-15** for the upper and lower aquifers, respectively. The selection rationale for all water level monitoring wells is summarized in **Table 3-16.**

Table 3-14. Groundwater Level Monitoring Well Network – Upper Aquifer

WELL ID	LATITUDE	LONGITUDE	MONITORING FREQUENCY	WELL DEPTH	WELL SCREEN INTERVAL	GROUND SURFACE ELEVATION	FIRST YEAR OF DATA	LAST YEAR OF DATA	YEARS MEASURED	NUMBER OF MEASUREMENTS
Bow-1U SWN: 29N03W18M001M	40.3672	-122.255	Bi-annual (Fall/Spring)	234 (ft, bgs)	N/A (ft, bgs)	418.54	7/7/2004	3/12/2020	17	98
Bow-2U SWN: 29N04W28D001M	40.345354	-122.332	Bi-annual (Fall/Spring)	134 (ft, bgs)	114 - 134 (ft, bgs)	502.54	10/19/1978	3/13/2020	43	113
Bow-3U SWN: 29N05W33A004M	40.329012	-122.426	Bi-annual (Fall/Spring)	210 (ft, bgs)	110 - 210 (ft, bgs)	534.56	9/13/2000	3/13/2020	21	67
Bow-4U SWN: 28N04W04P001M	40.304065	-122.323	Bi-annual (Fall/Spring)	270 (ft, bgs)	200-270 (ft, bgs)	537.54	10/12/1994	3/13/2020	24	60

Table 3-15. Groundwater Level Monitoring Well Network – Lower Aquifer

WELL ID	LATITUDE	LONGITUDE	MONITORING FREQUENCY	WELL DEPTH	WELL SCREEN INTERVAL	GROUND SURFACE ELEVATION	FIRST YEAR OF DATA	LAST YEAR OF DATA	YEARS MEASURED	NUMBER OF MEASUREMENTS
Bow-5L SWN: 29N03W21	40.354478	-122.212	Bi-annual (Fall/Spring)	790 (ft, bgs)	390-406, 490-530, 550-620, 630-650, 670-750 (ft, bgs)	624	3/28/2014	9/22/2020	6	21
Bow-6L SWN: 29N04W20A002M	40.358539	-122.334	Bi-annual (Fall/Spring)	451 (ft, bgs)	360 - 430 (ft, bgs)	451.75	5/22/2007	3/12/2020	14	72
Bow-7L SWN: 29N05W21H001M	40.353213	-122.43	Bi-annual (Fall/Spring)	280 (ft, bgs)	250 - 280 (ft, bgs)	622.55	4/20/2000	3/13/2020	21	60

Table 3-16. Summary of Rationale for Selection for Wells Using Groundwater Levels

SITE	AQUIFER	BASIS FOR SELECTION
Bow-1U SWN: 29N03W18M001M	Upper	Period of record, CASGEM and TC Well
Bow-2U SWN: 29N04W28D001M	Upper	Period of record, CASGEM and TC Well
Bow-3U SWN: 29N05W33A004M	Upper	Period of record, CASGEM and TC Well
Bow-4U SWN: 28N04W04P001M	Lower	Period of record, CASGEM and TC Well
Bow-5L SWN: 29N03W21	Lower	Period of record, CASGEM and TC Well
Bow-6L SWN: 29N04W20A002M	Lower	Period of record, CASGEM and TC Well
Bow-7L SWN: 29N05W21H001M	Lower	Period of record, CASGEM and TC Well

3.6.3 Groundwater Storage Monitoring Network

The objectives of the monitoring program are:

- Use groundwater level data and knowledge of aquifer storage coefficients to calculate changes in groundwater storage.
- Improve the understanding of the occurrence and movement of groundwater.
- Monitor local and regional groundwater levels including seasonal and long-term trends.
- Monitor groundwater levels where projects and s are planned.

Changes in groundwater storage cannot be measured directly, therefore this GSP adopts groundwater levels as a proxy for assessing change in storage, as described previously in Chapter 3. Change in storage will be estimated using the changes of groundwater levels measured at monitoring wells and storage coefficients of aquifer materials. The wells selected for monitoring changes in groundwater storage will be the same wells used for groundwater level monitoring. **Figures 3-2** and **3-3** illustrate the locations of the wells selected for monitoring of groundwater levels for the Upper and Lower Aquifers, respectively. **Tables 3-17** and **3-18** list the well identification, location, monitoring frequency, well construction data, and measurement years, and number of measurements for the Upper and Lower Aquifer, respectively. The same wells for water level monitoring are proposed for groundwater storage monitoring and the selection process and rationale for selection is consistent with section 3.11.1.1 (**Table 3-19**).

Table 3-17. Groundwater Storage Monitoring Network – Upper Aquifer

WELL ID	LATITUDE	LONGITUDE	MONITORING FREQUENCY	WELL DEPTH	WELL SCREEN INTERVAL	GROUND SURFACE ELEVATION	FIRST YEAR OF DATA	LAST YEAR OF DATA	YEARS MEASURED	NUMBER OF MEASUREMENTS
Bow-1U SWN: 29N03W18M001M	40.3672	-122.255	Bi-annual (Fall/Spring)	234 (ft, bgs)	N/A (ft, bgs)	418.54	7/7/2004	3/12/2020	17	98
Bow-2U SWN: 29N04W28D001M	40.345354	-122.332	Bi-annual (Fall/Spring)	134 (ft, bgs)	114 - 134 (ft, bgs)	502.54	10/19/1978	3/13/2020	43	113
Bow-3U SWN: 29N05W33A004M	40.329012	-122.426	Bi-annual (Fall/Spring)	210 (ft, bgs)	110 - 210 (ft, bgs)	534.56	9/13/2000	3/13/2020	21	67
Bow-4U SWN: 28N04W04P001M	40.304065	-122.323	Bi-annual (Fall/Spring)	270 (ft, bgs)	200-270 (ft, bgs)	537.54	10/12/1994	3/13/2020	24	60

Table 3-18. Groundwater Storage Monitoring Network – Lower Aquifer

WELL ID	LATITUDE	LONGITUDE	MONITORING FREQUENCY	WELL DEPTH	WELL SCREEN INTERVAL	GROUND SURFACE ELEVATION	FIRST YEAR OF DATA	LAST YEAR OF DATA	YEARS MEASURED	NUMBER OF MEASUREMENTS
Bow-5L SWN: 29N03W21	40.354478	-122.212	Bi-annual (Fall/Spring)	790 (ft, bgs)	390-406, 490-530, 550-620, 630-650, 670-750 (ft, bgs)	624	3/28/2014	9/22/2020	6	21
Bow-6L SWN: 29N04W20A002M	40.358539	-122.334	Bi-annual (Fall/Spring)	451 (ft, bgs)	360 - 430 (ft, bgs)	451.75	5/22/2007	3/12/2020	14	72
Bow-7L SWN: 29N05W21H001M	40.353213	-122.43	Bi-annual (Fall/Spring)	280 (ft, bgs)	250 - 280 (ft, bgs)	622.55	4/20/2000	3/13/2020	21	60

Table 3-19. Summary of Rationale for Selection for Wells Used for Storage

SITE	AQUIFER	BASIS FOR SELECTION
Bow-1U SWN: 29N03W18M001M	Upper	Period of record, CASGEM and TC Well
Bow-2U SWN: 29N04W28D001M	Upper	Period of record, CASGEM and TC Well
Bow-3U SWN: 29N05W33A004M	Upper	Period of record, CASGEM and TC Well
Bow-4U SWN: 28N04W04P001M	Lower	Period of record, CASGEM and TC Well
Bow-5L SWN: 29N03W21	Lower	Period of record, CASGEM and TC Well
Bow-6L SWN: 29N04W20A002M	Lower	Period of record, CASGEM and TC Well
Bow-7L SWN: 29N05W21H001M	Lower	Period of record, CASGEM and TC Well

3.6.4 Subsidence Monitoring Network

Data from different monitoring programs for subsidence is available for the Bowman Subbasin. These programs include four (4) PBO stations within the vicinity of the Subbasin, 2017 GPS Survey Data from DWR, and InSAR satellite vertical displacement data. None of the PBO stations exist inside the Subbasin so these sites were not selected for the monitoring program. The data collected by DWR showed minor levels of subsidence, but these readings fell within their margin of error of 0.17 ft. These stations were also not included in the final monitoring program. Lastly, InSAR data spanned the entirety of the Subbasin, and data pixels were available at or near each groundwater level monitoring well. This data has a relatively small error margin (18 mm or 0.06 ft) and is available to download on a monthly or annual basis with continuous measurements.

Therefore, the sustainability indicator for land subsidence is evaluated by monitoring land surface elevation at select InSAR data pixels near groundwater level monitoring wells. Specifically, six (6) pixels are monitored for vertical displacement. Selecting pixels near the groundwater monitoring wells will allow the GSA to study the impact of falling and rising water levels on subsidence in the same location and develop a relationship between water levels and subsidence over time. The pixels and rationale for selection are presented in **Table 3-20 and Table 3-21.**

Table 3-20. Land Subsidence Monitoring Network

SITE ID	SITE TYPE	MEASUREMENT TYPE	YEARS OF RECORD
DXF1N61	InSAR pixel	Vertical Ground Surface Displacement	2015 - 2019
DXAA6E6	InSAR pixel	Vertical Ground Surface Displacement	2015 - 2019
DWYYXU2	InSAR pixel	Vertical Ground Surface Displacement	2015 - 2019
DWIASYT	InSAR pixel	Vertical Ground Surface Displacement	2015 - 2019
DXNZ5CY	InSAR pixel	Vertical Ground Surface Displacement	2015 - 2019
DXI0T98	InSAR pixel	Vertical Ground Surface Displacement	2015 - 2019
DXFN2X3	InSAR pixel	Vertical Ground Surface Displacement	2015 - 2019

Table 3-21. Summary of Rationale for Selection of Subsidence Monitoring Sites

SITE	SITE TYPE	BASIS FOR SELECTION
DXF1N61	InSAR pixel	Proximity to GWL well
DXAA6E6	InSAR pixel	Proximity to GWL well
DWYYXU2	InSAR pixel	Proximity to GWL well
DWIASYT	InSAR pixel	Proximity to GWL well
DXNZ5CY	InSAR pixel	Proximity to GWL well
DXI0T98	InSAR pixel	Proximity to GWL well
DXFN2X3	InSAR pixel	Proximity to GWL well

3.6.5 Groundwater Quality Monitoring Network

The sustainability indicator for degraded water quality is evaluated by monitoring groundwater quality at a network of existing monitoring wells.

The objectives of the groundwater quality monitoring program for the Subbasin include the following:

- Evaluate groundwater quality conditions in the various areas of the basin, and identify differences in water quality spatially between areas in the aquifer system;
- Detect the occurrence of and factors attributable to natural (e.g., general minerals and trace metals) constituents of concern as represented by total dissolved solids (TDS);
- Assess the changes and trends in groundwater quality (seasonal, short- and long-term trends); and
- Identify the natural and human factors that affect changes in water quality

Figures 3-5 illustrates the locations of the wells selected for monitoring of groundwater quality. **Table 3-22** lists the well identification, location, monitoring frequency, well construction data, and measurement years, and number of measurements for the monitoring wells.

TABLE 3-22. GROUNDWATER QUALITY MONITORING NETWORK

WELL ID	LATITUDE	LONGITUDE	MONITORING FREQUENCY	WELL DEPTH	WELL SCREEN INTERVAL	GROUND SURFACE ELEVATION	FIRST YEAR OF DATA	LAST YEAR OF DATA	YEARS MEASURED	NUMBER OF MEASUREMENTS
Bow-1U SWN: 29N03W18M001M	40.3672	-122.255	Bi-annual (Fall/Spring)	234 (ft, bgs)	N/A (ft, bgs)	418.54	N/A	N/A	N/A	N/A
Bow-2U SWN: 29N04W28D001M	40.345354	-122.332	Bi-annual (Fall/Spring)	134 (ft, bgs)	114 - 134 (ft, bgs)	502.54	N/A	N/A	N/A	N/A
Bow-3U SWN: 29N05W33A004M	40.329012	-122.426	Bi-annual (Fall/Spring)	210 (ft, bgs)	110 - 210 (ft, bgs)	534.56	N/A	N/A	N/A	N/A
Bow-4U SWN: 28N04W04P001M	40.304065	-122.323	Bi-annual (Fall/Spring)	270 (ft, bgs)	200-270 (ft, bgs)	537.54	N/A	N/A	N/A	N/A

Similar to the approach for groundwater level monitoring above, monitoring wells were distributed across the Subbasin using the Hopkins method to provide thorough coverage. Although spatial and temporal data gaps exist in groundwater quality data, this network will allow for a comprehensive mapping of TDS trends. Continuous monitoring at the sites selected will establish a temporal record moving forward and assist in evaluating PMAs implemented moving forward. The distribution of wells across the Subbasin will not only help delineate spatial differences in TDS concentration but will also highlight areas in need of project and management actions in the future. Subsequent updating of the groundwater quality constituents will be developed in future GSP updates based on annual evaluation of TDS concentrations. The groundwater quality monitoring wells were ultimately chosen to be the same wells as the groundwater level monitoring wells. This approach will allow for ease of sampling and allow for future comparisons of changing water levels with water quality.

The selection rationale for groundwater quality monitoring wells is summarized in **Table 3-23.** Each site will comply with the data and reporting standards that are described in **Section 3.5.2.**

Table 3-23. Summary of Rationale for Selection for Wells Used Groundwater Quality

SITE	AQUIFER	BASIS FOR SELECTION
Bow-1U SWN: 29N03W18M001M	Upper	CASGEM and Tehama County Well
Bow-2U SWN: 29N04W28D001M	Upper	CASGEM and Tehama County Well
Bow-3U SWN: 29N05W33A004M	Upper	CASGEM and Tehama County Well
Bow-4U SWN: 28N04W04P001M	Upper	CASGEM and Tehama County Well

3.6.6 Interconnected Surface Water Monitoring Network

Groundwater level monitoring wells within one (1) mile of water bodies will be used as a proxy for monitoring. These wells are summarized in **Table 3-24** below. The basis for the selection of these wells in the interim is summarized in **Table 3-25**. There are extensive data gaps in the availability of monitoring sites. This data gap is discussed further in **Section 3.7.8.7.**

Table 3-24. Interconnected Surface Water Monitoring Network

WELL ID	LATITUDE	LONGITUDE	MONITORING FREQUENCY	WELL DEPTH	WELL SCREEN INTERVAL	GROUND SURFACE ELEVATION	FIRST YEAR OF DATA	LAST YEAR OF DATA	YEARS MEASURED	NUMBER OF MEASUREMENTS
Bow-1U SWN: 29N03W18M001M	40.3672	-122.255	Bi-annual (Fall/Spring)	234 (ft, bgs)	N/A (ft, bgs)	418.54	7/7/2004	3/12/2020	17	98
Bow-2U SWN: 29N04W28D001M	40.345354	-122.332	Bi-annual (Fall/Spring)	134 (ft, bgs)	114 - 134 (ft, bgs)	502.54	10/19/1978	3/13/2020	43	113
Bow-3U SWN: 29N05W33A004M	40.329012	-122.426	Bi-annual (Fall/Spring)	210 (ft, bgs)	110 - 210 (ft, bgs)	534.56	9/13/2000	3/13/2020	21	67
Bow-4U SWN: 28N04W04P001M	40.304065	-122.323	Bi-annual (Fall/Spring)	270 (ft, bgs)	200-270 (ft, bgs)	537.54	10/12/1994	3/13/2020	24	60

Table 3-25. Summary of Rationale for Selection for Wells for Interconnected Surface Waters

SITE	AQUIFER	BASIS FOR SELECTION
Bow-1U SWN: 29N03W18M001M	Upper	Upper aquifer well
Bow-2U SWN: 29N04W28D001M	Upper	Upper aquifer well
Bow-3U SWN: 29N05W33A004M	Upper	Upper aquifer well
Bow-4U SWN: 28N04W04P001M	Upper	Upper aquifer well

3.7 Description of Monitoring Protocols (Reg. § 354.34)

3.7.1 Protocols for Monitoring Sites

The monitoring protocols that will be used by the GSA as part of implementing this Groundwater Sustainability Plan are largely based on the *Best Management Practices for the Sustainable Management of Groundwater: Monitoring Protocols, Standards, and Sites* produced by the DWR. The recommended monitoring protocols were adjusted and added to fit the specific monitoring needs of the Subbasin to achieve sustainability. Monitoring protocols for interconnected surface waters are the same as those for groundwater levels due to the proxy network. Also, monitoring protocols for seawater intrusion were not necessary as the Subbasin is not connected to the coast. The monitoring protocols that are described in this document will provide the necessary data to track the MTs and MOs for each of the sustainability indicators. The monitoring protocols established herein will be reviewed every five (5) years as a part of periodic GSP updates. The following protocols will be applied to all monitoring sites:

- Long-term access agreements. Access agreements should include year-round site access to allow for increased monitoring frequency.
- A unique identifier that includes a written description of the site location, date established, access instructions, type(s) of data to be collected, latitude, longitude, and elevation.
- A modification log is to be kept to track all modifications to the monitoring site.
- All data collected and acquired should be added to the GSA's data management system or DMS. A description of the DMS is in Appendix 3-A.

3.7.2 Groundwater Level Elevation

3.7.2.1 Protocols for Measuring Groundwater Levels

Protocols for measuring groundwater levels including the following:

- Measure depth to water in the well using procedures appropriate for the measuring device. Equipment must be operated and maintained in accordance with manufacturer's instructions. Groundwater levels should be measured to the nearest 0.01 foot relative to the Reference Point (RP).
- For measuring wells that are under pressure, allow time for the groundwater levels to stabilize. In these cases, multiple measurements should be collected to ensure the well has reached equilibrium such that no significant changes in water level are observed. Every effort should be made to ensure that a representative stable depth to groundwater is recorded. If a well does not stabilize, the quality of the value should be appropriately qualified as a questionable measurement. If a well is artesian, site-specific procedures should be developed to collect accurate information and be protective of safety conditions associated with a pressurized well. In many cases, an extension pipe may be adequate to stabilize head in the well. Record the dimension of the extension and document measurements and configuration.
- The groundwater elevation should be calculated using the following equation.

  GWE= RPE−DTW

  Where:
  GWE = Groundwater Elevation in NAVD88 datum
  RPE = Reference Point Elevation in NAVD88 datum
  DTW = Depth to Water

- The measurements of depth to water should be consistent in units of feet, to an accuracy of tenths of feet or hundredths of feet.
- The well caps or plugs should be secured following depth to water measurement.
- Groundwater level measurements are to be made on a semi-annual basis at a minimum during periods which will capture seasonal highs and lows.

3.7.2.2 Recording Groundwater Level Measurements

- The sampler should record the well identifier, date, time (24-hour format), RPE, height of RP above or below ground surface, DTW, GWE, and comments regarding any factors that may influence the depth to water readings such as weather, nearby irrigation, flooding, or well condition. If there is a questionable measurement or the measurement cannot be obtained, it should be noted. Standardized field forms should be used for all data collection.
- All data should be entered into the GSA data management system (DMS) as soon as possible. Care should be taken to avoid data entry mistakes and the entries should be checked by a second person.

3.7.2.3 Installing Pressure Transducers and Downloading Data

The following procedures will be followed in the installation of a pressure transducer and periodic data downloads:

- The sampler must use an electronic sounder or chalked steel tape and follow the protocols listed above to measure the groundwater level and calculate the groundwater elevation in the monitoring well to properly program and reference the installation. It is recommended that transducers record measured groundwater level to conserve data capacity; groundwater elevations can be calculated later after downloading.
- The sampler must note the well identifier, the associated transducer serial number, transducer range, transducer accuracy, and cable serial number.
- Transducers must be able to record groundwater levels with an accuracy of at least 0.1 foot. Professional judgment will be exercised to ensure that the data being collected is meeting the Data Quality Objectives (DQO) and that the instrument is capable. Consideration of the battery life, data storage capacity, range of groundwater level fluctuations, and natural pressure drift of the transducers should be included in the evaluation.
- The sampler must note whether the pressure transducer uses a vented or non-vented cable for barometric compensation. Vented cables are preferred, but non-vented units provide accurate data if properly corrected for natural barometric pressure changes. This requires the consistent logging of barometric pressures to coincide with measurement intervals.
- Follow manufacturer specifications for installation, calibration, data logging intervals, battery life, correction procedure (if non-vented cables used), and anticipated life expectancy to assure that DQOs are being met for the GSP.
- Secure the cable to the well head with a well dock or another reliable method. Mark the cable at the elevation of the reference point with tape or an indelible marker. This will allow estimates of future cable slippage.
- The transducer data should periodically be checked against hand measured groundwater levels to monitor electronic drift or cable movement. This should happen during routine site visits, at least annually to maintain data integrity.

- The data should be downloaded as necessary to ensure no data is lost and entered into the basin's DMS following the quality assurance/quality control (QA/QC) program established for the GSP. Data collected with non-vented data logger cables should be corrected for atmospheric barometric pressure changes, as appropriate. After the sampler is confident that the transducer data have been safely downloaded and stored, the data should be deleted from the data logger to ensure that adequate data logger memory remains.

3.7.3 Groundwater Storage Measurements

The monitoring protocols for evaluating change in groundwater storage are the same as the protocols described above for groundwater levels.

3.7.4 Groundwater Quality Measurements

Annual monitoring of groundwater quality will include sampling and laboratory analysis of TDS. Additional constituents will be considered in the future as additional information becomes available. During the first sampling event, these wells will also be tested for major anions (carbonate, bicarbonate, chloride, sulfate) and major cations (boron, calcium, sodium, magnesium, potassium). Following the first sampling event, these anions and cations will be tested for every five (5) years. During sampling events, measurement of select water quality parameters will take place in the field. These field parameters should be measured at an annual frequency and include electrical conductivity at 25 °C (EC) in µS/cm, pH, temperature (in °C), and dissolved oxygen (DO) in mg/L. The annual testing is summarized in **Table 3-26**.

The GSP monitoring program will use the following protocols for collecting groundwater quality samples:

- Prior to sampling, the analytical laboratory will be contacted to schedule laboratory time, obtain appropriate sample containers, and clarify any sample holding times or sample preservation requirements.
- Each well used for groundwater quality monitoring will have a unique identifier. This identifier will appear on the well housing or the well casing to verify well identification.
- In the case of wells with dedicated pumps, samples should be collected at or near the wellhead following purging.
- Prior to sampling, the sampling port and sampling equipment will be cleaned of any contaminants. The equipment will be decontaminated between each sampling locations or wells to avoid cross-contamination.
- The groundwater elevation in the well should be measured following appropriate protocols described above in the groundwater level measuring protocols.
- For any well not equipped with low-flow or passive sampling equipment, an adequate volume of water should be purged from the well to ensure that the groundwater sample is representative of ambient groundwater and not stagnant water in the well casing. Purging three (3) well casing volumes is generally considered adequate. Professional judgment should be used to determine the proper configuration of the sampling equipment with respect to well construction such that a representative ambient groundwater sample is collected. If pumping causes a well to be evacuated (go dry), document the condition and allow well to recover to within 90 percent of original level prior to sampling.
- Field parameters of pH, electrical conductivity and temperature should be collected during purging and prior to the collection of each sample. Field parameters should be evaluated during the purging of the well and should stabilize prior to sampling. Measurements of pH should only be measured in the field; lab pH analysis are typically unachievable due to short hold times. Other

parameters, such as Oxidation-Reduction Potential (ORP), Dissolved Oxygen (DO) (in situ measurements preferable), or turbidity, may also be useful for assessing purge conditions. All field instruments will be calibrated daily and evaluated for drift throughout the day.

- Sample containers should be labeled prior to sample collection. The sample label must include sample ID (often well ID), sample date and time, sample personnel, sample location, preservative used, and analytes and analytical method.
- Samples should be collected under laminar flow conditions. This may require reducing pumping rates prior to sample collection.
- All samples requiring preservation must be preserved as soon as practically possible, ideally at the time of sample collection. Ensure that samples are appropriately filtered as recommended for the specific analyte. Entrained solids can be dissolved by preservative leading to inconsistent results of dissolve analytes. Specifically, samples to be analyzed for metals should be field filtered prior to preservation; do not collect an unfiltered sample in a preserved container.
- Samples should be chilled and maintained at 4 °C to prevent degradation of the sample. The laboratory's Quality Assurance Management Plan should detail appropriate chilling and shipping requirements.
- Samples must be shipped under chain of custody documentation to the appropriate laboratory promptly to avoid violating holding time restrictions.
- Groundwater quality samples shall be collected annually.
- All data will be entered into the GSA data management system (DMS) as soon as possible. Data entries should be checked by a second person to avoid incorrect data.

Table 3-26. Summary of Groundwater Quality Monitoring Constituents and Measurement Frequency for Representative Monitoring Sites

SITE	FIELD MEASUREMENTS	LABORATORY MEASUREMENTS (ANNUAL)	LABORATORY MEASUREMENTS (5-YEAR)
All Wells	Specific Conductance pH Dissolved Oxygen ORP Temperature	TDS	Carbonate Bicarbonate Chloride Sulfate Calcium Sodium Magnesium Potassium Nitrate

3.7.5 Subsidence Measurements

Subsidence monitoring for WWD will include the following protocols:

- Download and review subsidence data from the six (6) pixels designated as monitoring points for subsidence.
- Review groundwater level data collected at monitoring wells near each pixel. Analyze both datasets to determine if any meaningful correlations can be identified.

3.7.6 Interconnected Surface Water Measurements

Groundwater level monitoring wells within the upper aquifer will be used as a proxy for this indicator.

3.7.7 Representative Monitoring (*Reg. § 354.36*)

Representative Monitoring Sites (RMS) are defined in the GSP regulations as a subset of monitoring sites that are representative of conditions in the Subbasin. All the monitoring sites in this section are considered RMS using methods of selection consistent with best management practices described above under the groundwater level protocols. Groundwater elevation monitoring will be used to determine changes in groundwater storage. As previously stated in Chapter 3, reduction in groundwater storage cannot be directly measured. However, groundwater level data will be used in conjunction with aquifer parameters and the groundwater model to compute changes in groundwater storage subbasin wide. In the case of subsidence, no highly susceptible areas exist in the Subbasin. However, six (6) InSAR pixels will be monitored for vertical displacement and over time, the GSA will examine this data in conjunction with water level data collected to determine whether changes in water levels can be used as an early detection method for compaction, if possible.

3.7.8 Assessment and Improvement of Monitoring Network (*(Reg. § 354.38*)

As described in section 354.38 of the GSP Regulations, each agency is required to analyze the monitoring network for improvements as follows:

- Each GSA shall review the monitoring network and include an evaluation in the Plan and each 5 -year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.
- Each GSA shall identify data gaps wherever the basin does not contain enough monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the GSA.
- If the monitoring network contains data gaps, the Plan shall include a description of the following:
    - The location and reason for data gaps in the monitoring network
    - Local issues and circumstances that limit or prevent monitoring
- Each GSA shall describe steps that will be taken to fill data gaps before the next 5-year assessment, including the location and purpose of newly added or installed monitoring sites
- Each GSA shall adjust the monitoring frequency and distribution of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of PMAs under circumstances that include the following:
    - Minimum threshold exceedances
    - Highly variable spatial or temporal conditions
    - Adverse impacts to beneficial uses and users of groundwater
    - The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin

Monitoring frequency and density of sites for all sustainability indicators are described in previous sections in Chapter 3 of this Plan.

3.7.8.1 Review and Evaluation of the Monitoring Network

The monitoring networks described above for each of the applicable sustainability indicators will be evaluated on a yearly basis. This evaluation will involve a review of the described MTs and MOs and their comparison to observed trends in the networks. Furthermore, a more comprehensive review of the monitoring networks will be conducted every five (5) years as part of the GSP updates. During this review, projects and s will be evaluated, and the monitoring networks will be assessed for their efficacy in tracking progress based on the actions and projects. These evaluations and assessments also will highlight any additional data gaps and recommended changes to the monitoring networks.

3.7.8.2 Identification and Description of Data Gaps

Identification and description of data gaps for the monitoring networks described above for each of the applicable sustainability indicators are described below.

3.7.8.3 Groundwater Elevation

Groundwater elevation data has been extensively collected within the Subbasin over the past several decades therefore no data gaps were identified for this indicator.

3.7.8.4 Groundwater Quality

Data gaps in water quality monitoring exist on a temporal basis but not a spatial basis. During well selection, the limiting criteria was the record of TDS measurements. Historical data related to TDS was not continuously collected for a long period of time at any monitoring wells and no wells had TDS data spanning the base period of the model. The RMS wells were chosen to monitor groundwater quality within the Subbasin. The GSA plans to monitor these wells on a yearly basis and will establish a continuous monitoring record moving forward. This data collection will enable the GSA to identify any additional data gaps or noticeable trends in water quality.

3.7.8.5 Groundwater Storage

Groundwater storage data gaps are described in the groundwater elevation section as water levels are being used as a proxy for groundwater storage.

3.7.8.6 Subsidence

No data gaps are presently evident in the Subbasin for subsidence monitoring; however, the network will be reevaluated on a yearly basis for any emerging data gaps.

3.7.8.7 Interconnected Surface Waters

The interconnected surface water indicator had the most prominent data gaps compared to all other indicators. The two (2) contributors to this data gap were the lack of shallow (< 50 feet) monitoring wells in the vicinity of interconnected surface waters and critical groundwater dependent ecosystem (GDEs) and the lack of stream gages. Additionally, shallow well and stream gage based historical measurements were another form of data gap.

All GDEs within the Bowman Subbasin were examined and high priority GDEs were identified based on the change in the normalized difference vegetation index (NDVI). The high priority GDEs were mapped alongside shallow monitoring wells (**Figure 3-7**). However, no suitable monitoring wells for these GDEs could be identified due to the distance of wells from the GDEs (> 1 mile), the depth of the wells (> 50 feet), or the lack of correlation between the water level data to GDE health indicators.

Model results were used to identify interconnected surface waters within the Subbasin. The locations of these surface waters were compared to shallow monitoring wells. However, this analysis did not yield any viable monitoring wells within a one-mile radius of the surface waters (**Figure 3-8**). Furthermore, many surface water features lacked stream gages. Therefore, no meaningful comparisons could be made between surface water feature levels and groundwater levels if shallow monitoring wells were available.

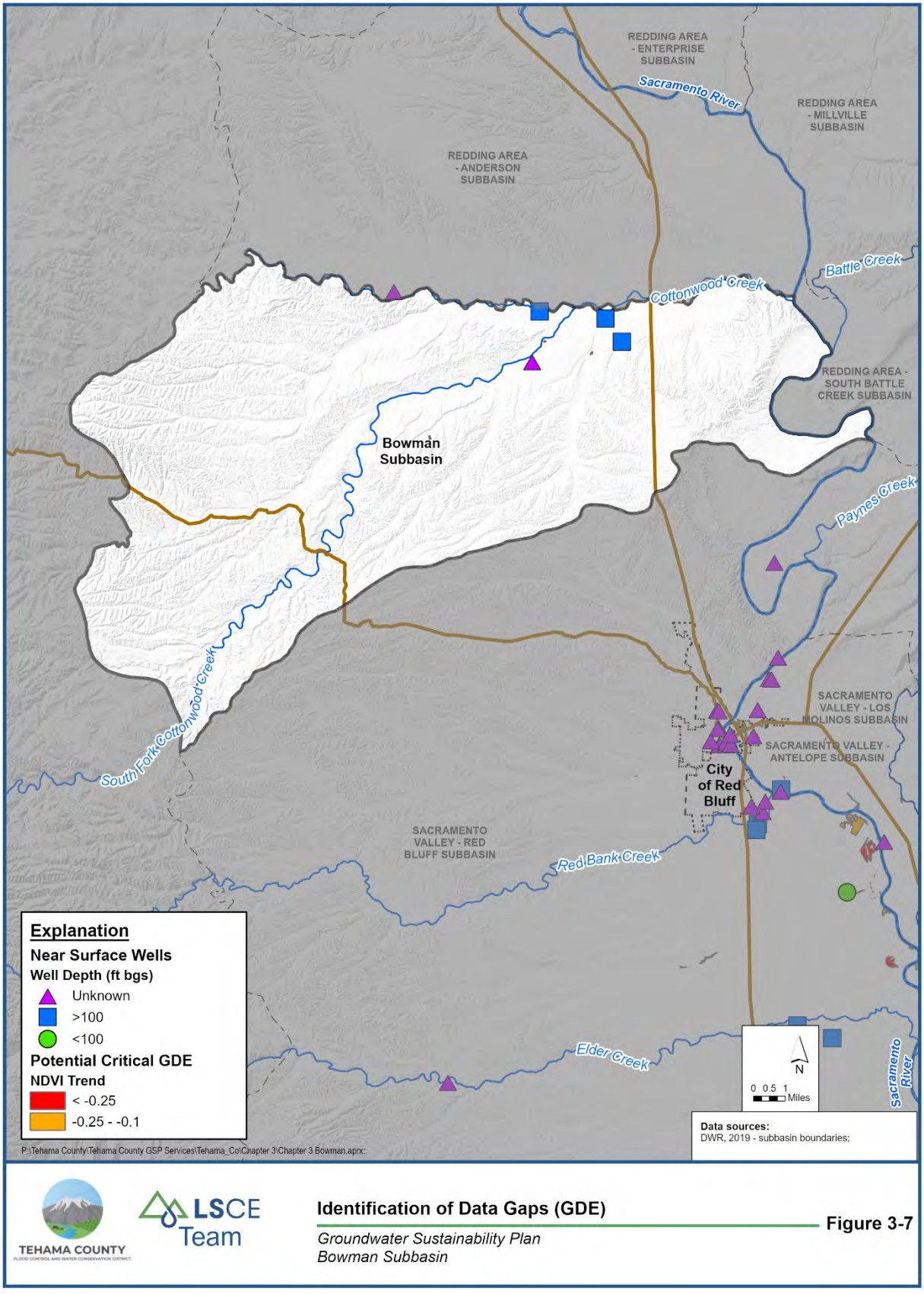
Due to these extensive data gaps, groundwater level monitoring wells within the upper aquifer will be used as a proxy for monitoring.

3.7.8.8 Description of Steps to Remedy Data Gaps

Data gaps have been presented in the groundwater elevation, groundwater quality, and groundwater storage monitoring networks. The GSA will take the following steps, prior to the first five (5)-year GSP update in 2027 to address these data gaps:

- Sampling events will be coordinated with well owners to prevent pumping and access issues.
- Although no monitoring network is currently in place for interconnected surface water, the GSA will look at the data gaps brought forth in the GDE and surface water data assessment and aim to bridge these gaps through the installation of shallow monitoring wells and stream gages near areas of concern. Also, it will consider conducting synoptic stream gaging where conditions are safe to do so.

In addition to these steps, the monitoring networks will be evaluated on a yearly and five (5)-year basis. If additional data gaps arise, the GSA will consider the implications of these gaps, associated costs, and importance to the continued implementation of the GSP and take appropriate actions to address the gaps.

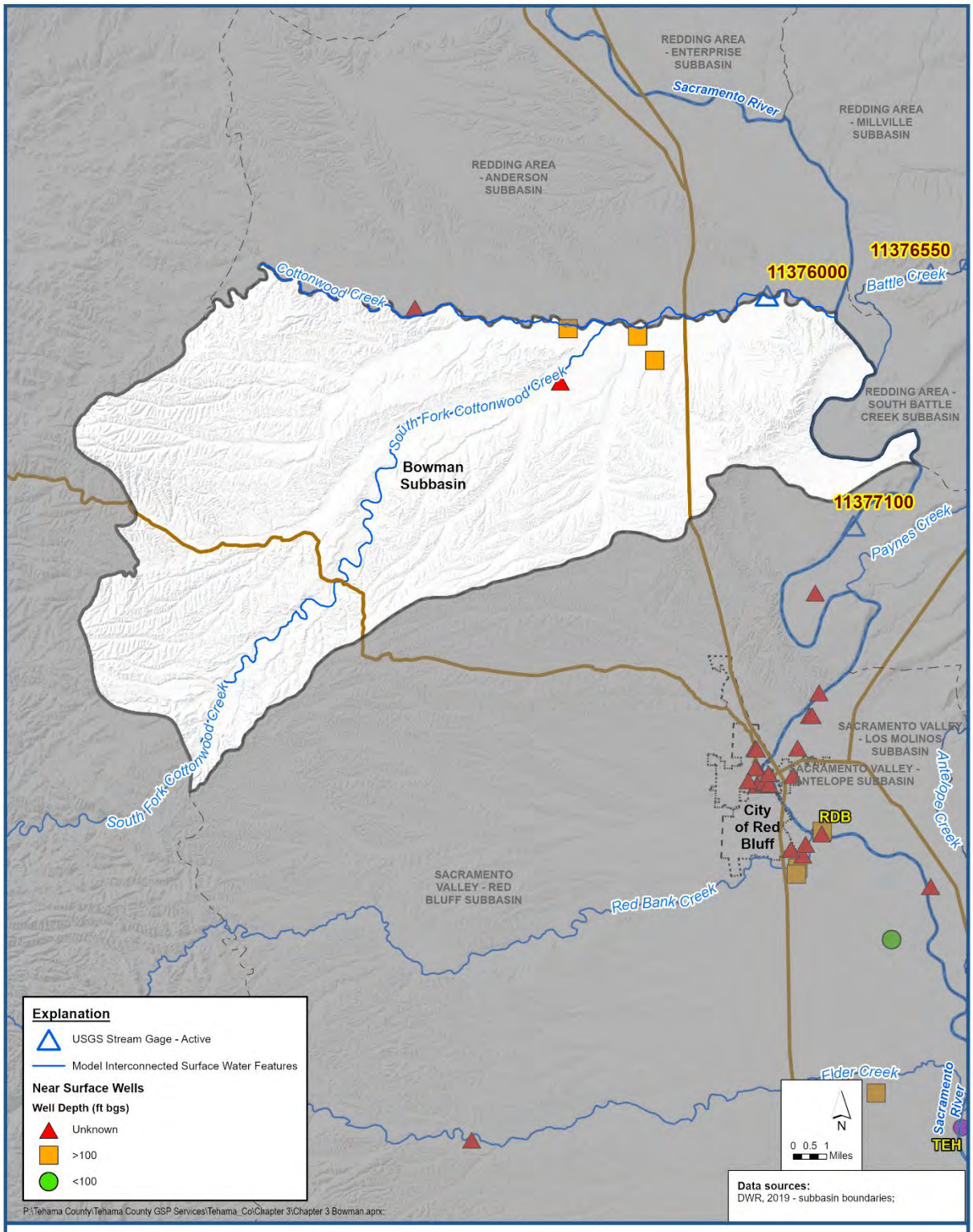


TEHAMA COUNTY
FLOOD CONTROL AND WATER CONSERVATION DISTRICT

LSCE Team

Identification of Data Gaps (GDE) — **Figure 3-7**

Groundwater Sustainability Plan
Bowman Subbasin



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Identification of Data Gaps (Surface Water Features) **Figure 3-8**

Groundwater Sustainability Plan
Bowman Subbasin

FINAL REPORT

Bowman Subbasin

Sustainable Groundwater Management Act

Groundwater Sustainability Plan

(Chapter 4 – Projects and Management Actions)

January 2022

Prepared For:

Tehama County Flood Control and Water Conservation District

Prepared By:

Luhdorff & Scalmanini

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4 SUSTAINABLE GROUNDWATER MANAGEMENT: PROJECTS AND MANAGEMENT ACTIONS (§ 354.44)

4.1 Introduction

This chapter describes the projects and management actions (PMAs) that are planned or considered for implementation in the Bowman Subbasin (Subbasin). In accordance with 23 CCR §354.44, PMAs were developed to achieve and maintain the Subbasin sustainability goal by 2042 and avoid undesirable results over the GSP planning and implementation horizon. Projects generally refer to structural features whereas management actions are typically non-structural programs or policies designed to support sustainable groundwater management.

4.1.1 Development Approach

PMAs were developed and prioritized through a tiered approach, beginning with an initial exploration with stakeholders of various PMA concepts, and then refining those concepts to a specific set of PMAs developed for implementation in the Bowman Subbasin and conceptual PMAs for further development if monitoring indicates they are needed. The following sections describe the process used to evaluate possible future changes in Subbasin conditions, identify PMAs for implementation, and maintain sustainability through adaptive management. The adaptive management approach planned for the Subbasin involves ongoing monitoring of Subbasin conditions and addressing any challenges related to maintaining groundwater sustainability by scaling and implementing PMAs in a targeted and proportional manner in accordance with the needs of the Subbasin

4.1.1.1 Evaluation of Future Subbasin Conditions

PMAs were formulated and evaluated for their potential to address possible future changes in Subbasin conditions that could cause undesirable results over the long term. The possible future changes in Subbasin conditions without PMAs were assessed through comparison of the projected water budget with current land use and the projected water budget with future land use, adjusted for 2070 central tendency (2070CT) climate change (see Section 2.3, Water Budget, for additional information). Water budget results from the Tehama Integrated Hydrologic Model (Tehama IHM) represent the best available data and science for describing projected future groundwater conditions in the Bowman Subbasin at the time of GSP development (consistent with 23 CCR §354.44(c)). Use of 2070CT climate change is regarded as a conservative approach for evaluating possible future changes in Subbasin conditions. While the 2070CT climate change adjustment assumes that the 2070CT effects are occurring every year in the projected water budget period; these effects will occur gradually over time with significant uncertainty in their magnitude and interannual variability.

Table 4-1 provides a comparison of key water budget parameters considered in formulation of the PMAs. Average water budget results are presented for three scenarios: the historical water budget scenario (1990-2018), the projected with current land use scenario (2022-2072, assuming 2019 land use occurs in all years), and the projected with future land use and 2070CT climate change scenario (2022-2072, assuming urban land increases slightly over the future period and that 2070CT climate change factors occur in all years). All scenarios represent conditions in the Subbasin without implementation of projects and management actions. All water budget quantities are expressed in average annual volumes of acre-feet per year (af/yr) over the indicated model simulation period, unless otherwise indicated.

Without projects and management actions, groundwater storage in the projected future land use 2070CT scenario is expected to decline by -500 af/yr. In comparison to the projected current land use water budget change in groundwater storage of -200 af/yr, the projected future land use 2070CT water budget indicates a relative decline of approximately 300 af/yr (approximately -0.3 percent of total inflows to the groundwater system). However, it is worth noting that such small changes in storage and the differences in simulated change in storage between model runs is within the estimated uncertainty of the projected water budget results (described in Section 2.3). The average annual decrease in groundwater storage in the projected scenarios is expected to be 500 af/yr (0.004 feet per acre) or less, resulting in Subbasin conditions that are not expected to cause undesirable results over the GSP planning and implementation horizon.

These results indicate that, even without PMAs, ongoing operation of the Bowman Subbasin according to the best estimates of future conditions described in the projected water budget is expected to maintain groundwater sustainability in the Subbasin through the end of the implementation period in 2042 and beyond though at least 2072. Even so, the GSA plans to continue monitoring sustainability indicators throughout GSP implementation and will initiate and scale PMAs as needed to ensure that the measurable objectives are met. Groundwater sustainability will be maintained through adaptive groundwater management, described below. Section 3, Monitoring Networks, and Section 2.1, Basin Setting, identify data gaps that will be addressed as part of GSP implementation (Section 5). Addressing data gaps will improve the modeled outputs, water budget parameters, and understanding of groundwater conditions in the Bowman Subbasin. Improvements in understanding of groundwater conditions will inform adaptive management of the Bowman Subbasin.

Table 4-1. Summary of Key Groundwater System Water Budget Parameters Influencing Formulation of Projects and Management Actions in the Bowman Subbasin (average annual volumes in acre-feet per year, rounded)

GROUNDWATER SYSTEM WATER BUDGET PARAMETER[1]	HISTORICAL (1990-2018)	PROJECTED, CURRENT LAND USE (2022-2072)	PROJECTED, FUTURE LAND USE, 2070CT (2022-2072)	DIFFERENCE (PROJECTED, FUTURE – PROJECTED, CURRENT)	PERCENT DIFFERENCE[2]
Net Seepage	42,500	46,000	49,100	3,100	7%
Deep Percolation	52,500	53,000	50,700	-2,300	-4%
Subsurface Inflow from Uplands (Small Watersheds)	100	100	100	0	0%
Groundwater Pumping	-6,100	-6,200	-7,100	-900	15%
Root Water Uptake	-3,000	-2,900	-2,800	100	-3%
Net Subsurface Inflow from Adjacent Subbasins	-87,700	-90,200	-90,500	-300	0%
Total Inflows[1]	*95,100*	*99,100*	*99,800*	*700*	*1%*
Total Outflows[1]	*-96,800*	*-99,300*	*-100,400*	*-1,100*	*1%*
Average Annual Change in Groundwater Storage (Total Inflows – Total Outflows)					
Average Volume (acre-feet per year)	-1,700	-200	-500	-300	-0.3%
Average Rate (acre-feet per acre per year)	-0.014	-0.002	-0.004	-0.002	

[1] Positive values indicate a net inflow to the groundwater system. Negative values indicate a net outflow from the groundwater system. Total inflows are the sum of all positive values, while total outflows are the sum of all negative values.

[2] Percent difference is calculated as the "Difference" column divided by the historical average volume for that parameter, except for the average annual change in groundwater storage, for which the percent difference is calculated relative to the historical average total inflows to the groundwater system.

4.1.1.2 PMAs Identified for Adaptive Groundwater Management

Recognizing the GSP data gaps and uncertainties in the basin setting (per 23 CCR §354.44(d)), PMA development and implementation in the Bowman Subbasin applies an adaptive approach informed by continued monitoring of groundwater conditions.

The adaptive approach includes two categories of PMAs:

- **PMAs developed for implementation** that would help to maintain groundwater sustainability while supporting other local goals. This includes a proposed grower education program, a proposed multi-benefit groundwater recharge project that would supply groundwater recharge and provide habitat for migrating shorebirds, and an invasive species removal and riparian habitat restoration project that would decrease groundwater demand and improve surface water conveyance infrastructure.
- A portfolio of other potential PMAs that could be implemented, as needed, to achieve and maintain long-term sustainable groundwater management across the Bowman Subbasin. These potential PMAs would be further evaluated and selected for implementation if Subbasin conditions changed such that they would be necessary to maintain groundwater sustainability. Management actions include a potential demand management program that could be implemented as a backstop to other PMAs to ensure groundwater sustainability.

PMAs are presented in this chapter according to these two categories of implementation for adaptive management. In accordance with 23 CCR §354.44(a), PMAs developed for implementation are expected to support the GSA in achieving the Bowman Subbasin sustainability goal and avoid exceedance of MTs defined in this GSP under future, potentially changing conditions. PMAs developed for implementation are described in greater detail in this GSP, in accordance with all the requirements in 23 CCR §354.44(b). The portfolio of other potential PMAs are described in lesser detail, reflecting their conceptual nature at the time of GSP development. It is anticipated that additional information will be provided in annual reports and periodic, five-year GSP updates, if these PMAs are needed, evaluated for feasibility, and selected for implementation.

Per 23 CCR § 354.44(b)(9), PMAs described in this GSP are expected to maintain the balance of groundwater extractions and recharge to ensure that lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels and storage in other years. In particular, in-lieu and direct recharge benefits of the PMAs developed for implementation are expected to increase the use and recharge of available surface water supplies during wetter years, offsetting any potential increases in groundwater pumping during drought when surface water supplies are limited. The expected recharge benefits of these PMAs are described in Section 4.4. The GSA's extensive portfolio of other potential PMAs will also be informed by continued monitoring of groundwater conditions and implemented, if needed, to maintain long-term sustainable groundwater management.

This remaining sections of this chapter are structured as follows:

- Section 4.2 provides an overview of all PMAs described in this GSP.
- Section 4.3 introduces the various PMA concepts that were explored as part of GSP development.
- Sections 4.4 and 4.5 describe the specific PMAs developed for implementation and the portfolio of other potential PMAs that may be implemented through adaptive management of the Bowman Subbasin. Within each category, PMAs are further classified by type (project or management action).

A matrix summary of all developed and potential PMAs is also provided in **Appendix 4-A.**

4.2 Summary of Projects and Management Actions

4.2.1 Overview of All Proposed Projects and Management Actions

Table 4-2 summarizes all PMAs identified for the Bowman Subbasin GSP. Summary information includes the PMA name, type, proponent, and a brief description of activities that would be completed as part of the PMA. PMAs are grouped into subsections in the table according to their implementation category (PMAs developed for implementation, or other potential PMAs). As described above, PMAs developed for implementation are planned to be implemented before 2042 to maintain groundwater sustainability while supporting other local goals. Other potential PMAs could be implemented, as needed, to achieve and maintain long-term groundwater sustainability, depending on changing conditions in the Bowman Subbasin.

PMAs are described in this GSP according to the requirements of 23 CCR §354.44(b). PMAs developed for implementation are described in greater detail. Other potential PMAs are described concisely and more generally, reflecting the conceptual nature and need for future development of these PMAs as they are needed. Additional project development and description will occur as those projects are needed, evaluated for feasibility, and selected for implementation.

Table 4-3 summarizes the estimated groundwater recharge benefit and capital, operating, and maintenance costs of PMAs developed for implementation. Specific project benefit and cost information is limited for many other proposed projects because a detailed feasibility assessment has not been completed. If needed, the GSA may further develop projects during the GSP implementation period and after 2042 and refine estimated costs as projects are identified for implementation. Additional information about all PMAs is provided in a matrix format in **Appendix 4-A**.

As GSP implementation proceeds, the GSA will continue to accept additional PMAs proposed by agencies and stakeholders. A list of all proposed PMAs will be maintained on the GSP website. PMAs can be added to the matrix **(Appendix 4-A)** at any time and will be reviewed for inclusion in the GSP at the discretion of the GSA. Review of new projects and management actions will occur during the periodic, five-year GSP updates, and at other times at the discretion of the GSA.

Past projects implemented in the Subbasin may also serve as models for future projects to support ongoing sustainability. One such project that was recently completed in the Bowman Subbasin is the construction of wetlands for effluent disposal implemented by Rio Alto Water District (RAWD) in Lake California. The District made necessary improvements to the wastewater treatment plant (WWTP) by constructing wetlands for final effluent disposal. These wetlands take 0.27 MGD during the dry season and 1 MGD during the wet season; a portion of this water goes to evapotranspiration and the remaining water goes to recharge, removing the direct discharge of secondary effluent from the federally protected Sacramento River and providing additional riparian habitat adjacent to the River. These wetlands will provide direct recharge to the underlying Bowman Subbasin. Additional information about this project is provided in **Appendix 2-J**, Tehama IHM Model Documentation.

Table 4-2. Summary of Projects and Management Actions Proposed for the Bowman Subbasin

PROJECT/MANAGEMENT ACTION NAME	PROJECT/ MANAGEMENT ACTION TYPE	PROPONENT	BRIEF DESCRIPTION
Projects and Management Actions Developed for Implementation: Projects and Management Actions in this category are planned to be completed prior to 2042. These projects and management actions are expected to support the GSA in achieving the GSP sustainability goal and responding to changing conditions in the Subbasin.			
Multi-Benefit Recharge	Direct Groundwater Recharge (Project)	Multi-Agency/ Jurisdiction	The Nature Conservancy (TNC) has prepared guidance to assist GSAs in planning on-farm, multi-benefit groundwater recharge programs. A multi-benefit recharge program will provide groundwater recharge through normal farming operations while also providing critical wetland habitat for shorebirds migrating along the Pacific Flyway. Fields with soil and cropping conditions conducive to groundwater recharge will be flooded and maintained with shallow depths to benefit shorebirds. Water will be sourced from existing or new water rights, depending on availability. The GSA may also consider incentives for participants, offsetting field preparation, irrigation, and water costs.
Grower Education	Education/ Outreach (Management Action)	Multi-Agency/ Jurisdiction	A grower education and outreach program is proposed as a management action for all subbasins in Tehama County. The program will provide growers with educational resources that help them to plan and implement on-farm practices that simultaneously support groundwater sustainability and maintain or improve agricultural productivity. This program would be accomplished through workshops and distribution of educational materials, as well as on-site irrigation system evaluations and irrigation water management assistance. The program would continue and potentially expand the irrigation evaluation services currently in place through the Mobile Irrigation Lab (MIL), operated in Tehama County by the Tehama County Resource Conservation District since 2002.
Cottonwood Creek Invasives Control Follow Up & Riparian Habitat Restoration	Groundwater Demand Reduction	Tehama County Resource Conservation District	A project to permanently control known invasive plant species occurrences within portions of Cottonwood Creek's South Fork located in Tehama County is proposed. Through the control of these plants, the threat of their spreading into the Sacramento River's main stem is reduced as is their impacts on those portions of the Creek's riparian zone that now contain infestations. Project work entails the removal of giant reed (arundo donax), salt cedar (Tamarisk), black locust, tree-of-heaven, pampas grass, and scotch broom. Herbicide and manual

PROJECT/MANAGEMENT ACTION NAME	PROJECT/ MANAGEMENT ACTION TYPE	PROPONENT	BRIEF DESCRIPTION
			removal methods will be employed. Project work is ongoing and is expected to continue for a total of five years. Due to the growth characteristics of Arundo and tamarisk in particular, follow up treatments are required in order to attain control of infested sites and to treat missed areas of infestation. It is anticipated that three follow up treatments will be required over a five-year period in order to assure control. Once formerly infested sites are free of infestations, restoration activities would be implemented. This would include enhancing existing riparian habitat to fill in fragmented areas, implementing riparian fencing, and/or obtaining conservation easements to protect riparian resources.
Portfolio of Other Potential Projects and Management Actions: Projects and Management Actions in this category are proposed as potential options that the GSA may wish to implement, as needed, to support ongoing sustainability, to adapt to changing conditions in the Subbasin, and to achieve other water management objectives			
Projects			
Direct Groundwater Recharge of Stormwater and Flood Water	Direct Groundwater Recharge		• Recharge groundwater with excess surface water in wet years for use in dry years. Recharge may be done in conveyances such as unlined canal and laterals, natural drainages such as creek beds, recharge basins, agricultural fields, and aquifer storage and recovery (ASR) wells. Areas identified for recharge should have suitable recharge surficial geology, low enough groundwater levels to provide storage for recharge, and access to surface water. • Divert flood water for off-stream temporary storage on private lands, providing direct recharge and potentially in-lieu recharge.
Stormwater Management Improvements	Direct Groundwater Recharge		• Improve stormwater management facilities to enhance groundwater recharge of stormwater. • Maintain stormwater pumps and ensure stormwater holding basins are of adequate size for retention. • Restore watersheds burned in wildfires and restore unused grazing land to reduce runoff and improve recharge.

PROJECT/MANAGEMENT ACTION NAME	PROJECT/ MANAGEMENT ACTION TYPE	PROPONENT	BRIEF DESCRIPTION
Levee Setback and Stream Channel Restoration	Direct Groundwater Recharge		• Restore stream channel and levee setback to increase groundwater recharge, provide wildlife habitat, and improve the overall riparian ecosystem.
Rain-MAR	Direct Groundwater Recharge		• Capture rainfall through modification of on-field conditions and recharge water the aquifer
Recycled Water Projects	Direct Groundwater Recharge, In-Lieu Groundwater Recharge		• Facilitate use of recycled water of suitable quality (e.g., treated wastewater) for groundwater recharge and for urban or agricultural irrigation. • Enhance wastewater treatment facilities to supply tertiary-treated Title-22 effluent for use as irrigation water. • Construct and operate wetlands as a discharge site for treated wastewater (e.g., the Rio Alto Water District Wastewater Treatment Plant & Constructed Wetlands Project). Creation of constructed wetlands would enhance the surrounding community by increasing natural habitat for waterfowl and wildlife, while offering educational and recreational opportunities for local schools and community residents through the development of walking trails and informational kiosks.
Invasive Plant Removal from Creeks and Irrigation Conveyance Canals	Groundwater Demand Reduction		• Remove invasive plants from creeks and irrigation conveyance canals (e.g., Arundo donax, tamarisk, Himalayan blackberry). Many small tributaries in the watersheds of Tehama County have decreased conveyance, elevated levels of siltation, and diminished flood-carrying capacity due to invasive vegetation overgrowth. Debris-clearing is a challenge due to environmental permitting restrictions. Plant removal would reduce conveyance issues, reduce evapotranspiration (ET), and allow for more water in the shallow groundwater area, restoring conditions for GDEs and native riparian species.
Inter-Basin Surface Water Transfers or Exchanges	In-Lieu Groundwater Recharge		• Promote inter-basin surface water transfers or exchanges and potentially subsidize surface water costs so that it is less expensive than groundwater.

PROJECT/MANAGEMENT ACTION NAME	PROJECT/ MANAGEMENT ACTION TYPE	PROPONENT	BRIEF DESCRIPTION
			• Import underutilized surface water and other supplies from other subbasins in Tehama County and use for direct recharge or in lieu of groundwater pumping. Potential opportunities include: ○ Treated wastewater from the City of Red Bluff ○ Trout Unlimited Groundwater substitution transfers ○ Groundwater substitution transfers.
Water Supply Reservoir Construction, Renovation, or Conversion	Surface Water Supply Augmentation		• Construct, renovate, or convert flood control facilities to a water supply reservoir.
Enhanced Boundary Flow Measurement	In-Lieu Groundwater Recharge		• Enhance measurement of boundary outflows resulting from precipitation runoff and irrigation return flows, which are estimated to be a substantial component of the water budget. Improved understanding of boundary outflows, which vary substantially from year to year, can facilitate capture of and use of this water for in-lieu recharge.
Well Metering	In-Lieu Groundwater Recharge		• Meter larger agricultural wells to better assess the total volume of groundwater pumped in the Subbasin. Data will help to better manage continued sustainability of the Subbasin within its sustainable yield and improve management of pumping for in-lieu recharge benefits.
Management Actions			
Assistance and Incentives for On-Farm Irrigation Infrastructure Improvements	Education/ Outreach, In-Lieu Groundwater Recharge		• Assist growers with conversion to efficient and dual-source irrigation systems. Related efforts may include soil mapping to customize irrigation timing and duration and grower education to encourage soil management to improve moisture retention. • Improve surface water conveyance and irrigation infrastructure to allow growers to utilize both surface water and groundwater for drip irrigation of orchards. Typical components required for a dual-source system are a surface water irrigation "turnout" or point of delivery to the field, a pipeline or ditch to convey water from the turnout to a pump station, a pump or pumps for pressurization, and filtration. Improvements in the

PROJECT/MANAGEMENT ACTION NAME	PROJECT/ MANAGEMENT ACTION TYPE	PROPONENT	BRIEF DESCRIPTION
			Subbasin may include installation of regulating reservoirs, filters or treatment, and pressurization equipment. • Assist growers with capital improvements to irrigation infrastructure, from use of groundwater to use of surface water or dual-source systems.
Incentives for Residential and Municipal Water Use Efficiency Improvements	Groundwater Demand Reduction		• Offer incentives for urban, residential, and commercial projects that improve water use efficiency, such as high efficiency appliance rebates and incentives for lawn removal, low-water landscape installation, rain barrels, graywater reuse, etc. • Evaluate municipal water system operation and reduce losses to reduce municipal groundwater pumping demand.
Demand Management	Groundwater Demand Reduction		• Promote conversion of agricultural lands to less water intensive crops to reduce water use while continuing to promote agriculture land use. Would be considered if other planned PMAs are insufficient to maintain sustainability. • Considered if other planned PMAs are insufficient to maintain sustainability: • Coordinate with county to restrict land use changes that increase water demand in the Subbasin. Management would primarily focus on development of new agricultural land, and to restrict growth in areas with no surface water supply. • Implement tiered fee structure for groundwater extractions to incentivize reduced groundwater use. • Curtail and/or restrict groundwater extractions through a groundwater extraction allocation program. • Curtail and/or restrict groundwater extractions through a land fallowing program. • Coordinate with county to develop policies that align with sustainable groundwater management goals. Possible ordinances include regulations and limits for groundwater use, export, and illegal diversion of surface water. County could create additional guidelines during the well

PROJECT/MANAGEMENT ACTION NAME	PROJECT/ MANAGEMENT ACTION TYPE	PROPONENT	BRIEF DESCRIPTION
			permitting process to reduce competition between nearby wells (i.e., well spacing or suggestions regarding total well depth, depth of well perforations, and location of a new well relation to existing wells). Efforts could be designed to be protective of domestic wells.
Incentives for Use of Available Surface Water and Recycled Water	In-Lieu Groundwater Recharge		• Incentivize use of surface water for irrigation when available to allow groundwater levels to recover in between drought years when surface water is not available. • Provide incentives for use of recycled water of suitable quality (e.g., treated wastewater) for groundwater recharge and for urban or agricultural irrigation to decrease groundwater demand.
Water Market for Surface Water and Groundwater Exchange	In-Lieu Groundwater Recharge		• Create a water market for exchanging surface water and groundwater, allowing for flexibility in water use to meet irrigation demands in the Subbasin while remaining within the overall sustainable yield.
Tehama County Domestic Well Tracking and Outreach Program	Additional Monitoring, Programs to Support Wells		• Provide domestic well owners with resources and funding for well testing, inspection, and replacement. Target well owners in locations where domestic wells are known to go dry or have water quality impacts. • Create a county-wide system to track dry domestic wells. Information will allow Tehama County to better manage assistance to domestic well owners when water levels drop and wells go dry, identify if wells need to be replaced, and provide information on well replacement.
Well Deepening or Replacement Program	Programs to Support Wells		• Create a program to deepen or replace shallow wells and/or wells that go dry.
Review of County Well Permitting Ordinances	Well Permitting Ordinances		• Review existing ordinances and assess if additional well permitting requirements are warranted. Follow updated DWR well construction recommendations (Bulletin 74), as needed. Improve the well permitting and installation program to help protect water quality, allow for better screening, and avoid interference or impacts on neighboring wells.

PROJECT/MANAGEMENT ACTION NAME	PROJECT/ MANAGEMENT ACTION TYPE	PROPONENT	BRIEF DESCRIPTION
Other Activities (Studies, Monitoring, Modeling)			
Coordination and Development of Public Data Portals	Coordination and Data Sharing		• Continue coordination with member units and other water purveyors to develop shared public data portals. Coordination would determine the types of data and data formats available, and establish standard methods for receiving, storing, and sharing data with the public, DWR, other agencies. • Continue coordination and information sharing among agencies in Tehama County and with agencies in neighboring subbasins. Coordination would include holding regular public meetings, attending meetings in neighboring subbasins, coordination with land use planning entities, and fostering relationships with relevant agencies and organizations. • Continue and improve sharing of contaminant data across organizations, including data to track and monitor contaminant plumes.
Additional Studies of GDEs and Groundwater - Surface Water Interactions	Additional Monitoring		• Analyze the relationship between groundwater levels and GDE health to improve the understanding of how GDEs are affected by conditions in the groundwater aquifer accessed by pumping. • Analyze the water supplies accessed by potential GDEs, potentially using a combination of surface water data, shallow groundwater level data, and remote sensing data related to vegetative cover. • Evaluate the need for additional studies or monitoring of groundwater-surface water interactions. Additional information would improve the understanding of how GDEs relate to the groundwater aquifer accessed by pumping, and may allow for refinement of how GDEs and their water supply needs are monitored

PROJECT/MANAGEMENT ACTION NAME	PROJECT/ MANAGEMENT ACTION TYPE	PROPONENT	BRIEF DESCRIPTION
Expanded Subbasin Monitoring and Aquifer Testing	Additional Monitoring		• Aquifer testing will improve the understanding of aquifer conditions, particularly the level of confinement, connectivity between depths, connectivity with surface water bodies, and the understanding of hydraulic properties needed for simulation within the Tehama IHM and an improved estimate of recharge entering the Subbasin. • Collect LIDAR (Light Detection and Ranging) data across the Subbasin to support monitoring all sustainability indicators. • Identify locations in the Subbasin that are potentially vulnerable to damage from subsidence.
Install Additional Agroclimate Stations	Additional Monitoring		• Install additional stations that monitor agriculture-related weather and climate parameters. Improved data will inform agricultural water use practices and potentially enhance water conservation. Data can also improve the accuracy of the Tehama Integrated Hydrologic Model (Tehama IHM).
Maintain and Expand Groundwater Level Monitoring Network	Additional Monitoring		• Maintain existing monitoring network to improve the understanding of aquifer conditions and dynamics and to monitor groundwater conditions related to sustainable management criteria. • Maintain existing coordination with other monitoring entities to support the use of identified monitoring locations as part of the monitoring network and to share relevant collected data. • Identify existing wells that may be incorporated into the groundwater level monitoring network. Wells may be used to collect additional data and improve understanding of aquifer conditions and dynamics, and groundwater conditions related to GDEs and surface water depletions. • Identify new monitoring sites that may be added to the groundwater level monitoring network. Wells may be used to collect additional data and improve understanding of aquifer conditions and dynamics, and groundwater conditions related to GDEs and surface water depletions.

PROJECT/MANAGEMENT ACTION NAME	PROJECT/ MANAGEMENT ACTION TYPE	PROPONENT	BRIEF DESCRIPTION
One-Time Groundwater Quality Snapshot and Evaluation	Additional Monitoring		• Conduct a one-time sampling of groundwater quality parameters over a wide range of wells in Tehama County. Data will improve understanding of groundwater quality conditions and provide a basis for refinement of monitoring networks. • Evaluate groundwater quality monitoring options, potentially informed by the one-time groundwater quality snapshot. Consider options to better characterize widespread groundwater quality conditions and address localized groundwater quality concerns.
Tehama County Well Inventory and Registration Program	Additional Monitoring		• Create a county-wide well inventory to compile all available information on active wells in Tehama County and improve understanding of well distribution, construction, and hydrogeology. Inventory will be useful for collecting additional groundwater data. • Create a well registration program to collect well locations, screening information, and pumping data for use in GSP updates.

Table 4-3. Benefits and Costs of Projects and Management Actions Developed for Implementation

PROJECT/ MANAGEMENT ACTION NAME	PROPONENT	FIRST YEAR OF IMPLEMENTATION	GROSS AVERAGE ANNUAL BENEFIT AT FULL IMPLEMENTATION (AF/YR)	ESTIMATED CAPITAL COST ($)	ESTIMATED ANNUAL COST AT FULL IMPLEMENTATION ($/YR)
Multi-Benefit Recharge	Multi-Agency / Jurisdictions	To Be Determined[1]	TBD	(reported as part of annual cost)	TBD
Grower Education	Multi-Agency / Jurisdictions	To Be Determined[1]	N/A[2]	N/A	$10,000
Cottonwood Creek Invasives Control Follow Up & Riparian Habitat Restoration	Tehama County Resource Conservation District	To Be Determined[1]	N/A[3]	N/A[3]	N/A[3]

[1] Planned initiation of the project or management action will occur before 2042, though the precise year will be determined as GSP implementation and annual reporting proceeds. The timing of implementation will be informed by improved understanding of basin groundwater conditions over time and will be planned to manage changing hydrologic or groundwater conditions to achieve the GSP sustainability goal.

[2] Grower education does not have a specific annual volumetric benefit but is expected to generally improve use of existing surface water supplies and reduce net consumption of groundwater supplies, supporting groundwater sustainability efforts.

[3] The proponent has not reported actual costs or benefits for past project implementation, or potential costs for future phases of implementation. These costs will be determined and reported in annual reports when known.

4.2.2 Sustainability Indicators Benefitted by Projects and Management Actions

The sustainability indicators expected to directly benefit from each type of project or management action are summarized in **Table 4-4.** All proposed projects and management actions are expected to benefit groundwater levels and groundwater storage, whether through direct or in-lieu groundwater recharge, or improved data collection, monitoring, and management of water supplies. Projects that enhance groundwater monitoring and strategic use of available surface water in lieu of groundwater are also expected to reduce surface water depletion by enhancing understanding and management of surface water. Grower education is also expected to benefit water quality by encouraging on-farm management of nutrient application, tailwater, and pumping to reduce potential degradation of water quality.

Table 4-4. Sustainability Indicators Expected to Benefit from Projects and Management Action Types Proposed for the Bowman Subbasin.

PROJECT/MANAGEMENT ACTION TYPE	SUSTAINABILITY INDICATORS EXPECTED TO DIRECTLY BENEFIT				
	GROUNDWATER LEVELS	GROUNDWATER STORAGE	WATER QUALITY	SURFACE WATER DEPLETION	LAND SUBSIDENCE
Coordination and Data Sharing	-[1]	-[1]	-[1]	-[1]	-[1]
Direct Groundwater Recharge	X	X		X	X
Education/Outreach	X	X	X	X	X
Groundwater Demand Reduction	X	X		X	X
In-Lieu Groundwater Recharge	X	X		X	X
Monitoring to Fill Data Gaps	-[1]	-[1]	-[1]	-[1]	-[1]
Programs to Support Wells[1]	-[2]	-[2]	-[2]	-[2]	
Surface Water Supply Augmentation	X	X		X	X
Well Permitting Ordinances	X	X	X	X	X

[1] Coordination, data sharing, and additional monitoring are beneficial to GSP implementation and tracking progress toward the Subbasin sustainability goal. However, there are no anticipated direct benefits to specific sustainability indicators.

[2] Programs designed to support wells (e.g., well tracking, well deepening or replacement) are beneficial for monitoring and addressing any potential impacts to those beneficial uses and users of groundwater during GSP implementation. However, there are no anticipated direct benefits to specific sustainability indicators.

4.2.3 Maintaining Sustainability

As described above, the evaluation of historical and projected groundwater conditions described in Chapter 2 and results from the Tehama IHM indicate that the Bowman Subbasin is currently in a sustainable conditions and sustainability is expected to be maintained without undesirable results over the GSP planning and implementation horizon. These results consider the potential effects of climate change (2070CT scenario) and are without implementation of any PMAs.

Ongoing management of the Bowman Subbasin under this GSP is planned to maintain sustainability and respond to unforeseen future conditions that may impact sustainable operation of the Bowman Subbasin. The GSA plans to maintain sustainability through an adaptive management strategy: continuing to monitor sustainability indicators throughout the GSP planning and implementation horizon and implement PMAs as needed to ensure that the sustainability goal is achieved and that undesirable results do not occur.

PMAs developed for implementation are expected to support ongoing sustainability. Grower education is planned to encourage on-farm practices that support direct and in-lieu recharge, and multi-benefit groundwater recharge is planned to supply direct recharge of available flood water to the Subbasin while also providing habitat to migratory shorebirds. Other potential PMAs would also be evaluated and selected for implementation if the GSA finds that established measurable objectives (MOs) cannot be maintained and/or if minimum thresholds (MTs) are being approached. This adaptive approach will be informed by continued monitoring of groundwater conditions, using the monitoring network and methods described in Chapter 3.

4.3 Overview of Concepts Explored

This section provides a brief overview of various concepts explored when proposing and identifying PMAs for the Bowman Subbasin. While not all concepts were proposed for implementation in the Bowman Subbasin, exploring these concepts is useful for identifying the types and scale of potential PMAs that could be explored and implemented in the future to maintain sustainability, depending on future changes in subbasin conditions.

4.3.1 Well Permit Revision

The need for and benefit from potential modifications to well regulations was considered as a mechanism to ensure that groundwater sustainability is maintained in the Subbasin. Well permitting regulations can help avoid adverse impacts on groundwater beneficial users by reducing potential for mutual well interference or streamflow depletion through limitations on well screen depths and well spacing and/or setbacks.

4.3.2 Demand Management

Demand management broadly refers to any water management activity that reduces the consumptive use of irrigation water. When considered as a management action to support sustainable groundwater management, demand management must result in a net reduction in groundwater pumping (pumping net of recharge). Activities that, for example, reduce canal seepage or reduce deep percolation to the groundwater system are generally ineffective at demand management. While they may decrease the quantity of water diverted or applied, they also reduce the quantity of recharge to usable groundwater, resulting in no (or little) net reduction in groundwater pumping.

Demand management activities considered as concepts for implementation in the Bowman Subbasin include:

- **Management and Restrictions of Land Use Changes**: Implementing county water use ordinances or other policies to restrict land use changes that would increase water demand in the Subbasin. Policies would generally restrict development of new agricultural land, restrict growth in areas with no surface water supply, and/or promote conversion of agricultural lands to less water intensive crops.
- **Pumping Fees:** Implementing tiered fee structures for groundwater extractions to incentivize reduced groundwater use.
- **Groundwater Extraction Allocation Program:** Creating groundwater extraction allocations to curtail or restrict the volume of groundwater extraction allowed. Could be implemented with pumping fees.
- **Land Fallowing Program:** Curtailing and/or restricting groundwater extractions by creating and enforcing or incentivizing a land fallowing program.

Demand management actions are scalable to suit the volume of groundwater reduction that is needed, both in the timing and the spatial extent of implementation. While long-term, wide-ranging demand management actions may be necessary to achieve and maintain sustainability in severely overdrafted areas, shorter-term and localized demand management actions are also possible to address localized groundwater concerns.

As described previously, the Bowman Subbasin is expected to be managed sustainably by 2042 and without undesirable results over the GSP planning and implementation horizon, even without implementation of PMAs. Demand management actions are thus considered only as conceptual, "backstop" measures that would be considered and implemented only if other planned PMAs are insufficient to maintain sustainability.

4.3.3 Multi-Benefit Recharge Project

Multi-benefit recharge projects have emerged as promising tools to maximize the benefits of recharge projects for numerous groundwater and environmental water uses and users. The multi-benefit recharge projects explored in Tehama County are specifically focused on strategic flooding of agricultural fields for managed aquifer recharge (MAR).

The main goals of these multi-benefit recharge projects are to simultaneously:

- recharge groundwater supplies using available surface water supplies, and
- create temporary habitat for migratory shorebirds along the Pacific Flyway

These multi-benefit recharge projects are distributed, operating through participating growers who voluntarily flood their fields during peak migratory periods to create temporary habitat for the shorebirds while also recharging the underlying aquifer. These projects can offer incentives to encourage grower participation and can also offer assistance for field preparation prior to flooding. The scale of implementation may vary depending on grower interest, which in turn may vary depending on water availability, water reliability, outreach, local interests, and incentives (if applicable).

Successful multi-benefit recharge projects will realize the greatest benefit from selecting sites with high groundwater recharge potential, flooding those sites at times when the environmental benefits to migratory shorebirds are highest, and implementing recharge with the greatest practicality. Ideal sites have soil and crop conditions favorable for flooding and recharge during peak migratory periods (generally July 15-October 1 and/or March 15-April 30). Practical sites have existing access to surface water and infrastructure that supports flooding.

Although the Bowman Subbasin is expected to continue to be managed sustainably through 2042 and beyond, without undesirable results over the GSP planning and implementation horizon, multi-benefit recharge is a concept of great interest to growers and stakeholders in the Subbasin. Thus, a multi-benefit recharge project has been developed for implementation in the Bowman Subbasin (see Section 4.4.1 for more information).

4.3.4 Flood Managed Aquifer Recharge (Flood-MAR)

Conceptually, projects that use flood water for on-farm managed aquifer recharge (i.e., Flood-MAR) are similar to the multi-benefit recharge projects described in the previous section, although the timing of Flood-MAR projects are confined to periods when flood water is available rather than the migratory periods of shorebirds. Flood-MAR projects operate through distributed, voluntary participation of growers, who divert and apply flood water to fields when it is available to supply groundwater recharge.

Implementation of Flood-MAR can occur at various scales, from individual landowners diverting flood water from creeks and streams using existing infrastructure, to larger facilities operated by one or more agencies to divert larger volumes of flood water to detention and recharge areas. Besides groundwater recharge, Flood-MAR can also provide benefits to flood risk reduction, ecosystem enhancement, water quality improvement, climate change adaptation, and recreation in the Bowman Subbasin. While no specific Flood-MAR project is specifically developed for implementation in the Bowman Subbasin at this time, Flood-MAR is proposed among other potential PMAs that could be implemented to support adaptive management of the Subbasin.

4.3.5 Rainfall Managed Aquifer Recharge (Rain-MAR) to Capture Runoff from Fields

Rainfall Managed Aquifer Recharge (Rain-MAR) projects considered in Tehama County would be designed to modify on-field conditions and infrastructure to capture and hold precipitation, taking water that would have otherwise drained from the field through runoff and instead supplying that to the groundwater system through on-field infiltration. Like the multi-benefit recharge and Flood-MAR projects described above, Rain-MAR projects would provide distributed groundwater recharge throughout the Subbasin, operating through voluntary grower participation. Besides groundwater recharge, Rain-MAR can also provide benefits to flood risk reduction by decreasing runoff, and to ecosystem enhancement for birds and other wildlife.

Although the Bowman Subbasin is expected to be managed sustainably by 2042 and without undesirable results over the GSP planning and implementation horizon, a Rain-MAR project is a scalable and potentially low-cost option for addressing localized groundwater issues, or as a response to future climate change effects. While no specific Rain-MAR project is specifically developed for implementation in the Bowman Subbasin at this time, a Rain-MAR project is proposed among other potential PMAs that could be implemented to support adaptive management of the Subbasin.

4.3.6 Other Groundwater Management Strategies (Projects and Management Actions and Cost Feasibility)

Various other groundwater management strategies have also been discussed in the Subbasin. Strategies discussed include use of recycled water, incentivizing maximum use of all surface water available through existing or potential future water rights or allocations, and coordinated and cooperative management between key groundwater user groups (e.g., urban, agricultural, environmental), and groundwater ordinances. The feasibility of different management strategies in the Subbasin is closely tied to cost. Recognizing that the Subbasin is currently in a sustainable condition and is projected to maintain sustainability through the GSP implementation and planning horizon, cost makes certain groundwater management strategies difficult to implement, although these management strategies are available for consideration if needed in the future.

4.3.7 Ongoing Evaluation of Groundwater Management Efforts

In accordance with SGMA and GSP regulations, the Subbasin will conduct ongoing assessments of groundwater conditions, including annual GSP reporting and five-year GSP updates. Ongoing assessments will evaluate new information on changes in water use, changes in Subbasin and management area groundwater conditions, efficacy or benefits from management actions implemented, and consider additional management tools or actions needed to maintain Subbasin sustainability. These efforts will support adaptive management of the Subbasin groundwater resources and enable the Subbasin to respond to groundwater management needs if they arise.

4.4 Projects and Management Actions Developed for Implementation

This section describes the PMAs that were developed for potential implementation in the Bowman Subbasin. GSP analyses indicate that the Bowman Subbasin is expected to be sustainable through 2042 and beyond, without undesirable results over the GSP planning and implementation horizon, even without implementation of PMAs. Nevertheless, the GSA has developed several PMAs for potential implementation to support ongoing sustainability and adapt to potential future changes in Subbasin conditions. These PMAs are described below and could be scaled as needed to support adaptive management of the Subbasin.

4.4.1 Multi-Benefit Recharge Project

4.4.1.1 Overview

An on-farm, multi-benefit groundwater recharge program has been developed for potential implementation in the Bowman Subbasin based on guidelines provided by The Nature Conservancy (TNC). The program would build on the successful TNC BirdReturns program by strategically flooding agricultural fields with the goals of (1) recharging groundwater supplies while (2) simultaneously creating critical winter habitat for shorebirds migrating along the Pacific Flyway.

The multi-benefit recharge project would be implemented through the coordinated actions of growers who volunteer to participate and flood their fields during the course of normal farming operations. During the migratory period, fields with soil and cropping conditions conducive to groundwater recharge would be flooded and maintained with shallow water depths, recharging groundwater while also providing critical wetland habitat for migrating shorebirds. If an incentive structure is established, the program could provide financial incentives to growers, potentially paying for field preparation, irrigation, and water costs to encourage grower participation.

This section summarizes implementation activities, operation and monitoring efforts, and related costs and benefits of a multi-benefit groundwater recharge program in the Bowman Subbasin.

4.4.1.2 Implementation

Implementation of a multi-benefit groundwater recharge program in the Bowman Subbasin would occur in multiple phases, with expansion of the program over time as voluntary grower participation increases. Multi-benefit recharge would be implemented at selected sites in the Bowman Subbasin, with multiple benefits to groundwater recharge and temporary wetland habitat for migrating shorebirds. Recharge and wetland habitat benefits in the early phases of the project would be analyzed, reported, and used to inform development and later implementation of the program.

Implementation of this project would commence with selection of sites suitable for multi-benefit recharge, and initiation of any necessary permitting and environmental documentation. The GSA would use tools and resources provided by TNC to identify fields with soil and cropping conditions conducive to groundwater recharge and temporary wetland habitat formation.[1]

In later phases of project implementation, suitable fields would continue to be identified following similar criteria, with refinement according to lessons learned from early project implementation.

Suitable project sites would be selected by the following characteristics:

- Soil characteristics that are conducive to recharge, as indicated by:
    - Soil types
    - SAGBI rating relationship
- Crop types that are conducive to high-quality, open wetland habitat suitable for shorebird stopovers when flooded (i.e., not orchards)
- Crop types that are suitable for recharge (i.e., suitable for flooding in February through April, and conducive to deep percolation)
- Water supply and infrastructure characteristics that are suitable for flooding (i.e., existing flood irrigation infrastructure, existing surface water supply)

The process for identifying and enrolling suitable fields in the program is documented extensively on the TNC BirdReturns project website (https://birdreturns.org/).

The GSA would conduct or coordinate outreach to local growers to identify willing participants that irrigate fields where multi-benefit groundwater recharge can be implemented. Outreach would be conducted through existing communication pathways described in the GSP. Participant responses would be gathered and organized through surveys that request information regarding:

- Field characteristics (location, size, cropping, field preparation methods)
- Existing water supply characteristics (water supply source(s), timing of water source(s))
- Existing measurement and monitoring infrastructure (flow meters, groundwater well)

[1] TNC offers an online Multi-Benefit Recharge Suitability Tool for identifying areas potentially suitable for multi-benefit recharge: https://tnc.maps.arcgis.com/apps/webappviewer/index.html?id=b898ab568d374cc9baf89f762d9bb78c.

- Other relevant information

The GSA, with potential support from other proponents in the Subbasin, would then coordinate with participating growers to implement on-farm, multi-benefit groundwater recharge. Following initial site selection and completion of any necessary permitting and environmental documentation, fields would be prepared for flooding and monitoring. At that time, necessary monitoring equipment would be installed, as needed. The program could be designed to pay for field preparation, irrigation, and water costs through an GSA-planned incentive structure.

During the "flooding window" (generally February through April), enrolled fields would then be flooded and maintained at a shallow water depth to supply groundwater recharge and temporary open wetland habitat for migrating shorebirds. Finally, after completion of the program requirements, contract fees (if applicable) would be paid to participants.

4.4.1.2.1 *Implementation Schedule*

A typical annual timeline of project implementation is provided in Table 4-5. At this time, the multi-benefit groundwater recharge program has been developed and evaluated only at an investigative, planning level. This project will ultimately be selected for implementation according to the criteria identified in Section 4.4.1.2.5. At that time, the GSA would develop and implement the program annually following the general implementation schedule presented in **Table 4-5**.

Table 4-5. Expected Annual Implementation Timeline for the Bowman Subbasin Multi-Benefit Groundwater Recharge Project

TIMELINE ACTIVITY	START	END
Participant Applications	December-January	March
Site Selection	January-February	March
Construction, Site Preparation	February	March
Operation	February	April
Financial Incentive Payment	April	June

4.4.1.2.2 *Notice to Public and Other Agencies*

The public and other agencies will be notified of project implementation activities through outreach and communication channels identified in the GSP.

4.4.1.2.3 *Construction Activities and Requirements*

This project may be configured and operated to utilize existing diversion and conveyance infrastructure available within the Subbasin or may require construction of new diversion and conveyance infrastructure. If existing infrastructure and facilities are available and used for this project, there would be no anticipated infrastructure construction activities and requirements. If new diversion and conveyance infrastructure must be constructed, it is anticipated that this project would require one or more diversion structures, each equipped with a pump, fish screen, and magnetic flow meter. Conveyance pipeline and metered turnout structures would also be required to supply water to participating fields,

and to facilitate project monitoring and reporting. The precise configuration and capacity of necessary infrastructure would be refined during future project development.

The project may also require on-farm activities for participating growers to enhance field flooding and recharge on existing fields. The program is designed to work within existing field infrastructure and irrigation systems. Any on-farm water management modifications are expected to be modest to increase standing water on fields outside of the growing season to support both recharge and habitat.

Prior to field flooding, the GSA could facilitate a survey of the fields and install pressure transducers and/or flow meters at inlets and outlets and in adjacent wells to facilitate measurement of applied water depths and changes in groundwater depth.

4.4.1.2.4 *Water Source*

Surface water used in this project is expected to be available from existing or new surface water rights contracts from waterways within or adjacent to the Subbasin. The availability and reliability of surface water for projects is described in Section 4.8. Existing or newly constructed diversion and conveyance infrastructure would be used to supply surface water to participating fields for multi-benefit groundwater recharge. Surface water would be delivered during a "flooding window," generally from February through April.

4.4.1.2.5 *Circumstances and Criteria for Implementation*

The primary constraints on the operation of this project are (1) the availability of sufficient surface water supply, and (2) the participation of growers with fields conducive to groundwater recharge.

Surface water supply conditions needed for this project include:

- Availability of surface water supplies that are sufficient to flood participating fields according to the specified flooding depth and duration
- Appropriate timing of surface water supply availability during the project "flooding window" (generally February through April), when wetland habitat for shorebirds migrating along the Pacific Flyway is needed
- Reliability of surface water supplies, based on historical reliability and expected future reliability

Grower participation needed for this project includes:

- Willingness of growers to participate in this program, informed by program applications
- Availability of participating fields suitable for groundwater recharge, based on soil texture, crop type, and availability of suitable surface water flood irrigation infrastructure

A multi-benefit groundwater recharge program is planned for future implementation pending funding and changes in future groundwater conditions in the Bowman Subbasin. The GSA will monitor groundwater levels in the Subbasin through the monitoring plan in this GSP. If groundwater levels decline near or below minimum thresholds, this project may be prioritized to support in-lieu recharge in those areas where undesirable results may occur. The GSA may also decide to implement this project at an earlier time to achieve these multi-benefits for the Subbasin.

Ongoing implementation of a multi-benefit groundwater recharge program does not depend on the implementation or performance of other projects or activities. While operation of this program is not expected to terminate, any future changes will be made to align with the District's goals and the overall Subbasin sustainability goal.

4.4.1.2.6 *Legal Authority, Permitting Processes, and Regulatory Control*

The following agencies have potential permitting roles for the multi-benefit groundwater recharge project: County, the State Water Resources Control Board (SWRCB), and USBR (if using CVP contract supply). If necessary, the GSA will obtain land grading permits from the County. If necessary, the GSA will apply or facilitate applications for permits required from the SWRCB for diversion of surface water to the extent that diversion is not already permitted under existing water rights and contracts. Recharge projects may also require an environmental review process under CEQA. If required, this project would need a Negative Declaration or Mitigated Negative Declaration.

4.4.1.3 Operation and Monitoring

Following site selection, operation of the multi-benefit recharge project would begin with site preparation. Field preparation is completed prior to flooding to enhance wetland habitat and recharge potential. Existing vegetation may be removed or incorporated, depending on recommendations or requirements associated with initial field conditions. Flow rate and groundwater level monitoring equipment may also be installed in the fields, as needed, to facilitate project monitoring. Soil and water samples could be collected to ascertain water quality prior to wetting, as desired. Wooden stakes should also be installed to support monitoring of water depths and bird presence.

After site preparation, multi-benefit groundwater recharge would be implemented through field flooding. During the implementation period (generally February through April), participants would spread water on their fields and maintain a shallow depth (four inches maximum) for four to six weeks. Participants would record any changes in water flow in an irrigation log. Meanwhile, the GSA would coordinate monitoring of field depth, bird presence, water delivery volume, and changes in groundwater depth.

4.4.1.4 Project Benefits and Costs

The expected benefits and costs of the multi-benefit recharge program are summarized in **Table 4-6.** Potential benefits to the groundwater system are estimated based on soil infiltration rates and analyses of potential recharge areas in the Bowman Subbasin (documented in Appendix 2-J). Habitat benefits are estimated to be equal to the participating area.

While actual participation in the program will vary from year to year, depending on grower interest, water availability, changes in cropping, and other factors, preliminary mapping was done to identify potential recharge areas that may be suitable for participation in the project. The total area suitable for the multi-benefit recharge project was evaluated based on recharge potential and cropping, as described in **Appendix 2-J, Tehama IHM Model Documentation**. Recharge potential was quantified based on the area-weighted soil agricultural groundwater banking index (SAGBI) rating of fields in the Subbasin, considering only fields with a SAGBI rating of "moderately good" or higher (UC Davis, 2021). Crop areas suitable for multi-benefit recharge were evaluated based on 2018 Land IQ spatial land use data, filtering land areas by crop type to exclude permanent crops, rice, crops with growing seasons unsuited to the flooding window, and non-agricultural areas. In total, there are approximately 140 acres of potentially suitable

multi-benefit recharge land in the Bowman Subbasin according to these criteria. Additional information is described in **Appendix 2-J**. Of this total, it is estimated that an average of approximately 70 acres may participate in the multi-benefit recharge program in a given year (approximately 50 percent of the total potential recharge area).

Based on observed infiltration rates from a multi-benefit recharge pilot project conducted on fields with soil infiltration characteristics similar to potential recharge areas identified in the Bowman Subbasin[2], infiltration rates are expected to range between 0.2 and 1.2 inches per day for participating fields in the Bowman Subbasin. Assuming an average of 30 days of flooding per year, the average expected recharge benefit of the multi-benefit recharge program is approximately 245 AF per year (ranging from 35 to 210 AF per year, depending on actual field recharge rates and areas participating). Analyses in Section 4.8 indicate that the potential water available for diversion from waterways in the Subbasin are generally sufficient to supply at least several hundred acre-feet of water for this project each year. While changes in water availability may impact the extent of program participation from year to year, the program could operate in most years, providing both groundwater recharge and migratory bird habitat along the Pacific Flyway.

Besides groundwater recharge and habitat, the multi-benefit recharge project can also provide benefits to flood risk reduction and climate change adaptation. Those potential benefits are not quantified at this time.

Typical program cost components are summarized in **Table 4-7**, on a per site basis. These costs include only on-farm equipment and direct costs and estimated program operation costs, and do not include costs for any new diversion and conveyance infrastructure that may be needed. The precise configuration and costs of any new diversion and conveyance infrastructure would be identified and refined during future project development.

Slightly higher on-farm and program costs are typically incurred in the first year a site participates in the program, as more coordination and site preparation is typically required. As a site continues to participate in the program, lower costs are anticipated from year to year. Costs per site may vary depending on future changes in program requirements and incentives. The total costs of the program will vary over time, depending on the number of sites enrolled and the extent to which new sites are enrolled or returning sites continue to participate in the multi-benefit recharge program.

[2] Observed infiltration rates for fields with a SAGBI rating of “moderately good” or higher for a 2020 pilot project conducted in Colusa County.

Table 4-6. Estimated Average Recharge Volume and Temporary Wetland Habitat Formation for the Multi-Benefit Groundwater Recharge Project

PROJECT	ESTIMATED POTENTIAL RECHARGE AREA (ACRES)	ESTIMATED PARTICIPATING AREA (ACRES/ WATER YEAR)	ESTIMATED AVERAGE ANNUAL RECHARGE[1] (AF/YEAR)	ESTIMATED AVERAGE ANNUAL ON-FARM COST[2]	AVERAGE ANNUAL ON-FARM COST PER AF BENEFIT
Multi-Benefit Groundwater Recharge	140	70	105	$12,250	$117

[1] Average estimated benefit, assuming 70 acres flooded for 30 days each year, with an estimated recharge rate ranging from 0.2-1.2 inches/day (35 - 210 AF/year).

[2] Assumes that on average 50 % of sites are new and 50 % of sites are established in a given year, and that average participating field sizes are 20 acres. See Table 4-7 for unit costs per site.

Table 4-7. Estimated Capital Cost and Average Annual Operating Cost per Site for the Multi-Benefit Groundwater Recharge Project

COST COMPONENT PER SITE	ESTIMATED AVERAGE ANNUAL COST AT NEW SITES ($)[1]	ESTIMATED AVERAGE ANNUAL COST AT ESTABLISHED SITES ($)
Capital Costs		
Equipment and Direct Cost	$2,000	$1,000
Operations and Maintenance Costs		
Labor, Coordination, Administration, and Analysis	$2,000	$2,000
Total	**$4,000**	**$3,000**

[1] Costs estimated based on implementation costs for a multi-benefit recharge pilot project in Colusa County. Typical costs will vary between individual programs, depending on how the GSA and/or participating agencies plan to implement and monitor the program.

4.4.2 Grower Education Relating to On-Farm Practices for Sustainable Groundwater Management

4.4.2.1 Overview

A grower education and outreach program is proposed as a management action for the Bowman Subbasin. The program will provide growers with educational resources that help them to plan and implement on-farm practices that simultaneously support groundwater sustainability and maintain or improve agricultural productivity. Implementation of these on-farm practices will be recorded, along with estimated or measured benefits to groundwater sustainability resulting from these practices.

This program would be accomplished through workshops and distribution of educational materials, as well as on-site irrigation system evaluations and irrigation water management assistance. The program would continue and potentially expand the irrigation evaluation services currently in place through the

Mobile Irrigation Lab (MIL), operated in Tehama County by the Tehama County Resource Conservation District since 2002.

Four categories of on-farm practices, or on-farm management actions, which may be covered in this program are:

1. maximizing the use of surface water (e.g., "in-lieu" recharge),
2. managing soils to improve infiltration and root zone soil moisture storage,
3. reducing (and minimizing) non-beneficial ET, and
4. precision nutrient management.

In aggregate, these on-farm practices will promote both agricultural productivity and economic benefits along with sustainable groundwater management[3]. **Table 4-8** identifies the sustainability indicators that will be supported by each category of on-farm management actions.

General topics identified for the grower education program are summarized below. Additional information and topics are summarized in Appendix 2-J

Table 4-8. Sustainability Indicators Benefitted by On-Farm Management Actions

ON-FARM MANAGEMENT ACTION	SUSTAINABILITY INDICATORS BENEFITTED
Maximizing surface water use	groundwater levels, groundwater storage
Managing soils to improve infiltration and root zone soil moisture storage	groundwater levels, groundwater storage
Reducing non-beneficial ET	groundwater levels, groundwater storage
Precision nutrient management	water quality

4.4.2.1.1 *Maximizing use of surface water ("in-lieu" recharge)*

The use of surface water for irrigation whenever it is available is a crucial practice to support sustainable groundwater management. The use of surface water both offsets local groundwater demand through reduced groundwater pumping ("in-lieu" recharge) and increases groundwater recharge through the non-consumptive recoverable flow of deep percolation of applied surface water from the land surface to the underlying aquifer. The on-farm practices to maximize the use of surface water include implementing a dual-source irrigation system, reducing tailwater resulting from irrigation, and other actions to promote the conjunctive management of surface water and groundwater.

A dual-source irrigation system is capable of diverting and utilizing surface water for irrigation when available and utilizing groundwater if surface water is unavailable. The benefits of this practice are that every acre-foot of surface water that is utilized is an acre-foot of groundwater that remains in the aquifer

[3] In most cases, not all on-farm practices will be able to be implemented. Also, some practices will not work in tandem with one another. For example, maximizing the use of available surface water and precision irrigation scheduling are not possible on the same field at the same time.

("in-lieu recharge"), supporting sustainable groundwater levels and maintaining groundwater storage. Additionally, the applied surface water will inevitably result in direct groundwater recharge through deep percolation. These positive impacts will initially occur in the aquifer directly beneath the grower's lands, while also influencing surrounding lands. The potential drawbacks to this system are the initial construction costs and higher maintenance costs associated with a more complex irrigation system that can draw from two water sources, as well as the potential for sediments and debris in surface water to obstruct irrigation systems. If the dual-source irrigation system is designed to accommodate this, surface water and groundwater could be intermixed during irrigation to mitigate these effects.

The on-farm management practice of reducing tailwater from irrigation and holding that water within the irrigated area will either increase the ET, increase the deep percolation, or some combination of the two. The practical steps taken to achieve these will vary from field to field. If there are irrigation application uniformity issues with over-irrigation occurring in certain parts of the field, addressing these issues will promote tailwater reduction. Also, if there are low-lying portions of a field or border strips that are not in agricultural production, excess applied water can be directed to these areas where it can be contained by topography or the construction of low berms and allowed to infiltrate the ground and recharge the underlying groundwater system, rather than flowing off the field.

The two practices above are examples of conjunctive management, which recognizes that surface water and groundwater are interdependent and seeks to combine and balance the beneficial use of both water sources to promote sustainable water use while minimizing any negative economic or environmental impacts that have the potential to occur (Dudley and Fulton, 2006). Conjunctive management is often practiced on a larger scale, but it can be applied by individual growers through the practices above (and others) to maximize surface water usage when available and promote groundwater sustainability.

4.4.2.1.2 *Managing soil to improve infiltration and root zone soil moisture storage*

Another on-farm practice that will promote groundwater sustainability is management of soil at the ground surface and within the root zone to improve infiltration of applied water and reduce runoff or ponding on the ground surface. This can be implemented through a variety of on-farm practices including planting cover crops or utilizing crop rotations to increase organic matter content in the root zone, application of manure or other organic material, limiting soil compaction by minimizing use of heavy equipment, and if there is a restrictive layer near the surface of the ground, potentially using deep ripping or tillage to improve infiltration past the restrictive layer (Sanden et al, 2016; USDA-NRCS, 2014). Improving infiltration will result in increases in direct recharge and improving soil moisture storage may increase effective precipitation and slightly reduce the required volume and frequency of irrigation.

4.4.2.1.3 *Reducing non-beneficial evapotranspiration*

This section describes two potential methods for reducing non-beneficial ET through altering and carefully controlling the timing and volume of applied water.

4.4.2.1.3.1 Precision irrigation scheduling

Precision irrigation scheduling has the potential to benefit both grower profits and sustainable groundwater management. Precision irrigation scheduling enables growers to accurately identify the timing and volume of irrigation water to apply to maximize crop productivity while minimizing water application. It typically requires real-time or near real-time information on soil moisture and weather conditions and is crop

dependent. When effectively implemented, precision irrigation scheduling promotes sustainable groundwater management through increased water use efficiency; water that otherwise would have been applied to the field remains in the groundwater system or is available for use elsewhere.

4.4.2.1.3.2 Regulated deficit irrigation

Regulated deficit irrigation applies irrigation water during important drought-sensitive growth stages for a crop and reduces applied irrigation water (i.e., deficit irrigation) during other growth stages where there will be little to no effect on crop yields. This on-farm management practice needs to be prudently applied, but it has the potential to reduce applied water and associated irrigation costs while having little to no impact on crop yields. It promotes sustainable groundwater management through reduced consumptive use; water that otherwise would have been applied to the field is not consumed and remains in the groundwater system or is available for use elsewhere.

4.4.2.1.4 *Precision nutrient management*

Another negative impact to the groundwater system that can result from irrigated agriculture is the degradation of groundwater quality occurring from excess application of nutrients (i.e., nitrogen, phosphorus, etc.) and pesticides or herbicides. As applied water infiltrates the ground and percolates to the aquifer, it can transport excess nutrients, pesticides, or herbicides applied on the land surface during crop production or liberate these constituents that are present in the ground from historic practices. At high concentrations, these materials are a health concern if this groundwater is pumped and used for human consumption. Improving on-farm nutrient management and efficiency of nutrient application will save on-farm costs and reduce the nutrient influx to the groundwater system.

4.4.2.2 Implementation

The GSA would implement the grower education program by planning, preparing, and conducting outreach efforts related to the topics above. Outreach efforts may include seminars, trainings, workshops, and publications on topics related to on-farm water management and groundwater sustainability. The program would continue and expand the irrigation evaluation services currently in place through the Mobile Irrigation Lab (MIL), operated in Tehama County by the Tehama County Resource Conservation District since 2002.

As the GSA begins to conceptualize and implement specific grower education programs and tools, it may consider partnering with local grower groups, educational and agricultural extension professionals, and others who are experienced in grower outreach and are knowledgeable about local agricultural practices. Potential agencies and groups that the GSA may consider partnering with are:

- University of California Cooperative Extension (UCCE)
- California State University, Chico (Chico State)
- University of California, Davis (UC Davis)

Staff and researchers at UCCE, Chico State, and UC Davis regularly partner with counties and other local agencies to conduct applied research and education programs throughout California.

4.4.2.2.1 *Implementation Schedule*

A general implementation schedule for the grower education program is presented in **Table 4-9**. Planning and partnership development are expected to begin in the first two years of GSP implementation, recurring as needed over the GSP implementation period. As topics are planned and partnerships are developed, education programs are expected to occur throughout GSP implementation.

It is anticipated that the public and other agencies will be notified of planned grower education activities through outreach and communication channels identified in the GSP.

Table 4-9. Grower Education Program Implementation Schedule

PHASE/TIMELINE ACTIVITY	DESCRIPTION	YEAR START	YEAR END
Education Topic Planning	Identifying specific education topics relevant to local agricultural practices and groundwater conditions	Year 1 of Project Implementation	Ongoing
Partnership Development	Identifying and teaming with partner agencies to plan and implement grower outreach	Year 2 of Project Implementation	Ongoing
Education Program Implementation	Conducting grower education and outreach activities	Year 3 of Project Implementation	Ongoing

4.4.2.2.2 *Notice to Public and Other Agencies*

The public and other agencies will be notified of planned grower education activities through outreach and communication channels identified in the GSP.

4.4.2.2.3 *Construction Activities and Requirements*

There are no anticipated construction activities that would affect the grower education program. The grower education program will primarily require development and distribution of technical and educational resources, which the GSA will prepare through the partnerships described above.

4.4.2.2.4 *Water Source*

While there is no water source directly used in this program, the grower education program will promote conjunctive use of groundwater and all surface water sources available to growers and will promote reduction in non-beneficial ET of all water sources.

4.4.2.2.5 *Circumstances and Criteria for Implementation*

Grower education programs will add value to other groundwater sustainability efforts at any time during GSP implementation. Because on-farm water management decisions are so impactful to achieving and maintaining groundwater sustainability, implementation of grower education programs is anticipated throughout GSP implementation, with planning efforts beginning the first year of GSP implementation. Over time, programs will be tailored to reflect current technologies and best practices in on-farm water management, especially as the GSA's understanding of groundwater conditions in the Bowman Subbasin grows.

4.4.2.2.6 *Legal Authority, Permitting Processes, and Regulatory Control*

The GSA has the authority to plan and partner with other groups to implement grower education activities. There are no anticipated permitting or regulatory processes that would affect the grower education program.

4.4.2.3 Operation and Monitoring

The grower education program will be accomplished by the GSA through partnerships with agencies, as described under the implementation section, above. The GSA and partner agencies will develop and distribute educational materials on topics relevant to local agricultural practices and groundwater conditions.

Grower responses to specific educational topics will be assessed and monitored through pre- and post-workshop surveys. These surveys will be designed to identify the extent to which growers adopt recommended practices.

All benefits to sustainability indicators in the Bowman Subbasin will be evaluated through groundwater monitoring and water quality monitoring at nearby monitoring sites, identified in the GSP

4.4.2.4 Benefits and Costs

Implementation of grower education activities is ultimately expected to benefit groundwater levels, groundwater storage, and water quality. Encouraging growers to implement on-farm water management practices that maximize surface water use and reduce non-beneficial ET is expected to provide in-lieu recharge benefits to the groundwater system. Encouraging soil management to enhance infiltration is expected to enhance direct groundwater recharge. Both in-lieu and direct recharge are anticipated to benefit groundwater levels and groundwater storage. Encouraging growers to implement precision nutrient management is also expected to help manage nutrient loading in the subbasin, with benefits to water quality.

The benefits of grower education are expected throughout program implementation, beginning the first or second year of education program implementation **(Table 4-9**). These benefits will be monitored as described in the operation and monitoring section, above.

The total cost of the grower education program will vary depending on the types and extent of educational outreach. Grower outreach and education through social media communication may be inexpensive or virtually free, while seminars, trainings, workshops, and publications will likely incur planning and development costs. Total costs are expected to be proportional to the expansion of the education program over time. Conceptual-level estimated costs for grower education are approximately $10,000, assuming approximately two workshops per year, and that $5,000 is required for workshop preparation, implementation, and related distributed materials. These efforts and costs may be distributed across one or more Subbasins in Tehama County. Refined costs will be developed, and actual costs will be described in the GSP annual reports as specific education activities are planned and implemented.

4.4.3 Cottonwood Creek Invasives Control Follow Up & Riparian Habitat Restoration

4.4.3.1 Overview

Since 2012, agencies in the Bowman Subbasin have been engaged in demand management in riparian zones through removal of invasive plant species. This project would build on past projects by strategically removing known invasive plant species occurring within portions of Cottonwood Creek's South Fork located in Tehama County. The goal of this project would be to reduce demand on riparian and groundwater resources with the benefit of increased groundwater availability for all beneficial users of groundwater in the Subbasin and improved surface water conveyance and ground and surface water interactions.

It is anticipated that follow up treatments will be required over a five-year period in order to assure control of invasive species and ensure healthy functioning of the watershed. Once formerly infested sites are free of infestations, native plants need to be reestablished in order to expedite the development of the Creek's riparian corridor. This project would also enhance existing riparian habitat by filling-in fragmented areas with native species, controlling erosion along creek banks, implementing riparian fencing, and/or obtaining conservation easements to protect riparian resources.

This section summarizes implementation activities, operation and monitoring efforts, and related costs and benefits of a Cottonwood Creek invasives control follow-up and riparian habitat restoration in the Bowman Subbasin.

4.4.3.2 Implementation

Implementation of a Cottonwood Creek invasives control follow-up would occur periodically over the course of 5 years. Based on invasive growth and thoroughness of removal in previous stages, control would be implemented at selected sites in the Bowman Subbasin, with benefits of groundwater demand reduction and improved natural wetland habitat. Estimated demand reduction and wetland habitat benefits from previous phases of the project would be analyzed, reported, and used to inform development and later implementation of the program.

The project proponent reports that this project is currently in the implementation and construction, maintenance, and monitoring phases. While initial project work was funded and began in September 2012, follow-up is required on an ongoing basis. Due to the growth characteristics of Arundo and Tamarisk in particular, follow up treatments are required in order to achieve control of infested sites and to treat missed areas of infestation. At appropriate intervals over the span of 5 years, additional sites for removal will be identified, with refinement according to lessons learned from early project implementation.

Project work entails the identification and removal of following species along the Cottonwood Creek corridor:

- giant reed (Arundo Donax)
- salt cedar (Tamarisk)
- black locust
- tree-of-heaven
- pampas grass
- scotch broom

Tehama County Resource Conservation District will work with agencies in the Subbasin to ensure these management actions and set goals are achieved. It is anticipated that three follow up treatments will be required over a five-year period in order to assure control. Once formerly infested sites are free of infestations, native plants need to be reestablished in order to expedite the development of the Creek's riparian corridor and to prevent erosion of creek banks.

Following removal, the third phase of the project would involve identification of project areas, where fragmented riparian areas need to be filled-in, where riparian fencing would be beneficial, and where conservation easements would be beneficial. This would be followed by the appropriate actions for each location- planting of native species, obtainment of proper permitting and construction of riparian fencing. The GSA would work with appropriate authorities to obtain permissions where necessary.

Recharge and wetland habitat benefits in the early phases of the project would be analyzed, reported, and used to inform development and later implementation of the program.

4.4.3.2.1 *Implementation Schedule*

This project follows up on completed work and ensures permanent removal of invasive species. The current status of this effort is ongoing. Work began in September 2012 on the first phase of this project. However, the ongoing follow-up portion of the project is still in the early conceptual stage. Thus, the implementation and termination dates of the ongoing follow-up portion have yet to be determined. Criteria for implementation will depend on the availability of grant funding, regrowth of invasive species and other factors.

4.4.3.2.2 *Notice to Public and Other Agencies*

Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA newsletter, member agency newsletter, inter-basin coordination meetings, member agency governing body public meetings, GSP annual report(s), public scoping meetings and environmental/regulatory permitting notification.

4.4.3.2.3 *Construction Activities and Requirements*

If deemed appropriate for specific locations along Cottonwood Creek, riparian fencing would be constructed. Requirements include permission from landowners, identification of location for fence posts, and installation of posts and fencing.

Appropriate permits will be obtained for work around and near the surface water infrastructure described in this project. While mechanical means may be used to remove trees and transport them to an appropriate disposal facility, this project does not involve any major construction activities.

4.4.3.2.4 *Water Source*

As a demand management and habitat restoration project, no water source will be required for implementation of this project.

4.4.3.2.5 *Circumstances and Criteria for Implementation*

The circumstances for implementation of this project will depend on the availability of grant funding, regrowth of invasive species and other factors.

4.4.3.2.6 *Legal Authority, Permitting Processes, and Regulatory Control*

GSAs, Districts, and individual project proponents have the authority to plan and implement projects. The County has a permitting role for this demand management project. This project may require an environmental review process under CEQA. If required, this project would need either an Environmental Impact Report and Negative Declaration or Mitigated Negative Declaration.

4.4.3.3 Operation and Monitoring

Expert knowledge will be required to identify and mark invasive species for removal. Both herbicide and manual removal methods will be employed. Monitoring will occur over the course of 5 years.

Periodic follow-up will take place through visual inspection and will follow the same procedure.

Sustainability indicators that are expected to benefit from this project include increased groundwater levels and groundwater storage, as well as reduction in depletions of interconnected surface water. All benefits to sustainability indicators in the Bowman Subbasin will be evaluated through groundwater monitoring and water quality monitoring at nearby monitoring sites, identified in the GSP.

4.4.3.4 Project Benefits and Costs

There are multiple expected benefits of this project. Through the control of these invasive plants, the threat of their spreading into the Sacramento River's main stem is reduced as is their impacts on those portions of the Creek's riparian zone which now contain infestations. The project is also expected to improve surface water infrastructure conveyance and decrease groundwater demand in riparian zones. This project is currently in the early conceptual stage. Thus, the expected yield of this project has yet to be determined and will be reported in annual reports when known.

Restoration of the natural riparian habitat around Cottonwood Creek has multiple expected benefits as well. Filling-in fragmented areas with native species, controlling erosion along creek banks, implementing riparian fencing, and/or obtaining conservation easements to protect riparian resources will increase recharge potential along Cottonwood Creek. Improved native habitat may increase the ability of the area surrounding the creek to reduce flood water velocity and to recharge flood water into the groundwater while simultaneously assisting with erosion control and sediment trapping (NRCS 1996). Recycling of nutrients and other chemical reactions within the riparian zone improve groundwater quality through absorption of chemicals and nutrients.

Evaluation of benefits will be quantified through post project monitoring. Post project monitoring will be compared to pre-project data as a means of quantifying the benefit. Post project monitoring may include but is not limited to: flow measurement consistent with state regulations, consumptive use analysis, reductions in groundwater use, well monitoring, determination of infiltration rates, water balance analysis, as-built drawings, and stream gaging.

In order to control possible erosion along creek banks, the earlier phases of this project will be closely followed by the latter phases, which involves habitat restoration to prevent erosion. Trees will be planted to prevent erosion of the creek bed; these trees will likely use groundwater near the creek that is replenished from the creek. As the trees grow, their increased use of groundwater will offset some of the groundwater demand reduction achieved through removal of the invasive species. These plants would be

more resistant to drought than the plants currently in place and would adapt to the conditions naturally occurring in this area.

This project is currently in the early conceptual stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in annual reports when known. Potential funding sources are being evaluated as project planning continues; they include, but are not limited to, the following: grants, loans, bonds, assessment fees, and cost-sharing programs. Potential funding sources will be reported in annual reports when known.

4.5 Portfolio of Other Potential Projects and Management Actions

In addition to the PMAs developed for implementation, the GSA has identified a portfolio of other potential PMAs that could provide benefits with respect to one or more of the sustainability indicators. These PMAs are still under development and require additional information that would be determined through future monitoring and evaluation, and as the GSA continues to identify and collect additional data. This section provides descriptions for these other potential PMAs that could be selected for future implementation in the Bowman Subbasin if needed to maintain sustainability.

While the Bowman Subbasin is currently sustainable and is expected to be managed sustainably throughout the GSP planning and implementation horizon, the GSA has planned an adaptive management strategy that will be informed by continued monitoring of groundwater conditions throughout GSP implementation. If monitoring indicates that established measurable objectives (MOs) cannot be maintained and/or that minimum thresholds (MTs) are being approached, one or more of these potential PMAs could be evaluated and selected for implementation to ensure that the sustainability goal is achieved and that undesirable results do not occur.

The portfolio of potential PMAs is summarized below, organized according to PMA type. “Projects” generally refer to structural features or activities that may require construction and related permitting activities (e.g., recharge basins, Flood-MAR). “Management actions” are typically non-structural programs, policies, or efforts that serve to change behaviors and practices around groundwater use designed to support sustainable groundwater management (e.g., education programs, well ordinances). Per 23 CCR §354.44(b)(2), the potential management actions include demand management efforts that could be rapidly implemented and scaled if the Bowman Subbasin is approaching minimum thresholds specified in the GSP. Projects and management actions are expected to benefit specific groundwater sustainability indicators through their implementation, for example improving groundwater levels, groundwater storage, or water quality. “Other” activities are also proposed that do not directly benefit specific groundwater sustainability indicators but are still beneficial for effectively implementing the GSP. Examples of other activities include studies, monitoring, and improvements in modeling to better understand groundwater conditions in the Subbasin.

Potential PMAs are described at a reconnaissance-level of detail relative to the PMAs described in **Section 4.4**, above. However, PMA information is still reported in accordance with 23 CCR §354.44(b). The required information is summarized in a table following a brief description of each potential PMA.

4.5.1 Potential Projects

This section describes potential projects that would be implemented if determined to be necessary, pending future conditions in the Bowman Subbasin. **Table 4-10** lists the potential projects described in the subsections that follow.

Table 4-10. List of Potential Projects Proposed for the Bowman Subbasin

PROJECT	PRIMARY PROJECT TYPE(S)[1]
Direct Groundwater Recharge of Stormwater and Flood Water	Direct Groundwater Recharge
Stormwater Management Improvements	Direct Groundwater Recharge
Levee Setback and Stream Channel Restoration	Direct Groundwater Recharge
Recycled Water Projects	Direct Groundwater Recharge, In-Lieu Groundwater Recharge
Invasive Plant Removal from Creeks and Irrigation Conveyance Canals	Groundwater Demand Reduction
Inter-Basin Surface Water Transfers or Exchanges	Surface Water Supply Augmentation
Water Supply Reservoir Construction, Renovation, or Conversion	Surface Water Supply Augmentation
Enhanced Boundary Flow Measurement	Additional Monitoring
Well Metering	Additional Monitoring

[1]The primary function of the project as conceptualized, although during implementation projects may be used for multiple functions to support groundwater sustainability.

4.5.1.1 Direct Groundwater Recharge of Stormwater and Flood Water

This project would recharge groundwater using excess surface water available in wet years. Additional recharge during wet years provided by this project would offset increased demand for groundwater during drier years (23 CCR §354.44(b)(9)). It is anticipated that this project would primarily use flood water and stormwater, diverted directly from waterways, or delivered to recharge areas through existing conveyance infrastructure. Recharge may occur through conveyance such as unlined canal and laterals, natural drainages such as creek beds, recharge basins, and aquifer storage and recovery (ASR) wells. Recharge may also occur using flood water for on-farm managed aquifer recharge (Flood-MAR). Specific recharge areas are not yet identified but should have characteristics that are suitable for recharge (e.g., suitable surficial geology, low enough groundwater levels to provide storage for recharge, and access to surface water). A summary of the project is provided in **Table 4-11.**

Table 4-11. Direct Groundwater Recharge of Stormwater and Flood Water: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This project is proposed for implementation in areas of the Subbasin that have access to stormwater and/or flood water. The precise location would be determined through further evaluation if/when the project is selected for implementation, depending on the characteristics of the chosen project configuration. The project would provide direct groundwater recharge to the aquifer. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This project is currently in the early planning stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years when stormwater and flood water is available, potentially beginning the first year of project implementation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This project would use flood water and stormwater when available along creeks, streams, and channels in and adjacent to the Bowman Subbasin. See Section 4.8 for additional information regarding water available for projects in the Bowman Subbasin.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early planning stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This project is currently in the early planning stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

4.5.1.2 Stormwater Management Improvements

This project would improve stormwater management efforts to enhance groundwater recharge during periods when stormwater is available. Improvements to existing facilities may include maintenance and repairs of pumps and holding basins to ensure they have adequate capacity to manage and retain anticipated stormwater. Improvements to the watershed and landscape may include restoration of areas affected by wildfires and of unused grazing land to reduce runoff and improve recharge. A summary of the project is provided in **Table 4-12**.

Table 4-12. Stormwater Management Improvements: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This project is proposed for implementation in areas of the Subbasin with existing stormwater management infrastructure, and in wildfire-affected areas or grazing land that may contribute to undesirable stormwater runoff characteristics. The precise location of the project would be determined through further evaluation if/when the project is selected for implementation, depending on the characteristics of the chosen project configuration. The project would provide direct groundwater recharge to the aquifer by reducing runoff and by improving or increasing the recharge potential of stormwater detention facilities. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This project is currently in the early planning stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years when stormwater flows occur, potentially beginning the first year of project implementation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This project would use stormwater when available along creeks, streams, and channels in and adjacent to the Bowman Subbasin. See Section 4.8 for additional information regarding water available for projects in the Bowman Subbasin
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.

ITEM IN GSP REGULATIONS	DESCRIPTION
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early planning stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This project is currently in the early planning stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

4.5.1.3 Levee Setback and Stream Channel Restoration

This project would restore stream channels and levee setbacks in the Subbasin to increase groundwater recharge of surface water along waterways. The project is also expected to provide other benefits to environmental water users, providing wildlife habitat, and improving the overall riparian ecosystem. A summary of the project is provided in **Table 4-13**.

Table 4-13. Levee Setback and Stream Channel Restoration:Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This project is proposed for implementation along stream channels in and surrounding the Subbasin boundaries. The precise location of the project would be determined through further evaluation if/when the project is selected for implementation, depending on the characteristics of the chosen project configuration. The project would provide direct groundwater recharge to the aquifer by restoring channel and levee characteristics, with additional benefits for environmental water users. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This project is currently in the early planning stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years that stream flows occur, potentially beginning the first year of project implementation.

ITEM IN GSP REGULATIONS	DESCRIPTION
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This project would not directly use water supplies but would improve management and conveyance of existing flows along stream channels in and surrounding the Bowman Subbasin. See Section 4.8 for additional information regarding water available for projects in the Bowman Subbasin.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early planning stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This project is currently in the early planning stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

4.5.1.1 Rain-MAR

This project would modify on-field conditions and infrastructure to capture and hold precipitation, taking water that would have otherwise drained from the field through runoff and instead supplying that to the groundwater system through rainfall managed aquifer recharge (Rain-MAR). Rain-MAR would provide distributed groundwater recharge throughout the Subbasin, operating through voluntary grower participation. Besides groundwater recharge, Rain-MAR can also provide benefits to flood risk reduction by decreasing runoff, and to ecosystem enhancement for birds and other wildlife. A summary of the project is provided in **Table 4-14**.

Table 4-14. Rain-MAR: Summary (23 CCR §354.44(b)).

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This project is proposed for implementation in agricultural areas of the Subbasin, particularly those with soil and slope characteristics suitable for retaining runoff and supplying recharge to the aquifer. The precise location would be determined through further evaluation if/when the project is selected for implementation, depending on the characteristics of the chosen project configuration. The project would provide direct groundwater recharge to the aquifer. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This project is currently in the early planning stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years when precipitation and runoff occurs, potentially beginning the first year of project implementation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This project would capture precipitation on-field, preventing runoff and using that water to recharge the aquifer instead. Precipitation may be available in all years, with additional precipitation in wetter years. See Section 2.3 for the Subbasin water budget, including average annual precipitation over the projected water budget period. This project increases subbasin recharge only in wet years when precipitation volume is high, such that some precipitation flows out of the subbasin,
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early planning stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This project is currently in the early planning stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

4.5.1.2 Recycled Water Projects

Recycled water projects would identify and facilitate use of recycled water of suitable quality in the Subbasin. Recycled water could be used for groundwater recharge, urban or agricultural irrigation, or other purposes. Potential sources of recycled water include treated wastewater or treated process water from agricultural facilities. To generate additional supply, the projects may also explore enhancements to wastewater treatment facilities to supply tertiary-treated Title-22 effluent for irrigation. Projects may also explore construction of wetlands as a discharge site for treated wastewater, modeled after the completed Rio Alto Water District Wastewater Treatment Plant & Constructed Wetlands Project. Constructed wetlands may provide groundwater recharge benefits while also enhancing habitat for waterfowl and wildlife and providing other educational and recreational opportunities for the community. A summary of the projects is provided in **Table 4-15.**

Table 4-15. Recycled Water Projects: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This project is proposed for implementation in all areas of the Subbasin with access to recycled water of suitable quality. The precise location of the project would be determined through further evaluation if/when the project is selected for implementation, depending on the characteristics of the chosen project configuration. Depending on how and where recycled water is used, the project could provide direct groundwater recharge (e.g., when used to create wetlands) and in-lieu groundwater recharge (e.g., when used for irrigation) benefits. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This project is currently in the early planning stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years recycled water is available, potentially beginning the first year of project implementation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This project would use available recycled water supplies of suitable quality. This project is currently in the early planning stage. Precise sources and reliabilities of recycled water would be identified if/when the project is evaluated and selected for implementation. Those will be reported in GSP annual reports and five-year updates when known.

ITEM IN GSP REGULATIONS	DESCRIPTION
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and benefit evaluation Methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early planning stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This project is currently in the early planning stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

4.5.1.3 Invasive Plant Removal from Creeks and Irrigation Conveyance Canals

Similar to the potential project developed for implementation along Cottonwood Creek (Section 4.4), this project would remove invasive plants from creeks and irrigation conveyance canals (e.g., Arundo donax, tamarisk, Himalayan blackberry). In addition to Cottonwood Creek, many small tributaries in the watersheds of Tehama County have decreased conveyance, elevated levels of siltation, and diminished flood-carrying capacity due to invasive vegetation overgrowth. Debris-clearing is a challenge due to environmental permitting restrictions. Removal of these plants along other waterways would reduce conveyance issues, reduce non-beneficial consumptive use of shallow groundwater and surface water, and restore conditions for GDEs and native riparian species. A summary of the project is provided in **Table 4-16.**

Table 4-16. Invasive Plant Removal: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This project is proposed for implementation along stream channels and irrigation conveyance canals in the Subbasin. The precise location of the project would be determined through further evaluation if/when the project is selected for implementation, depending on the characteristics of the chosen project configuration. The project would reduce groundwater demand of those invasive species removed, with additional benefits for other environmental water users. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This project is currently in the early planning stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue beginning the first year of project implementation.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability (§354.44(b)(6))	While there is no water source directly used by this project, removal of invasive plants species will reduce non-beneficial consumptive use of shallow groundwater and surface water, preserving an equal volume of water for other uses in the Subbasin.
Legal authority, permitting processes, and regulatory control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and benefit evaluation methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early planning stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This project is currently in the early planning stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

4.5.1.4 Inter-Basin Surface Water Transfers or Exchanges

This project would promote inter-basin transfers or exchanges of underutilized surface water supplies from other subbasins in Tehama County. As part of this project, incentives for surface water use could also be explored to encourage in-lieu groundwater recharge. Potential opportunities for transfers and exchanges include, but are not limited to:

- Transfers of treated wastewater from the City of Red Bluff
- Trout Unlimited Groundwater substitution transfers, and
- Other Groundwater substitution transfers.

A summary of the project is provided in **Table 4-17**.

Table 4-17. Inter-Basin Surface Water Transfers or Exchanges: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This project is proposed for implementation in all areas of the Subbasin with access to surface water supplies, particularly along irrigation conveyance canals or channels that could be used to transfer water. The precise location of the project would be determined through further evaluation if/when the project is selected for implementation, depending on the characteristics of the chosen project configuration. The project would augment surface water supplies available to users in the Subbasin, which could be used for direct groundwater recharge and/or in-lieu groundwater recharge, depending on how and where the water is used. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This project is currently in the early planning stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue beginning the first year of project implementation, pending potential transfers or exchanges.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This project would use surface water supplies procured through potential transfers or exchanges from other agencies in Tehama County. This project is currently in the early planning stage. Precise sources and reliabilities of surface water transfers or exchanges would be identified if/when the project is evaluated and selected for implementation.

ITEM IN GSP REGULATIONS	DESCRIPTION
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early planning stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This project is currently in the early planning stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

4.5.1.5 Water Supply Reservoir Construction, Renovation, or Conversion

This project would explore opportunities to construct, renovate, or convert flood control facilities to a water supply reservoir. Additional surface water storage would augment available surface water supplies for use in the Subbasin, with potential direct recharge or in-lieu recharge benefits depending on how or where the surface water is used. A summary of the project is provided in **Table 4-18.**

Table 4-18. Water Supply Reservoir Construction, Renovation, or Conversion: Summary (23 CCR §354.44(b)).

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This project is proposed for implementation at existing flood control facilities in the Subbasin, or potentially at other locations identified as suitable for construction of a new water supply reservoir. The precise location of the project would be determined through further evaluation if/when the project is selected for implementation, depending on the characteristics of the chosen project configuration. The project would augment surface water supplies available to users in the Subbasin, which could be used for direct groundwater recharge and/or in-lieu groundwater recharge, depending on how and where the water is used. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.

ITEM IN GSP REGULATIONS	DESCRIPTION
Timeline (§354.44(b)(4))	This project is currently in the early planning stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to begin following reservoir construction, renovation, or conversion. Benefits are expected to accrue in all years when stormwater flows occur, potentially beginning the first year of project operation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This project would augment surface water supply resources by managing and storing flood flows along stream channels in and surrounding the Bowman Subbasin. See Section 4.8 for additional information regarding water available for projects in the Bowman Subbasin.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This project is currently in the early planning stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This project is currently in the early planning stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

4.5.1.6 Enhanced Boundary Flow Measurement

This project would enhance measurement of boundary outflows from lands in the Subbasin. Outflows of interest include surface water outflows from canals and drains, and distributed outflows from irrigated lands, such as precipitation runoff and irrigation return flows. Distributed outflows, in particular, are believed to be a substantial component of the water budget but are largely unquantified at this time. Improved understanding of boundary outflows, which vary substantially from year to year, can facilitate capture and use of this water for in-lieu recharge. A summary of the project is provided in **Table 4-19.**

Table 4-19. Enhanced Boundary Flow Measurement: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This project is proposed for implementation at locations where surface water outflows occur (e.g., measurement sites at the ends of canals and drains), or at locations where surface water outflows can be estimated more accurately (e.g., measurement sites at strategic locations along streams and creeks). The precise location of the project would be determined through further evaluation if/when the project is selected for implementation, depending on the characteristics of the chosen project configuration. The project would help to improve management of existing surface water supplies in the Subbasin, allowing this water to be captured and used for in-lieu recharge or other beneficial uses. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This project is currently in the early planning stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue beginning the first year of project operation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This project would not directly use water supplies but would improve management and utilization of existing surface water supplies in the Bowman Subbasin. See Section 4.8 for additional information regarding water available for projects in the Bowman Subbasin.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	While enhanced boundary flow measurement is beneficial to GSP implementation and supporting Subbasin sustainability, there are no anticipated direct benefits to specific sustainability indicators. This project is currently in the early planning stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.

ITEM IN GSP REGULATIONS	DESCRIPTION
Costs (§354.44(b)(8))	This project is currently in the early planning stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

4.5.1.7 Well Metering

This project would enhance monitoring of groundwater extractions in the Subbasin by installing meters on larger agricultural wells. The data collected through this project would help the GSA to better manage continued sustainability of the Subbasin within its sustainable yield and improve management of pumping for in-lieu recharge benefits. A summary of the project is provided in **Table 4-20**.

Table 4-20. Well Metering: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This project is proposed for implementation at larger agricultural wells in the Subbasin. The precise location of the project would be determined through further evaluation if/when the project is selected for implementation, depending on the characteristics of the chosen project configuration. Data collected through this project would help to manage continued operation of the Subbasin within its sustainable yield and allow better management of pumping for in-lieu recharge benefits. This project may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This project is currently in the early planning stage. Thus, the start and completion dates for this project have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue beginning the first year of project operation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This project would not directly use water supplies but would improve management and utilization of groundwater supplies in the Bowman Subbasin within the sustainable yield of the Subbasin.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual project proponents have the authority to plan and implement projects. Required permitting and regulatory review will be project-specific and initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.

ITEM IN GSP REGULATIONS	DESCRIPTION
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	While well metering is beneficial to GSP implementation and supporting Subbasin sustainability, there are no anticipated direct benefits to specific sustainability indicators. This project is currently in the early planning stage. Thus, the expected yield of this project has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-project measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This project is currently in the early planning stage. Thus, the anticipated costs of this project have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The project proponent would identify funding sources to cover project costs as part of project development. These may include grants, fees, loans, and other assessments.

4.5.2 Potential Management Actions

This section describes potential management actions that would be implemented if determined to be necessary, pending future conditions in the Bowman Subbasin. Table 4-21 lists the potential management actions described in the subsections that follow.

Table 4-21. List of Potential Management Actions Proposed for the Bowman Subbasin

MANAGEMENT ACTION	MANAGEMENT ACTION TYPE(S)[1]
Assistance and Incentives for On-Farm Irrigation Infrastructure Improvements	Education/Outreach, In-Lieu Groundwater Recharge
Incentives for Residential and Municipal Water Use Efficiency Improvements	Groundwater Demand Reduction
Demand Management	Groundwater Demand Reduction
Incentives for Use of Available Surface Water and Recycled Water	In-Lieu Groundwater Recharge
Water Market for Surface Water and Groundwater Exchange	In-Lieu Groundwater Recharge
Tehama County Domestic Well Tracking and Outreach Program	Additional Monitoring, Programs to Support Wells
Well Deepening or Replacement Program	Programs to Support Wells
Review of County Well Permitting Ordinances	Well Permitting Ordinances

[1]The primary function of the management action as conceptualized, although during implementation management actions may be used for multiple functions to support groundwater sustainability.

4.5.2.1 Assistance and Incentives for On-Farm Irrigation Infrastructure Improvements

This management action would provide growers assistance with on-farm irrigation infrastructure improvements, especially capital improvements that support groundwater sustainability and allow growers to convert to dual-source irrigation systems. Dual-source irrigation systems support in-lieu groundwater recharge by allowing growers to use both surface water and groundwater for drip irrigation of orchards and other crops. Typical components required for a dual-source system are a surface water irrigation "turnout" or point of delivery to the field, a pipeline or ditch to convey water from the turnout to a pump station, a pump or pumps for pressurization, and filtration. Other improvements to water conveyance infrastructure may also support on-farm irrigation using surface water, including installation of regulating reservoirs, filters or treatment, and pressurization equipment.

Implementation of this management action together with the planned grower education program (**Section 4.4.2**) would further encourage on-farm practices that support groundwater sustainability. A summary of the management action is provided in **Table 4-22**.

Table 4-22. Assistance and Incentives for On-Farm Irrigation Infrastructure Improvements: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This management action is proposed for implementation in irrigated areas of the Subbasin that have access to surface water supplies (e.g., surface water supplier service areas, areas with surface water rights adjacent to waterways). The precise location would be determined through further evaluation if/when the management action is selected for implementation. The management action would provide in-lieu groundwater recharge by encouraging and incentivizing use of surface water for irrigation when available. This management action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This management action is currently in the early planning stage. Thus, the start and completion dates for this management action have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years when surface water is available and used by participants in-lieu of groundwater, potentially beginning the first year of implementation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This management action would use existing surface water supplies when available in the Bowman Subbasin. See Section 4.8 for additional information regarding water available for projects in the Bowman Subbasin.

ITEM IN GSP REGULATIONS	DESCRIPTION
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement management actions. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, depletion of interconnected surface water, and potentially water quality. This management action is currently in the early planning stage. Thus, the expected yield of this management action has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This management action is currently in the early planning stage. Thus, the anticipated costs of this management action have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The proponent would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.2.2 Incentives for Residential and Municipal Water Use Efficiency Improvements

This management action would offer incentives for urban, residential, and commercial projects that improve water use efficiency. Residential and municipal water in the Subbasin is primarily supplied by groundwater. Improvements in residential and municipal water use efficiency thus support in-lieu groundwater recharge. Potential incentives and offers through this management action may include rebates for high efficiency appliances and incentives for lawn removal, low-water landscape installation, rain barrels, graywater reuse, or other activities that offset groundwater demand. Among these, only incentives for lawn removal and low-water landscape installation are expected to impact the Subbasin water budget, although all would offset some groundwater demand. This management action may also evaluate municipal water system operations and losses for other opportunities to reduce municipal water demand. A summary of the management action is provided in **Table 4-23**.

Table 4-23. Incentives for Residential and Municipal Water Use Efficiency Improvements: Summary (23 CCR §354.44(b)).

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This management action is proposed for implementation in residential areas and municipal service areas in the Subbasin. The precise location would be determined through further evaluation if/when the management action is selected for implementation. The management action would reduce groundwater demand by reducing residential and urban water demands, which are mainly met by groundwater in the Subbasin. This management action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This management action is currently in the early planning stage. Thus, the start and completion dates for this management action have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years beginning the first year of implementation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This management action would not directly use water supplies but would improve management and utilization of groundwater supplies in the Bowman Subbasin.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement management actions. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This management action is currently in the early planning stage. Thus, the expected yield of this management action has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This management action is currently in the early planning stage. Thus, the anticipated costs of this management action have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The proponent would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.2.3 Demand Management

While demand management is not expected to be required in the Bowman Subbasin during GSP implementation, demand management has been identified as a backstop to other potential PMAs if those are insufficient to maintain sustainability over the GSP planning and implementation horizon.

If needed, this management action would implement any of various water management activities that reduce demand for groundwater, primarily by reducing the consumptive use of irrigation water and reducing net groundwater pumping (pumping net of recharge) in the Subbasin. The demand management activities proposed in this management action are configurable and scalable, allowing the GSA to implement only those activities needed to address localized groundwater concerns.

As described in Section 4.3.2**,** potential demand management activities that could be implemented in Tehama County include:

- **Management and Restrictions of Land Use Changes**: Implementing County water use ordinances or other policies to restrict land use changes that would increase water demand in the Subbasin. Policies would generally restrict development of new agricultural land, restrict growth in areas with no surface water supply, and/or promote conversion of agricultural lands to less water intensive crops.
- **Pumping Fees:** Implementing tiered fee structures for groundwater extractions to incentivize reduced groundwater use.
- **Groundwater Extraction Allocation Program:** Creating groundwater extraction allocations to curtail or restrict the volume of groundwater extraction allowed. Could be implemented with pumping fees.
- **Land Fallowing Program:** Curtailing and/or restricting groundwater extractions by creating and enforcing a land fallowing program.
- **Other County Ordinances**: The County may develop or review policies and ordinances that align with sustainable groundwater management goals. Possible ordinances include regulations and limits for groundwater use, export, and illegal diversion of surface water. The County could also create additional guidelines during the well permitting process to reduce nearby competition between wells (i.e., well spacing or suggestions regarding total well depth, depth of well perforations, and location of a new well relation to existing wells). Efforts may be designed to be protective of domestic wells.

A summary of the management action is provided in **Table 4-24**.

Table 4-24. Demand Management: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	Demand management is proposed for scaled implementation in areas of the Subbasin where groundwater conditions may cause undesirable results. While demand management is not expected to be required in the Bowman Subbasin during GSP implementation, demand management has been identified as a backstop to other potential PMAs if those are insufficient to maintain sustainability. The precise location would be determined through further evaluation if/when the management action is selected for implementation. The management action would reduce groundwater demand by reducing pumping (through fees or allocations) and by reducing consumptive water requirements (through fallowing or policies to restrict land use changes). This management action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This management action is currently in the early planning stage. Thus, the start and completion dates for this management action have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue beginning the first year of implementation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This management action would reduce utilization of groundwater supplies in the Bowman Subbasin.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement management actions. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This management action is currently in the early planning stage. Thus, the expected yield of this management action has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.

ITEM IN GSP REGULATIONS	DESCRIPTION
Costs (§354.44(b)(8))	This management action is currently in the early planning stage. Thus, the anticipated costs of this management action have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The proponent would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.2.4 Incentives for Use of Available Surface Water and Recycled Water

This management action would incentivize the use of surface water and/or recycled water for irrigation whenever those water sources are available. Incentivized pricing structures and conveyance infrastructure improvements that enhance the utility of these water supply sources are expected to reduce groundwater demand among growers who irrigate with groundwater for reasons of cost and convenience. By offsetting groundwater demand with a like volume of surface water or recycled water, this management action is expected to provide in-lieu groundwater recharge benefits to the Subbasin. A summary of the management action is provided in **Table 4-25.**

Table 4-25. Incentives for Use of Available Surface Water and Recycled Water: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This management action is proposed for implementation in irrigated areas of the Subbasin that have access to surface water supplies (e.g., surface water supplier service areas) and/or areas adjacent to waterways and conveyance infrastructure that could be used to convey recycled water. The precise location would be determined through further evaluation if/when the management action is selected for implementation. The management action would provide in-lieu groundwater recharge by encouraging and incentivizing use of surface water and/or recycled water for irrigation when available. This management action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This management action is currently in the early planning stage. Thus, the start and completion dates for this management action have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years beginning the first year of implementation, depending on availability of surface water and recycled water.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This management action would use surface water supplies and available recycled water supplies of suitable quality. See Section 4.8 for additional information regarding water available for projects in the Bowman Subbasin.

ITEM IN GSP REGULATIONS	DESCRIPTION
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement management actions. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This management action is currently in the early planning stage. Thus, the expected yield of this management action has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This management action is currently in the early planning stage. Thus, the anticipated costs of this management action have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The proponent would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.2.5 Water Market for Surface Water and Groundwater Exchange

This management action would create a water market for growers and other water users in the Bowman Subbasin, allowing them to exchange surface water and groundwater. A surface water and groundwater exchange would allow for flexibility in water use to meet irrigation demands, while maintaining groundwater extraction within the overall sustainable yield of the Subbasin. A summary of the management action is provided in **Table 4-26.**

Table 4-26. Water Market for Surface Water and Groundwater Exchange: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This management action is proposed for implementation in irrigated areas of the Subbasin. The precise location would be determined through further evaluation if/when the management action is selected for implementation. The management action would provide flexibility to water users to manage the use of groundwater within the sustainable yield of the Subbasin. This management action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This management action is currently in the early planning stage. Thus, the start and completion dates for this management action have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years beginning the first year of implementation, depending on participation and availability of surface water.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This management action would use surface water supplies and manage use of groundwater supplies within the sustainable yield of the Subbasin. See Section 4.8 for additional information regarding water available for projects in the Bowman Subbasin.
Legal authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement management actions. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	The sustainability indicators expected to benefit are groundwater levels, groundwater storage, and depletion of interconnected surface water. This management action is currently in the early planning stage. Thus, the expected yield of this management action has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This management action is currently in the early planning stage. Thus, the anticipated costs of this management action have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The proponent would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.2.6 Tehama County Domestic Well Tracking and Outreach Program

This management action would create a system for tracking groundwater conditions at domestic wells across Tehama County. The centralized information in this system would allow the County to better manage and focus assistance and resources for domestic well owners in areas where monitoring indicates that groundwater levels have dropped, or in areas where wells are reported to have water quality impacts or have gone dry. This management action would also provide domestic well owners with resources and funding for well testing, inspection, and replacement, especially in areas where the tracking system indicates that wells have gone dry or that water quality concerns exist. Together, these actions will allow the County to be more proactive in supporting beneficial use of groundwater by domestic well users throughout GSP implementation. A summary of the management action is provided in **Table 4-27**.

Table 4-27. Tehama County Domestic Well Tracking and Outreach Program: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This management action is proposed for implementation throughout Tehama County. The management action would track dry domestic wells and offer outreach and assistance services to all domestic well users to support their ongoing beneficial use of groundwater. This management action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This management action is currently in the early planning stage. Thus, the start and completion dates for this management action have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years beginning the first year of implementation, depending on participation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This management action would not directly use water supplies but would improve management and utilization of groundwater supplies in the Bowman Subbasin within the sustainable yield of the Subbasin.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement management actions. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.

ITEM IN GSP REGULATIONS	DESCRIPTION
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	While domestic well tracking and outreach are beneficial to GSP implementation and supporting Subbasin sustainability, there are no anticipated direct benefits to specific sustainability indicators. This management action is currently in the early planning stage. Thus, the expected yield of this management action has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This management action is currently in the early planning stage. Thus, the anticipated costs of this management action have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The proponent would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.2.7 Well Deepening or Replacement Program

This management action would create a program to deepen or replace shallow wells and/or wells that have gone dry in Tehama County. This program would complement the well tracking and outreach program described in the previous section. A summary of the management action is provided in **Table 4-28**.

Table 4-28. Well Deepening or Replacement Program: Summary (23 CCR §354.44(b)).

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This management action is proposed for implementation throughout Tehama County. The management action would create a program to deepen or replace shallow wells to support ongoing beneficial use of groundwater by those users. This management action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This management action is currently in the early planning stage. Thus, the start and completion dates for this management action have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years beginning the first year of implementation, depending on participation.
Notice to Public and Other agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This management action would not directly use water supplies but would improve management and utilization of groundwater supplies in the Bowman Subbasin within the sustainable yield of the Subbasin.

ITEM IN GSP REGULATIONS	DESCRIPTION
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement management actions. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	While a well deepening and replacement program is beneficial to supporting beneficial uses and users of groundwater in the Subbasin, there are no anticipated direct benefits to specific sustainability indicators. This management action is currently in the early planning stage. Thus, the expected yield of this management action has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This management action is currently in the early planning stage. Thus, the anticipated costs of this management action have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The proponent would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.2.8 Review of County Well Permitting Ordinances

Through this management action, Tehama County would review existing well permitting ordinances and assess whether additional well permitting requirements are warranted to maintain sustainable groundwater conditions in the Subbasin. As needed, county ordinances could be updated to follow the latest DWR-recommended well standards (described in DWR Bulletin 74). The management action may also improve the well permitting and installation program to help protect water quality, allow for better screening, and avoid interference or impacts of pumping on neighboring wells. A summary of the management action is provided in **Table 4-29**.

Table 4-29. Review of County Well Permitting Ordinances: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This management action is proposed for implementation throughout Tehama County. The management action would review existing County well permitting ordinances and assess whether additional well permitting requirements are warranted to support groundwater sustainability. This management action may be implemented and would be monitored and quantified with respect to groundwater conditions, as needed, if sustainable levels are not reached following implementation of other PMAs. This will be done in the context of Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This management action is currently in the early planning stage. Thus, the start and completion dates for this management action have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years beginning the first year of implementation
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This management action would not directly use water supplies but would improve management and utilization of groundwater supplies in the Bowman Subbasin within the sustainable yield of the Subbasin.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement management actions. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	While reviewing and updating County well permitting ordinances may be beneficial to supporting ongoing operation of the Subbasin within its sustainable yield, there are no anticipated direct benefits to specific sustainability indicators. This management action is currently in the early planning stage. Thus, the expected yield of this management action has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This management action is currently in the early planning stage. Thus, the anticipated costs of this management action have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The proponent would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.3 Potential Other Activities

This section describes other potential activities that could be implemented if determined to be necessary, pending future conditions in the Bowman Subbasin. These potential "other" activities are not expected to directly benefit specific groundwater sustainability indicators but are still beneficial for effectively implementing the GSP. Examples of other activities include studies, monitoring, and improvements in modeling to better understand groundwater conditions in the Subbasin

Table 4-30 lists the potential other activities described in the subsections that follow.

Table 4-30. List of Potential Other Activities Proposed for the Bowman Subbasin

OTHER ACTIVITY	OTHER ACTIVITY TYPE(S)[1]
Coordination and Development of Public Data Portals	Coordination and Data Sharing
Additional Studies of GDEs and Groundwater - Surface Water Interactions	Additional Monitoring
Expanded Subbasin Monitoring and Aquifer Testing	Additional Monitoring
Install Additional Agroclimate Stations	Additional Monitoring
Maintain and Expand Groundwater Level Monitoring Network	Additional Monitoring
One-Time Groundwater Quality Snapshot and Evaluation	Additional Monitoring
Tehama County Well Inventory and Registration Program	Additional Monitoring

[1]The primary function of the activity as conceptualized, although during implementation actions may be used for multiple functions to support groundwater sustainability.

4.5.3.1 Coordination and Development of Public Data Portals

This activity would maintain ongoing coordination and information sharing among water purveyors and agencies in the Tehama County subbasins and neighboring subbasins. As part of this activity, agencies may develop shared public data portals to track and monitor groundwater sustainability indicators. Coordination would determine the types of data and data formats available, and establish standard methods for receiving, storing, and sharing data with the public, DWR, other agencies. Coordination would also foster relationships with neighboring Subbasins, land use planning entities, and relevant local, state, and federal agencies and organizations. A summary of this activity is provided in **Table 4-31**.

Table 4-31. Coordination and Development of Public Data Portals: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This activity would foster joint coordination and information sharing among agencies in the Tehama County subbasins and neighboring subbasins. Information sharing may include development of shared public data portals to track and monitor groundwater sustainability indicators. This activity may be initiated to support GSP implementation if determined to be necessary or useful for maintaining ongoing sustainability in the Bowman Subbasin, pending future conditions. The details of this effort would be determined through further evaluation if/when the action is selected for implementation. Implementation will be done in the context of the Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This activity is currently in the early planning stage. Thus, the start and completion dates for this activity have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years beginning the first year of implementation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This activity will not directly use water supplies.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement coordination and data sharing efforts. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	While coordination and data sharing are beneficial to GSP implementation and supporting Subbasin sustainability, there are no anticipated direct benefits to specific sustainability indicators. This activity is currently in the early planning stage. Thus, the expected yield of this activity has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This activity is currently in the early planning stage. Thus, the anticipated costs of this activity have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The County and/or other proponents would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.3.2 Additional Studies of GDEs and Groundwater - Surface Water Interactions

This activity would investigate the relationship between groundwater levels and access to surface water supplies on the health of groundwater dependent ecosystems (GDEs). Supporting analyses may consider a combination of surface water data, shallow groundwater level data, and remote sensing data related to vegetative cover to improve the understanding of how GDEs are affected by conditions in the groundwater aquifer accessed by pumping. Findings of these analyses may be used to refine how GDEs, and their water supply needs are monitored and protected during GSP implementation. This activity would also evaluate the need for additional studies or monitoring of groundwater-surface water interactions to address potential data gaps, as needed. A summary of this activity is provided in **Table 4-32**.

Table 4-32. Additional Studies of GDEs and GroundwaterSurface Water Interactions: Summary (23 CCR §354.44(b)).

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This activity would analyze the water supplies used to support GDEs and evaluate the need for additional studies or monitoring of groundwater-surface water interactions to improve overall understanding of GDEs and address potential data gaps, as needed. This activity may be initiated to support GSP implementation if determined to be necessary or useful for maintaining ongoing sustainability in the Bowman Subbasin, pending future conditions. The details of this effort would be determined through further evaluation if/when the action is selected for implementation. Implementation will be done in the context of the Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This activity is currently in the early planning stage. Thus, the start and completion dates for this activity have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years beginning the first year of implementation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This activity will not directly use water supplies.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement studies. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.

ITEM IN GSP REGULATIONS	DESCRIPTION
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	While studies of GDEs and groundwater-surface water interactions are beneficial to GSP implementation and supporting Subbasin sustainability, there are no anticipated direct benefits to specific sustainability indicators. This activity is currently in the early planning stage. Thus, the expected yield of this activity has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This activity is currently in the early planning stage. Thus, the anticipated costs of this activity have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The County and/or other proponents would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.3.3 Expanded Subbasin Monitoring and Aquifer Testing

This activity would expand monitoring efforts across the Subbasin to improve understanding of existing groundwater conditions, monitor changes in groundwater conditions throughout GSP implementation, and improve simulation of the Subbasin water budget within the Tehama IHM. Specific monitoring efforts may include:

- Aquifer testing to improve the understanding of aquifer conditions, particularly the level of confinement, connectivity between depths, connectivity with surface water bodies, and hydraulic properties.
- LIDAR (Light Detection and Ranging) data collection and analysis across the Subbasin to support monitoring of all sustainability indicators.
- Identification of locations in the Subbasin that are potentially vulnerable to damage from subsidence.

A summary of this activity is provided in **Table 4-33**.

Table 4-33. Expanded Subbasin Monitoring and Aquifer T\esting: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This activity would expand monitoring efforts across the Subbasin (e.g., aquifer testing, LIDAR data collection) to improve understanding and modeling of groundwater conditions and address potential data gaps, as needed. This activity may be initiated to support GSP implementation if determined to be necessary or useful for maintaining ongoing sustainability in the Bowman Subbasin, pending future conditions. The details of this effort would be determined through further evaluation if/when the action is selected for implementation. Implementation will be done in the context of the Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This activity is currently in the early planning stage. Thus, the start and completion dates for this activity have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years beginning the first year of implementation.
Notice to public and other agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water source & reliability (§354.44(b)(6))	This activity will not directly use water supplies.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement monitoring and data collection efforts. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	While Subbasin-wide monitoring and data collection efforts are beneficial to GSP implementation and supporting Subbasin sustainability, there are no anticipated direct benefits to specific sustainability indicators. This activity is currently in the early planning stage. Thus, the expected yield of this activity has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This activity is currently in the early planning stage. Thus, the anticipated costs of this activity have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The County and/or other proponents would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.3.4 Install Additional Agroclimate Stations

This activity would install additional "agroclimate stations" that monitor agriculture-related weather and climate parameters. Data collected by these stations would help to inform agricultural water use practices and potentially enhance water conservation efforts through strategic irrigation scheduling. These data may also improve the accuracy of the Tehama IHM. A summary of this activity is provided in **Table 4-34**.

Table 4-34. Install Additional Agroclimate Stations: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This activity would install additional stations that monitor agriculture-related weather and climate parameters to inform agricultural water use practices, improve modeling of groundwater conditions, and address potential data gaps, as needed. This activity may be initiated to support GSP implementation if determined to be necessary or useful for maintaining ongoing sustainability in the Bowman Subbasin, pending future conditions. The details of this effort would be determined through further evaluation if/when the action is selected for implementation. Implementation will be done in the context of the Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This activity is currently in the early planning stage. Thus, the start and completion dates for this activity have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years beginning the first year of implementation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This activity will not directly use water supplies.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement monitoring and data collection efforts. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	While monitoring and data collection efforts are beneficial to GSP implementation and supporting Subbasin sustainability, there are no anticipated direct benefits to specific sustainability indicators. This activity is currently in the early planning stage. Thus, the expected yield of this activity has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.

ITEM IN GSP REGULATIONS	DESCRIPTION
Costs (§354.44(b)(8))	This activity is currently in the early planning stage. Thus, the anticipated costs of this activity have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The County and/or other proponents would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.3.5 Maintain and Expand Groundwater Level Monitoring Network

This effort would encompass various activities to maintain and expand the groundwater level monitoring network in the Bowman Subbasin. Specific efforts proposed under this effort include:

- Maintenance of wells in the existing monitoring network
- Identification of existing wells in the Subbasin that may be incorporated into the groundwater level monitoring network
- Identification of new monitoring wells that may be added to the groundwater level monitoring network.
- Ongoing coordination with other monitoring entities to support the use of identified monitoring locations as part of the monitoring network and to share relevant collected data.

Maintaining and improving the monitoring network would improve the understanding of groundwater conditions in the Subbasin. Additional wells may be used to fill data gaps and improve understanding of aquifer conditions and dynamics, and groundwater conditions related to GDEs and surface water depletions. A summary of this activity is provided in **Table 4-35.**

Table 4-35. Maintain and Expand Groundwater Level Monitoring Network: Summary (23 CCR §354.44(b))

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This activity would maintain and expand the Subbasin groundwater level monitoring network to improve understanding of aquifer conditions and dynamics, and groundwater conditions related to GDEs and depletions of interconnected surface water. Monitoring will address potential data gaps, as needed, and improve modeling of groundwater conditions throughout GSP implementation. This activity may be initiated to support GSP implementation if determined to be necessary or useful for maintaining ongoing sustainability in the Bowman Subbasin, pending future conditions. The details of this effort would be determined through further evaluation if/when the action is selected for implementation. Implementation will be done in the context of the Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This activity is currently in the early planning stage. Thus, the start and completion dates for this activity have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue in all years beginning the first year of implementation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This activity will not directly use water supplies.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement monitoring and data collection efforts. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	While monitoring and data collection efforts are beneficial to GSP implementation and supporting Subbasin sustainability, there are no anticipated direct benefits to specific sustainability indicators. This activity is currently in the early planning stage. Thus, the expected yield of this activity has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This activity is currently in the early planning stage. Thus, the anticipated costs of this activity have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The County and/or other proponents would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.3.6 One-Time Groundwater Quality Snapshot and Evaluation

This activity would conduct a one-time sampling of groundwater quality parameters over a wide range of wells in Tehama County, providing a "groundwater quality snapshot" in Tehama County. The data collected through this effort would improve understanding of groundwater quality conditions in the Subbasin and provide a basis for refinement of the groundwater quality monitoring network. Evaluation of these data can also inform the selection of groundwater quality monitoring options that better characterize both widespread groundwater quality conditions and localized groundwater quality concerns. A summary of this activity is provided in **Table 4-36.**

Table 4-36. One-Time Groundwater Quality Snapshot and Evaluation: Summary (23 CCR §354.44(b)).

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This activity would conduct and evaluate a one-time sampling of groundwater quality parameters over a wide range of wells in Tehama County. The data collected in this study will improve understanding of groundwater quality conditions and provide a basis for refinement of the Subbasin monitoring network. This activity may be initiated to support GSP implementation if determined to be necessary or useful for maintaining ongoing sustainability in the Bowman Subbasin, pending future conditions. The details of this effort would be determined through further evaluation if/when the action is selected for implementation. Implementation will be done in the context of the Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This activity is currently in the early planning stage. Thus, the start and completion dates for this activity have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue following evaluation of data collected in the one-time groundwater quality snapshot.
Notice to public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This activity will not directly use water supplies.
Legal Authority, Permitting Processes, and Regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement monitoring and data collection efforts. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.

ITEM IN GSP REGULATIONS	DESCRIPTION
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	While monitoring and data collection efforts are beneficial to GSP implementation and supporting Subbasin sustainability, there are no anticipated direct benefits to specific sustainability indicators. This activity is currently in the early planning stage. Thus, the expected yield of this activity has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This activity is currently in the early planning stage. Thus, the anticipated costs of this activity have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The County and/or other proponents would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.5.3.7 Tehama County Well Inventory and Registration Program

This activity would create a county-wide well inventory to compile all available information on active wells in Tehama County and improve understanding of well distribution, construction, and hydrogeologic characteristics. The inventory would be useful for identifying and filling monitoring data gaps. Complementary to the inventory, Tehama County could also create a well registration program to collect well locations, screening information, and pumping data for use in GSP updates. A summary of this activity is provided in **Table 4-37.**

Table 4-37. Tehama County Well Inventory and Registration Program: Summary (23 CCR §354.44(b)).

ITEM IN GSP REGULATIONS	DESCRIPTION
Implementation (§354.44(b)(1)(A); §354.44(b)(6))	This activity would create an inventory and registration program for all wells in Tehama County. Data collected through this program would improve understanding of well distribution, construction, and hydrogeology, and support ongoing Subbasin modeling and GSP implementation. This activity may be initiated to support GSP implementation if determined to be necessary or useful for maintaining ongoing sustainability in the Bowman Subbasin, pending future conditions. The details of this effort would be determined through further evaluation if/when the action is selected for implementation. Implementation will be done in the context of the Sustainable Management Criteria to ensure sustainable operation of the Bowman Subbasin.
Timeline (§354.44(b)(4))	This activity is currently in the early planning stage. Thus, the start and completion dates for this activity have yet to be determined and will be provided in GSP annual reports and five-year updates when known. Benefits are expected to accrue beginning the first year of implementation.
Notice to Public and Other Agencies (§354.44(b)(1)(B))	Public and/or Inter-Agency Noticing will be facilitated through GSA board meetings, GSA and/or cooperating agency website(s), GSA and/or cooperating agency newsletters, inter-basin coordination meetings, agency governing body public meetings, GSP annual reports and five-year updates, public scoping meetings and environmental/regulatory permitting notification.
Water Source & Reliability (§354.44(b)(6))	This activity will not directly use water supplies.
Legal Authority, Permitting Processes, and regulatory Control (§354.44(b)(3); §354.44(b)(7))	The GSA, Districts, and individual proponents have the authority to plan and implement monitoring and data collection efforts. Required permitting and regulatory review will be initiated through consultation with applicable governing agencies. Governing agencies for which consultation will be initiated may include, but is not limited to: DWR, SWRCB, CDFW, Flood Board, Regional Water Boards, USFWS, NMFS, LAFCO, County of Tehama, and CARB.
Benefits and Benefit Evaluation Methodology (§354.44(b)(5))	While monitoring and data collection efforts are beneficial to GSP implementation and supporting Subbasin sustainability, there are no anticipated direct benefits to specific sustainability indicators. This activity is currently in the early planning stage. Thus, the expected yield of this activity has yet to be determined and will be reported in GSP annual reports and five-year updates when known. Evaluation of benefits will be based on analysis of pre- and post-action measurements supported by modeling. Measured parameters will include surface water deliveries, groundwater levels, and others to be determined. Modeling will be done with the Tehama IHM model used for GSP development.
Costs (§354.44(b)(8))	This activity is currently in the early planning stage. Thus, the anticipated costs of this activity have yet to be determined and will be reported in GSP annual reports and five-year updates when known. The County and/or other proponents would identify funding sources to cover costs as part of development. These may include grants, fees, loans, and other assessments.

4.6 Project Financing

The plan and content related to project financing is in development.

4.7 GSA Coordination

4.7.1 Goals, Policies, and Ordinances

The Tehama County Flood Control and Water Conservation District (District) GSA is the exclusive GSA for the Bowman Subbasin. As a county-wide agency, the District was established in 1957 by legislation to, among other functions, provide for the control and conservation of flood and storm waters; the protection of watercourses and watersheds; and for the acquisition, retention, conservation, and distribution of drainage, storm, flood, and other waters for beneficial uses in Tehama County. These goals are aligned with the goals of other agencies within the Subbasin, and with GSAs in neighboring subbasins in Tehama County, many of which are also exclusively managed by the District GSA.

The District Board of Directors is composed of members of the Tehama County Board of Supervisors, who are responsible for passing ordinances and policies related to well permitting, groundwater aquifer protection, and groundwater use in the Subbasin. This overlapping organizational structure facilitates direct coordination of policies and ordinances that are directly aligned with the subbasin sustainability goal established by the GSA and the PMAs described in this GSP.

Specific policies and ordinances that may be reviewed during GSP implementation include:

- Well permitting ordinances to align well construction recommendations with DWR Bulletin 74, as needed, and/or to help protect water quality, allow for better screening, and avoid interference or impacts of pumping on neighboring wells. Efforts could be designed to be protective of domestic wells.
- Ordinances to regulate or limit groundwater use, export, and illegal diversion of surface water (would be considered if other planned PMAs are insufficient to maintain sustainability)

4.7.2 Well Owner Outreach and Education

Education and outreach efforts to well owners about proper well protection, maintenance, and monitoring will benefit individual well owners and all groundwater beneficial users. Wellhead protection efforts can help protect groundwater quality from impacts from surface activities. Regular well maintenance and monitoring will maximize the life of a well and its pumping equipment. Monitoring of well performance and groundwater conditions in a well will keep well owners aware of well or groundwater conditions that may impact the reliability or quality of water produced by their well. Well monitoring and reporting of monitoring information by well owners can also greatly benefit the Subbasin in understanding groundwater conditions, including identification of any groundwater management-related concerns. Outreach and education efforts by the Subbasin can coordinate with well owner outreach content available through other agencies and programs including ILRP, SWRCB, DWR, USGS, and others.

4.7.3 Participation in Other Water Resources Management Programs

The GSA's and local stakeholders' continued role and participation in other water resources management efforts occurring with the Subbasin and at a more regional level are important to ensure coordination within and between groundwater subbasins in the area across different levels of water resources management. This involvement includes coordinating in development or updating of the Tehama County

Groundwater Management Plan (GWMP), assisting with preparation and implementation of the North Sacramento Valley Integrated Regional Water Management Plan (IRWMP), and participation in other planning efforts involving salt and nutrient management plans, Irrigated Lands Regulatory Program (ILRP) and other groundwater quality related programs.

4.8 Subbasin Water Available for Projects (MBK)

The Bowman Subbasin has two primary sources of surface water that could be a supply for groundwater recharge projects: the Sacramento River that is the western boundary of the subbasin and Cottonwood Creek, the northern boundary of the subbasin. The information and analysis presented in this section focuses on Cottonwood Creek to illustrate the analysis that quantifies the potential water available for groundwater recharge projects.

4.8.1 Cottonwood Creek

Cottonwood Creek originates in the White Mountains and flows east to join the Sacramento River. The watershed upstream of the Sacramento Valley is approximately 930 square miles. The United States Geological Survey (USGS) has maintained a gage on Cottonwood Creek from 1940 to present. This gage is located about 2.4 miles east of Highway 5 and 2.4 miles west of the Sacramento River near where Cottonwood Creek enters the agricultural lands of the Sacramento Valley floor. The average annual runoff from Cottonwood Creek for the period of observed flows was approximately 627,000 acre-feet.

The gaged daily flows for the period of water year 1949 through 2020 were used as a common period for surface water availability for Tehama County subbasins. **Figure 4-1** shows the monthly flow volume in Cottonwood Creek averaged by water year type with the study period of 1949 -2020. The water year types shown in the **Figure 4-1** are defined in the Sacramento Valley Water Year Hydrologic Classification (SWRCB Decision 1641) as shown in Table 4-38. The index is the Sacramento Valley unimpaired runoff for the water year.

Table 4-38. Water Year Classification Defined in Sacramento Valley Water Year Hydrologic Classification

CLASSIFICATION	ABBREVIATION	INDEX (MILLIONS OF ACRE-FEET)
Wet	W	>= 9.2
Above Normal	AN	7.8 – 9.2
Below Normal	BN	6.5 – 7.8
Dry	D	5.4 - 6.5
Critical	C	<= 5.4

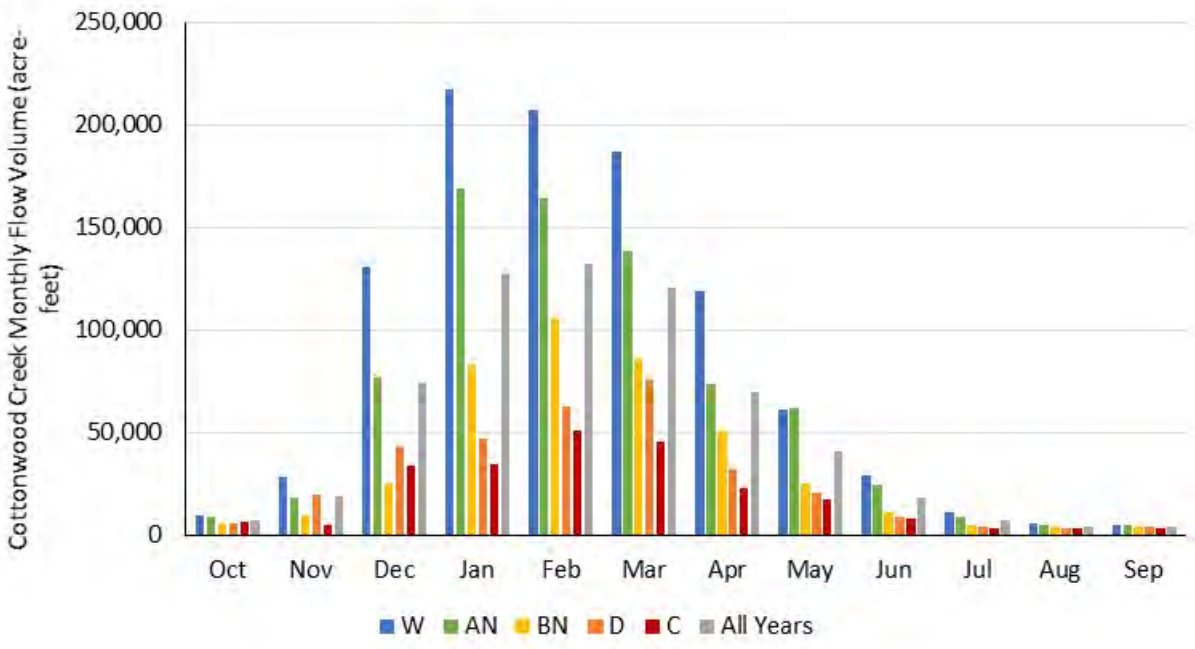

Figure 4-1. Cottonwood Creek Monthy Flow Volume by Water Year Classification

Figure 4-1 shows flow in Cottonwood Creek is higher in wetter years and lower in dry years with the highest monthly flows occurring in the months of January through March.

4.8.2 Water Right Permits

A water right or permit will be required to divert and store water from Cottonwood Creek for groundwater recharge and beneficial uses. The State Water Resources Control Board (SWRCB) issues and administers water rights in California. There are two categories of water right permits available through the SWRCB to divert water for groundwater recharge projects: standard permits and temporary permits. Both permits require an application be filed with the SWRCB. Temporary permits allow for short-term periods of diversion and storage, e.g., 180-days, but are not water rights. Temporary permits are a conditional approval to divert and use available water.

Standard permits are available through two different application processes: standard and streamlined. A standard water right application is typically more involved and may require significant effort and many years of review and processing by the SWRCB. The streamlined application process is relatively new and was designed to divert water during high flow events to recharge groundwater basins. The goal of the streamlined application process is to help GSAs address SGMA and reduce the impact of groundwater extractions. The GSA can also apply for a temporary permit and a streamlined permit at the same time, as it could take several years for the streamlined permit to get approved.

4.8.3 Potential Water Available from Cottonwood Creek for Groundwater Recharge

An analysis of Cottonwood Creek was performed based on the eligibility criteria for streamlined application processing of a standard permit. The following criteria were applied to the observed and extended Cottonwood Creek gage data to determine the water available for potential diversion:

- season of diversion of December 1 through March 31
- flow at the point of diversion is above the 90th percentile for the day based on the gage record
- the diversion rate is limited to no more than 20 percent of the total flow.

The 90th percentile flow for each day was calculated based on the gaged record of flows. The observed daily flow was then compared to the 90th percentile flow for each day to determine when water could be diverted during the December 1 through March 31 period each year. The daily water available was limited to no more than 20 percent of total flow, and further limited based on an assumed diversion and groundwater recharge capacity of 100 cfs. A multi-benefit recharge project on Cottonwood Creek is at a preliminary planning level of development and the actual diversion capacity of existing or new facilities will need to be verified or designed. A recharge capacity of 100 cfs would require about 3,500 acres assuming a recharge rate of 0.7 inches/day. This recharge rate is the middle of the range of recently percentile for the winter of 1998 as an example of the analysis for a wet year.

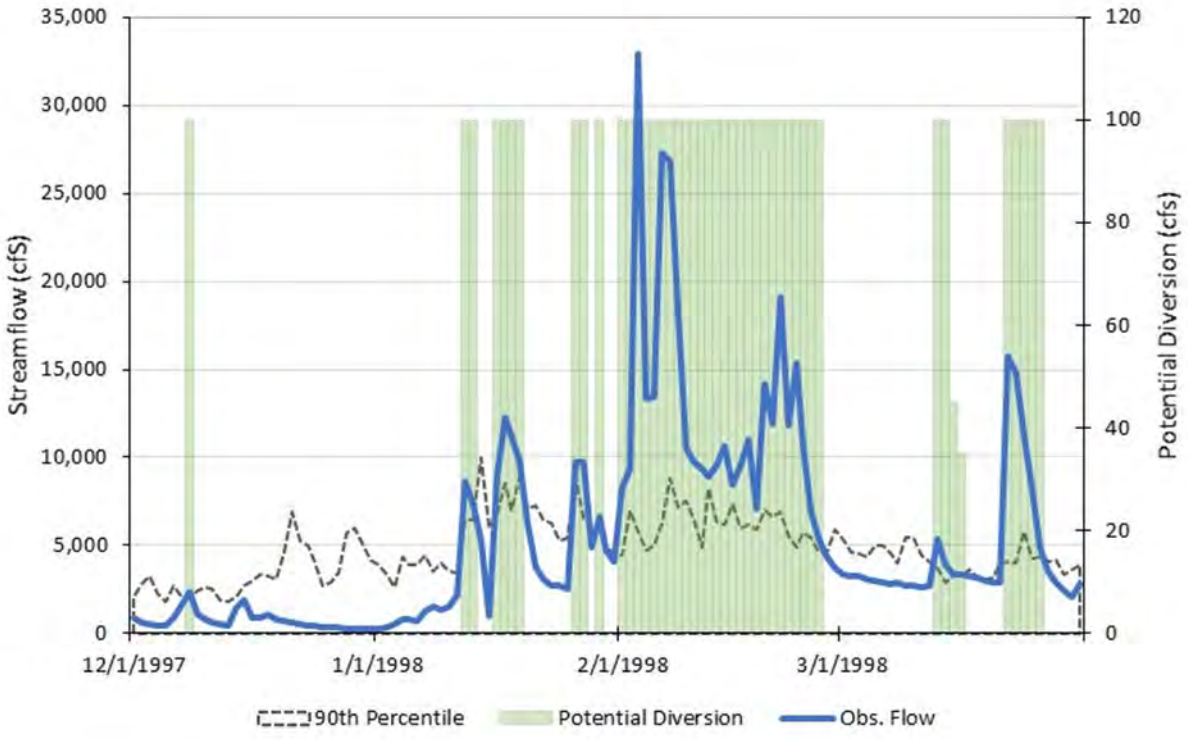

Figure 4-2. Potential Diversion for Example Wet Year: Winter 1998 under Streamlined Permit

In 1998 the estimated flow in Cottonwood Creek went above the 90th percentile for several brief periods in January, the majority of February and again during two periods in of March. During these periods, the green line illustrates potential diversion of 100 cfs under the criteria for a streamlined water right permit. The total volume of diversion for water year 1998 was estimated to be approximately 8,700 ac-ft. **Figure 4-2** illustrates a few key considerations for the use of Cottonwood Creek as a source for groundwater recharge. The relatively "flashy" nature of rain-fed streams like Cottonwood Creek will need projects that can respond quickly to divert and recharge water when available. Additionally, the potential recharge available is dependent on the capacity to divert and recharge the water when it is available.

The analysis illustrated for a single year in **Figure 4-2** was performed for each of the 72 years in the period of analysis. **Figure 4-3** shows the average monthly potential diversion by water year type from Cottonwood Creek that could be used for groundwater recharge from December to March.

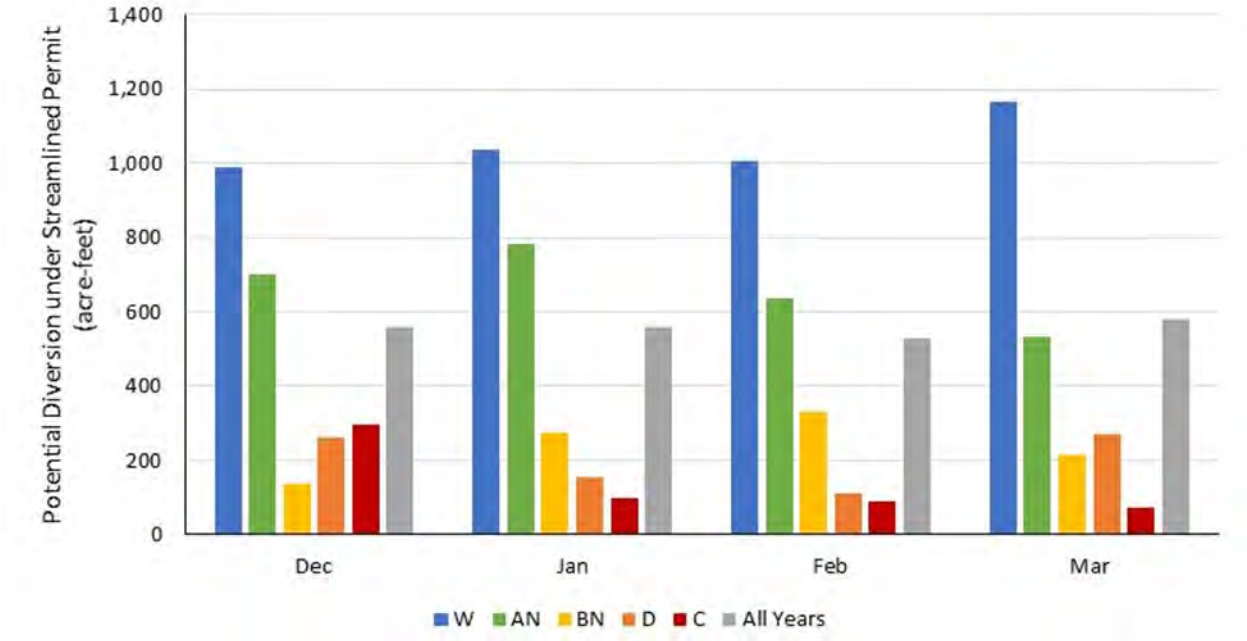

Figure 4-3. Potential Diversion under Streamlined Permit by Water Year Classifcation

Results summarized in **Figure 4-3** show potential diversions of several hundred acre-feet in most months in wet and above normal years and a limited amount of water available in critical years.

The potential water available for groundwater recharge varies depending on the rainfall each year, as shown in **Figure 4-4**. There would have been water available for recharge in 65 of the 72 years studied. The average yearly potential groundwater recharge from Cottonwood Creek is approximately 2,250 acre-feet/year, assuming a diversion and recharge capacity of 100 cfs.

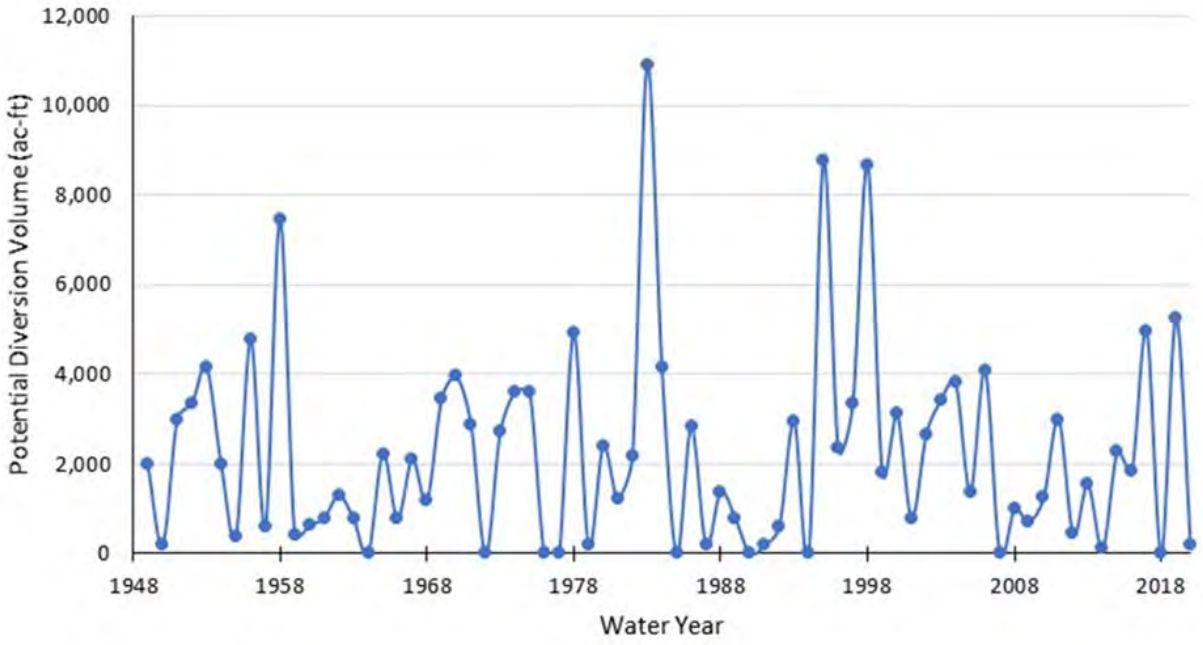

Figure 4-4. Potential Diversion Volume for Water Years 1948-2020

As described above, the water available for groundwater recharge from Cottonwood Creek is dependent on the assumption for the diversion and recharge capacity. A simple sensitivity analysis was performed to understand how the annual average water available for recharge varies based on the assumed diversion/recharge capacity**. Figure 4-5** illustrates the results of this analysis and indicates that a recharge capacity of 50 cfs would more than provide for the projected storage deficit under current and future land use (207 ac-ft/yr and 302 ac-ft/year respectfully). With a more conservative approach, a capacity of approximately 100 cfs on Cottonwood Creek could provide the recharge that would exceed the largest simulated average annual change in storage deficit identified in the water budget summary for the Bowman Subbasin (approximately 1,700 ac-ft/yr for the historical period 1990-2018).

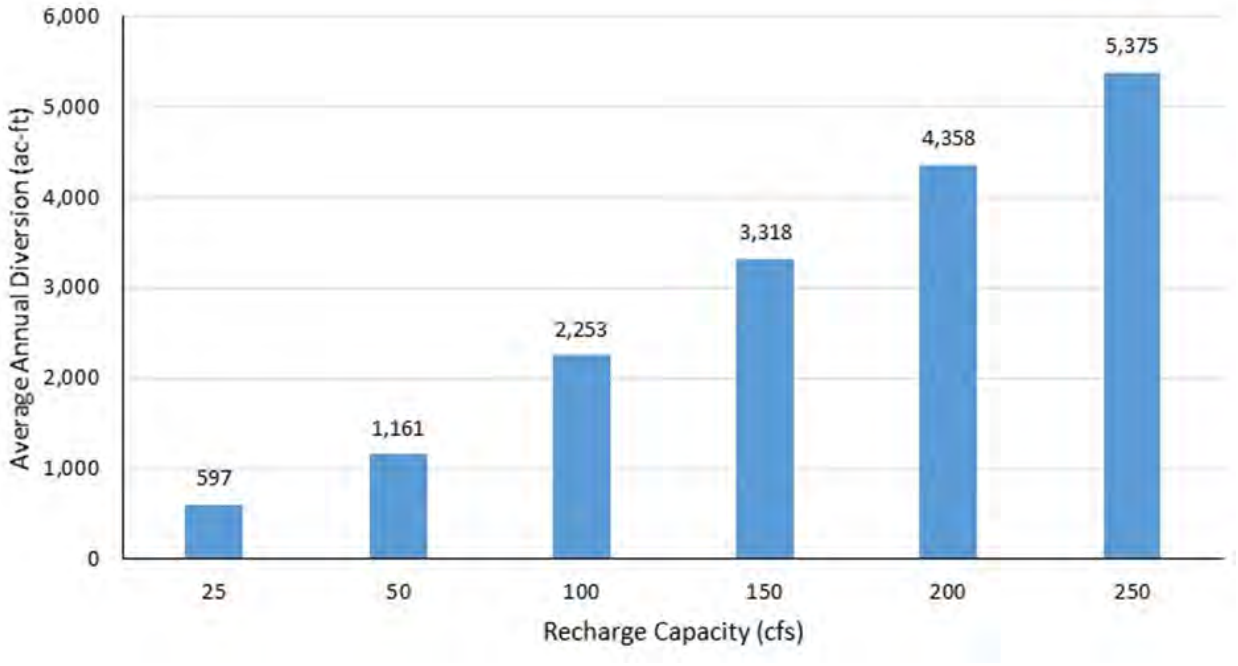

Figure 4-5. Average Annual Potential Diversion under Streamlined Permit with varying Recharge Capacity

FINAL REPORT

Bowman Subbasin

Sustainable Groundwater Management Act

Groundwater Sustainability Plan

(Chapter 5 – Plan Implementation)

January 2022

Prepared For:

Tehama County Flood Control and Water Conservation District

Prepared By:

Luhdorff & Scalmanini

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LIST OF ACRONYMS & ABBREVIATIONS

DMS	Data Management System
DWR	Department of Water Resources
FTE	Full Time Equivalent
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
SGMA	Sustainable Groundwater Management Act
SWRCB	State Water Resources Control Board

5. PLAN IMPLEMENTATION (REG. § 354.6)

This chapter describes the approach the GSA will use to implement this GSP. This GSP will be implemented to achieve the Subbasin sustainability goal by 2042 and avoid undesirable results through 2090 as required by SGMA and GSP regulations. Implementation of this GSP includes the projects and management actions described in Chapter 4, in addition to on-going activities that will be completed by the GSA related to monitoring, management, administration, updates, reporting, and public outreach. This chapter describes the tasks necessary for GSP implementation, associated costs, and a description of the implementation schedule and annual and five-year updates to be provided to DWR.

5.1 Estimate of GSP Implementation Costs

GSP implementation costs include both costs specific to projects and management actions and costs for the GSA to administer and operate all other tasks associated with the GSP over the 20-year implementation period. These costs may be subject to change, as they are projections based on the time of development of this report. GSP implementation and GSA support costs are estimated on an annual basis and are described in further detail below.

5.1.1 GSA Administration, Management, Operations, and Other Costs

The GSA will incur costs for administrative tasks including administrative and finance staff, insurance, meetings, reporting, record keeping, bookkeeping, legal advice, outreach, government relations, engineering services, permitting, public outreach, and miscellaneous supplies and materials. This will include continued monitoring of project and management actions for efficacy, economic feasibility, and coordination as necessary if modifications need to be made to projects and management actions. It is anticipated that administrative and management needs will be monitored and updated accordingly throughout GSP implementation, as they may be subject to change based on the implementation schedule and unforeseen needs throughout implementation. This includes:

- **Operation and Maintenance:** Purchase, maintenance, and repairs to monitoring equipment such as transducers, dataloggers, meters, etc. will occur as needed.
- **Project Management and Coordination:** Coordination between the GSA and GSAs of adjacent subbasins, stakeholders, consultants, and other interested parties will be ongoing.
- **Administrative Personnel:** One (1) full time equivalent (FTE) employee. Professionals trained in the Data Management System (DMS) will collect and process monitoring data for input into the DMS. Personnel will also complete outreach and accounting system support.
- **Engineering and Consulting:** Consulting from outside technical services will be used as needed for data management, analysis, and reporting.
- **Legal Expense:** Legal expenses may be incurred for water rights or water transfer programs and legal review.
- **Public Outreach:** The GSA will continue outreach to encourage public participation throughout GSP implementation. This will include Groundwater Commission, GSA board meetings, updating the GSA website, and public meetings.

It is expected that GSA administration costs will include efforts for administering all five (5) GSPs managed by the GSA: Antelope, Bowman, Los Molinos, Red Bluff, and Corning. Therefore, administration costs are reflective of the total cost for administering all five GSPs. The estimated annual cost for GSA administration, management, and operations is $470,000. Costs associated with these individual tasks are included in **Table 5-1** below:

Table 5-1. Estimated GSA Administration, Management, and Operations Costs

DESCRIPTION	ESTIMATED ANNUAL COST
Operation and Maintenance	$45,000
Project Management and Coordination	$100,000
Administrative Personnel	$240,000
Engineering and Consulting	$20,000
Legal Expense	$50,000
Public Outreach	$15,000
Total	**$470,000**

5.1.2 Monitoring

The GSA will oversee the implementation of the monitoring programs described in Chapter 3. This includes monitoring groundwater and surface water levels, groundwater storage, water quality, and land subsidence to evaluate the progress of the Subbasin in reaching the sustainability goal. Related tasks include data review and analysis, data management, maintenance of monitoring wells and monitoring equipment, deploying any necessary technology, updates to the groundwater model, and development of annual reports. The GSA will routinely monitor data to track Subbasin conditions and sustainability indicators to ensure progress is being made towards sustainability in the Subbasin. Each monitoring task can be further described as follows:

- **Groundwater and Surface Water Level Monitoring:** Groundwater level data will be collected from the monitoring network as described in Chapter 3. Bi-annual measurements will be collected by trained professionals via depth to groundwater measurements manually or by transducers. Surface water will also be monitored through the monitoring network described in Chapter 3. Data will be collected to correlate groundwater and surface water to monitor interconnected surface and groundwater. All data will be managed in the DMS, and the analysis will be included in the annual report submitted to DWR.
- **Groundwater Quality Monitoring:** Groundwater quality data will be collected from the monitoring network as described in Chapter 3. Trained professionals will collect samples on a biannual basis. Samples will be sent to a certified laboratory for analysis, and results will be reviewed, managed, and reported in the annual report submitted to DWR.

- **Land Subsidence Monitoring:** Land subsidence data will be collected from the monitoring network in accordance with Chapter 3. This data will be reviewed and included in the annual report submitted to DWR.
- **Annual Report:** An annual report will be developed and submitted to DWR per Section 5.3 below.

The total estimated cost for monitoring in the Bowman Subbasin is $104,000 as displayed by **Table 5-2** below.

Table 5-2. Estimated Annual Monitoring Costs

MONITORING TASK	ESTIMATED ANNUAL COST
Groundwater and Surface Water Level Monitoring	$20,000
Water Quality Monitoring	$20,000
Land Subsidence Monitoring	$14,000
Annual Report	$50,000
Total	**$104,000**

5.1.3 GSP Implementation and Updates

Implementation of this GSP requires development and submittal of annual and periodic updates to DWR. Costs associated with the preparation of annual reports includes data and technical analyses, summary material, and evaluation of sustainability objectives. Costs and efforts associated with periodic evaluations includes information developed for the annual reports, in addition to evaluation of sustainability conditions, objectives, monitoring, and documentation of new information available since the last update to the GSP. Annual and periodic reports are described in further detail in Sections 5.3 and 5.4, respectively. It is anticipated that these reports will be prepared by technical consultants in coordination with GSA staff and in coordination with other GSAs and stakeholders. A breakdown of estimated plan update costs is provided in **Table 5-3** below.

Table 5-3. Estimated Plan Update Costs

DESCRIPTION	ESTIMATED ANNUAL COST
Updates to Water Budget and Groundwater Model, Analyze Effectiveness of Projects and Management Actions, Revise Sustainable Management Criteria	$240,000
Updates to Management Strategies	$18,000
Public Outreach	$10,000
5-Year Periodic Updates	$32,000
Total	**$300,000**

5.1.4 Project and Management Actions Development and Implementation Costs

Projects and Management Actions are described in Chapter 4. Estimated costs for development and implementation of these plans and programs are included in Chapter 4. The GSA will also incur costs for project planning as new information is obtained on Subbasin conditions and project and management actions are implemented and observed. It is anticipated that the GSA will evaluate new and existing projects for improvement based on Subbasin conditions as needed. This includes evaluation of potential impacts on sustainability indicators and development of related technical studies and planning efforts such as feasibility assessments, environmental studies, water rights evaluations, coordination with outside agencies, land evaluations, grant applications, and other applicable efforts depending on the scope of the project. Project and management actions related planning, coordination, and studies are expected to be ongoing.

5.1.5 Total Costs

Annual implementation costs of this GSP are expected to vary by year based on implementation schedules for projects and management actions, necessary updates to data management and modeling systems, and other maintenance and management needs. Costs will be updated during the 5-year milestone review period. Inflation and contingency are also included for planning purposes. Contingency includes potential actions needed to respond to critically dry years or trends toward minimum thresholds or undesirable results, and inflation reflects a 3% assumed annual value, included each year, for planning and budgeting purposes. The total estimated GSP implementation cost is $19.8 million as displayed in **Table 5-4** below.

Table 5-4. Estimated GSP Implementation Costs through 2042

FISCAL YEAR	GSA ADMINISTRATION	MONITORING	5-YEAR UPDATES	10% CONTINGENCY	TOTAL
2022	$470,000	$104,000	$0	$57,000	$631,000
2023	$484,000	$107,000	$0	$59,000	$650,000
2024	$499,000	$110,000	$0	$61,000	$670,000
2025	$514,000	$114,000	$0	$63,000	$690,000
2026	$529,000	$117,000	$150,000	$80,000	$876,000
2027	$545,000	$121,000	$150,000	$82,000	$897,000
2028	$561,000	$124,000	$0	$69,000	$754,000
2029	$578,000	$128,000	$0	$71,000	$777,000
2030	$595,000	$132,000	$0	$73,000	$800,000
2031	$613,000	$136,000	$169,000	$92,000	$1,010,000
2032	$632,000	$140,000	$174,000	$95,000	$1,040,000
2033	$651,000	$144,000	$0	$79,000	$874,000
2034	$670,000	$148,000	$0	$82,000	$900,000
2035	$690,000	$153,000	$0	$84,000	$927,000
2036	$711,000	$157,000	$196,000	$106,000	$1,170,000
2037	$732,000	$162,000	$202,000	$110,000	$1,205,000
2038	$754,000	$167,000	$0	$92,000	$1,013,000
2039	$777,000	$172,000	$0	$95,000	$1,044,000
2040	$800,000	$177,000	$0	$98,000	$1,075,000
2041	$824,000	$182,000	$227,000	$123,000	$1,357,000
2042	$849,000	$188,000	$234,000	$127,000	$1,397,000
Total	**$13,478,000**	**$2,983,000**	**$1,502,000**	**$1,798,000**	**$19,757,000**

5.1.6 Funding Sources

Development of this GSP was funded through Proposition 1 and Proposition 68 grant funds awarded by DWR to support the formation of GSAs and adoption of initial GSPs to achieve SGMA compliance within regulatory submittal deadlines. Ongoing implementation, monitoring, and reporting are expected to be funded through local fees and GSP priority projects and actions outlined in Chapter 4 would be funded by outside grants, cost sharing, and other funding sources. The GSA will develop and approve a financing plan with prioritized five-year CIP projects and actions to serve as the basis to impose fees to fund groundwater management activities included in the GSP. SGMA gives GSAs the authority to impose these fees (Water Code §§ 10730, 10730.2 (a).) which can cover groundwater management costs such as administration, operations and maintenance, acquisition of property, facilities, and services, supply, production, treatment and/or distribution of water, and other activities necessary to implement the GSP while maintaining SGMA compliance. These fees can be fixed and charged on a parcel or square foot basis or charged on a volumetric basis if actual historic and current water use data is available. The GSA is also granted the authority by SGMA to implement any separate fee authority (Water Code § 10730.8) and/or adopt a charge or assessment under its special district fee authority pursuant to Water Code Section 35470. Fee amount and type will be implemented through a comprehensive fee study and in accordance with legal review and regulatory requirements, SGMA compliance, and California Law. The GSA will seek additional grants and funding sources to assist with implementation costs as well.

GSP priority projects ready for implementation can take advantage of available grants to fund projects on a local or regional scale that are ready for implementation. Projects serving disadvantaged or severely disadvantaged communities may receive a higher priority under certain funding programs. The next available project funding opportunity is through the phase 2 $77M Sustainable Groundwater Management Grant Implementation solicitation cycle expected to occur in 2022 with funding applications due to DWR for eligible GSAs/GSPs in Spring or Summer 2022. Certain GSP priority actions may be eligible for other funding sources depending on project characteristics, funding program guidelines, and funding amount requested. If the GSA/GSP pursues this funding source the project should be included in the adopted GSP and be included on the GSP five-year CIP priority list. Project applicants must be in compliance with SGMA regulations and requirements at the time of the funding request.

The GSA will provide planning for funding assistance and ensure maximum outside funding sources can be secured for eligible projects that are a priority to the GSA and GSP project applicants. Cost sharing and/or upfront costs (such as funding application preparation and submittal costs) may be required for funding success. And future funding sources may include planning or implementation funding only which can be applied as warranted based on how developed priority projects are at the time of the funding program solicitation period.

5.2 Schedule for Implementation

This initial GSP will be adopted and submitted to DWR by January 31, 2022. The implementation timeline will begin thereafter and will allow GSAs to develop and implement projects and management actions to meet sustainability objectives by 2042. GSP implementation also includes annual and periodic evaluations and submittals to DWR. The full schedule for implementation is subject to change and will be evaluated and updated as necessary based on implementation progress, sustainability goals, monitoring, and other factors that could affect overall implementation efforts.

The comprehensive implementation schedule update will be competed every five years as part of the GSP five-year update process, which will include the updated GSP five-year CIP program with existing project prioritization and/or addition of new projects, to assist the GSA meet SGMA compliance requirements over the planning horizon.

The GSP implementation schedule may be modified periodically as agreed to by the GSA and GSP project partner(s) based on the near-term availability of significant funding opportunities or options. Being flexible with schedule could assist the GSA/GSP maximize outside funding secured when these unique opportunities arise as needed to meet GSP sustainability criteria. An example would be passage of a new State Proposition that includes planning and/or implementation funding for GSAs/GSPs that is not currently available.

5.3 Annual Reporting

Annual reports will be completed and submitted to DWR by April 1 of each year pursuant to GSP Regulation §356.2. Annual reports will include sections on general information, basin conditions, and plan implementation progress for the reporting period. The annual report submitted to DWR will comply with the requirements of §356.2. The outline of subsections to be utilized in the development of the annual report, with a general outline of information to be included under each subsection, are detailed below.

5.3.1 General Information (§356.4(a))

This section will highlight the key content of the annual report. An executive summary will be prepared to describe the Subbasin sustainability goals, progress of projects and management actions of the GSP, any significant findings and/or key recommendations for the reporting period, and an updated basin map.

5.3.2 Subbasin Conditions (§356.4(b))

The subbasin conditions section will provide an update on groundwater and surface water conditions in the Subbasin with respect to the sustainability goals described in the GSP. This will include basic information about the Subbasin and technical information including:

- **Groundwater Elevation Data:** Groundwater elevation data will be collected from the monitoring network on a bi-annual basis as described in Chapter 3. Data will be organized in a data management system, and hydrographs and groundwater elevation contour maps will be generated and included in the annual report, including seasonal high and low conditions in relation to historical data. This section will also include a written interpretation of the data and a description of data gaps and recommendations if necessary.
- **Groundwater Extraction Data**: Groundwater extraction data will be obtained through metering efforts and pumping data or estimated by land use if necessary for the reporting period and presented via tables, maps, and a written description. Data will be presented on maps and by water use sector, with a description of the measurement method and measurement accuracy.
- **Surface Water Supply:** Surface water supply quantities will be presented based on information obtained from annual surface water diversion reporting.

- **Total Water Use:** Total water use within the GSP boundary will be evaluated through information as it is available on production records, delivery records, metered well use, and applicable management plans. Data will be presented in the annual report by water use sector, with a description of the measurement method and measurement accuracy.
- **Change in Groundwater Storage:** The estimated change in groundwater storage will be evaluated for each principal aquifer based on observed changes in groundwater levels over a selected period. Information will be presented in tabular form and as a map for each principal aquifer indicating the water year type (wet, dry, normal), groundwater use, annual change in groundwater storage, and cumulative change in storage based on historical data and new data from the reporting period.

5.3.3 Plan Implementation Progress (§356.4(c))

The Annual Report will include a summary of the progress of the GSP implementation of projects, management actions, and other GSA activities. It will describe the Plan's progress toward achieving interim milestones, the implementation schedule, and discuss significant updates or changes, as necessary.

5.4 Periodic Evaluations and Reporting

The GSA will evaluate the GSP every five years and whenever the plan is amended. The evaluation will be submitted to DWR and include the elements of the Annual Report, a summary of the GSP, project, and management action implementation progress, and progress toward meeting the sustainability goal of the Subbasin. The information that will be provided in these five-year evaluations is captured in the following subsections:

5.4.1 Sustainability Evaluation (§356.4(a) - §356.4(b))

This section will include an evaluation and description of current groundwater conditions for each sustainability indicator and overall progress towards sustainability. A summary of conditions in relation to interim milestones, measurable objectives, and minimum thresholds will be provided. Depictions of groundwater elevations for the evaluation period will be provided as graphs, figures, and a written description. If any minimum threshold exceedances are observed, the GSA will investigate probable causes and implement corrective actions or plans where feasible. However, minimum threshold exceedances may not always result in corrective action due to factors that may be outside of the control of the GSA.

Projects and management actions will also be evaluated to determine their implementation status, success, and progress toward reaching the Subbasin sustainability goal. This will include an assessment of conditions and whether the project or management action is contributing to an improvement in conditions. If it is determined that progress is not being made toward reaching the sustainability goal, the implementation timeline is not being met, or the project or management action is not performing as expected, the project or management action will be re-evaluated and revised or accelerated path. Similarly, if an improvement in conditions is exhibited faster than projected, the scale or timeline of projects and management actions may be re-evaluated and revised if necessary. The evaluation will describe any changes to the project and management action implementation schedule and the steps the GSA will take to revise or add to projects and management actions if necessary.

Other elements of the plan such as the basin setting, management areas, and sustainability indicators will be evaluated for any significant or unanticipated changes that may have developed during the evaluation period. The sustainability indicators will be evaluated for undesirable results, and minimum thresholds and measurable objectives will be reconsidered if necessary. This will include review of any significant changes in water use to determine if potential overdraft conditions exist and proposed mitigation measures if such conditions exist or are anticipated. Any proposed revisions will be documented in the periodic evaluation.

5.4.2 Monitoring Network (§356.4(e))

The GSP monitoring network is detailed in Chapter 3 and will be evaluated during the periodic review. This will include a review of data collected, potential data gaps, and an assessment of the functionality of the monitoring network. If data gaps are identified, the evaluation will include a plan to improve the monitoring network to acquire additional data sources. A description of how new information will be incorporated into future GSP updates will be included if necessary. Installation of new data collection facilities and analysis of new data will be prioritized in the GSP.

5.4.3 New Information (§356.4(f))

It is assumed that new information on groundwater conditions, projects and management actions, and sustainability objectives will become available over time to be incorporated into the GSP. Significant, new information that becomes available following plan adoption or prior periodic evaluations will be discussed, and an adaptive management approach will be applied to identify, review, and incorporate all new information into the GSP. The periodic evaluations will indicate whether new information warrants changes to any aspect of the GSP.

5.4.4 GSA Actions (§356.4(g))

The GSA will complete ongoing monitoring, management, and collaboration to meet the sustainability goal specified in the GSP. The periodic evaluation will include a description of any changes in regulations or ordinances. This includes state laws and regulations or local ordinances that have been implemented since the previous periodic evaluation. The effect on elements of the GSP and any necessary updates to the GSP including the basin setting, measurable objectives, minimum thresholds, and undesirable results will be described. Furthermore, relevant or enforcement actions taken by the GSA will be described along with how such actions support sustainability in the Subbasin.

5.4.5 Plan Amendments, Coordination, and Other Information (§356.4(i) - (§356.4(k))

Any completed or proposed amendments to the plan will be described in the periodic evaluation. This includes changes to the basin setting, measurable objectives, minimum thresholds, and undesirable results. A description of coordination between GSAs within the basin, between hydrologically connected basins, and land use agencies will be presented. The GSA will summarize any other information deemed appropriate to support the GSP and will provide associated required information to DWR.

The implementation schedule for the 20-year implementation period is presented in **Figure 5-1** below.

Figure 5-1. GSP Implementation Schedule

TASK NAME	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Plan Implementation																					
GSP Submittal to DWR	x																				
Outreach and Communication																					
Monitoring and DMS																					
GSP Reporting																					
Annual Reports	x	x	x	x	x		x	x	x	x		x	x	x	x		x	x	x	x	
5-year GSP Evaluation Reports						x					x					x					x

x Indicates a submittal.
Indicates ongoing event.

FINAL REPORT

Bowman Subbasin

Sustainable Groundwater Management Act

Groundwater Sustainability Plan (Chapter 6 - References)

January 2022

Prepared For:

Tehama County Flood Control and Water Conservation District

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Appendix 1-A

Tehama County Flood Control and Water Conservation District Act of Formation and Resolution No. 5-2021 to Adopt the GSP for Bowman Subbasin

located within the district, of the percentage of costs to be split among the zones created, and that no general law contains provisions for the issuance of bonds and for the purpose of raising funds to assist in such work. The cost of adequate flood control and water conservation is beyond the means of the property owners and taxpayers of the district, and it is necessary to negotiate to obtain financial aid from the United States Government. It is recommended by the United States Government and it is desirable to immediately form a political entity to satisfactorily deal with the agency of the United States Government.

Investigation having shown conditions in the County of Sonoma to be peculiar to that county, it is hereby declared that a general law cannot be made applicable thereto and that the enactment of this special law is necessary for the conservation, development, control and use of said waters for the protection of life and property therein and for the public good. [Amended by Stats 1951 ch 1344 § 28 p 3244; Stats 1957 ch 1515 § 6 p 2863.]

ACT 8510

Tehama County Flood Control and Water Conservation District Act

[Stats 1957 ch 1280 p 2581, effective July 4, 1957; Amended by Stats 1959 ch 940 p 2968; Stats 1961 ch 631 p 1802, ch 1493 p 3338, ch 2213 p 4559; Stats 1963 ch 332 p 1116; Stats 1967 ch 219 p 1351; Stats 1969 ch 27; Stats 1970 ch 190, effective June 9, 1970.]

AN ACT to create a flood control district to be called Tehama County Flood Control and Water Conservation District; to provide for the control and conservation of flood and storm waters and the protection of watercourses, watersheds, public highways, life and property from damage or destruction from such waters; to provide for the acquisition, retention, and reclaiming of drainage, storm, flood, and other waters and to save, conserve, and distribute such waters for beneficial use in said district; to authorize the incurring of indebtedness, the issuance and sale of bonds, and the levying and collection of taxes and assessments on property within said district and in the respective zones thereof; to define the powers of said district; to provide for the government, management, and operation of said district and for the acquisition and construction of property and works to carry out the purposes of the district, declaring the urgency thereof, to take effect immediately.

Note–Stats 1961 ch 1292, effective July 10, 1961, authorized a grant to the Tehama County Flood Control and Water Conservation District for fish and wildlife enhancement and recreation in connection with the Paskenta Dam and Reservoir.

§ 1. District created: Territory

A flood control and water conservation district is hereby created, to be known and designated as "Tehama County Flood Control and Water Conservation District," and the boundary and territory of said district are as follows: all that territory of the County of Tehama lying within the exterior boundaries thereof.

§ 2. Definitions

"District" means Tehama County Flood Control and Water Conservation District.

"Board" means the board of directors of the district.

"County" means the County of Tehama.

"Counties" means the several counties of the State of California.

"State" means the State of California.

"Subterranean supply of waters" means (a) that amount of water percolated into natural underground reservoirs, from surface reservoirs owned or controlled by the district, to replenish and augment the supply therein, (b) that

amount of the underflow water of a surface watercourse to the extent augmented by the release of water from a surface reservoir owned or controlled by the district, and (c) any underflow of a surface watercourse being put to beneficial use within the district on the effective date of this act.

§ 3. Objects and purposes of act: Powers of district

The objects and purposes of this act are to provide, to the extent that the board may deem expedient or economical, for the control and disposition of the storm and flood waters of said district and to that end the district is hereby created to be a body corporate and politic and as such shall have power:

(a) To have perpetual succession.

(b) To sue and be sued in the name of the district in all actions and proceedings in all courts and tribunals of competent jurisdiction.

(c) To adopt a seal and alter it at pleasure.

(d) To take by grant, purchase, gift, devise or lease; to hold, use, enjoy, sell, and contract to sell, lease, or dispose of real, personal and mixed property of every kind within or without the district necessary, expedient or advantageous to the full exercise and economic enjoyment of its purposes.

(e) To acquire and contract to acquire by purchase, donation or other lawful means in the name of the district from private persons, public and private corporations, associations, agencies or districts, lands, rights-of-way, easements, privileges, material, and property of every kind within or without the district, to do all work and to acquire, construct, maintain and operate any and all works and improvements within or without the district, and to make, execute, carry out and enforce all contracts of every character, necessary, convenient, incidental, useful or proper to carry out any of the provisions, objects or purposes of this act, and to complete, extend, add to, repair, or otherwise improve any works or improvements acquired by it as herein authorized.

(f) To have and exercise the right of eminent domain, and in the manner provided by law for the condemnation of private property for public use by the State, any political subdivision or district thereof, except that such right shall be exercised only as against property located within the county.

In condemnation proceedings, the district shall proceed under the provisions of Title 7 (commencing at Section 1237) of Part 3 of the Code of Civil Procedure, which said provisions are hereby made applicable for that purpose: and it is hereby declared that the use of the property, lands, rights-of-way, easements or materials which may be condemned, taken or appropriated under the provisions of this act is a public use, and the board is granted the same powers and rights with respect to the taking of property for public uses of said district as are now or may hereafter be conferred by general law on the legislative body of a county, city and county, incorporated city or town, municipal water district or irrigation or reclamation district; provided, however, that no

property shall be taken unless it is taken upon a finding of a court of competent jurisdiction that the taking is for a more necessary public use than that to which it has already been appropriated.

(g) To compel by injunction or other lawful means the owner or owners of any bridge, trestle, wire line, viaduct, embankment or other structure which shall be intersected, traversed, or crossed by any channel, ditch, bed of any stream, waterway, conduit or canal so to contruct or alter the same as to offer a minimum of obstruction to the free flow of water through or along such channel, ditch, bed of any stream, waterway, conduit or canal, and whenever necessary in the case of existing works or structures, to compel the removal or alteration thereof for such purpose or purposes. All costs of relocating or altering or otherwise changing existing works or structures shall be paid by the district: provided, however, that all costs of relocating or otherwise changing any portion of a state highway shall be paid for from funds available for rights-of-way for flood control purposes and not from funds appropriated for state highway purposes.

(h) To construct, maintain, repair and operate all levees, bulkheads, walls of rock or other material, pumps, dams, channels, conduits, pipes, ditches, canals, reservoirs, drains, tunnels, poles, posts, wires, lamps, powerplants, railroads, dredgers and all other auxiliary, incidental, necessary or convenient agencies, work or improvements that may be required to carry out, facilitate, repair, maintain and complete the same.

(i) To incur indebtedness, and to issue bonds in the manner herein provided and to provide for the issuance of warrants of the district in payment of district obligations and the registration of any warrants not paid for want of funds and the rate of interest such warrants shall bear after registration and until such payment.

(j) To cause assessments to be levied and collected for the purpose of paying any obligations of the district in the manner hereinafter provided.

(k) To appoint and employ such engineers, attorneys, assistants and other employees as may be necessary and fix their compensation, including, if it deem advisable, a clerk, superintendent of work, assessor, treasurer and tax collector, and define their powers and duties, and fix and determine the amount of bond required of each employee and pay the premium on each such bond; which said officers and employees and each of them shall serve at the pleasure of the board.

The board shall have the power to combine any two or more offices in its discretion.

(*l*) To establish and fix the boundaries of zones, or abolish the same, in the district as provided in this act; to make transfers of money from the general fund of the district to any special fund and to create and administer such special funds as in their discretion may seem advisable, and to abolish the same; to create and administer revolving funds to facilitate and assist in the carrying on and completing of such acquisi-

tions, works, and improvements provided for herein, and to abolish same; and to do any and all things necessary or incidental to the accomplishment of the things which are permitted to be done under this act.

(m) To make and enter into contracts with the United States, the State of California, any political subdivision, county, municipality, district, agency or mandatory of the State of California or of the United States and any department, board, bureau or commission of the State of California or the United States, or any person, firm, association or corporation, jointly or severally, for the acquisition of property rights or the construction, maintenance and operation in whole or in part of any or all works and improvements provided in this act.

(n) To lease or rent to or from any of the parties named in subdivision (m) of this section any property or rights necessary, in the opinion of the board, to accomplish or carry out any of the work or improvement or the maintenance thereof and under such terms and conditions as may be agreed upon between the parties.

(o) To receive and accept any and all contributions in labor, material or money from any of the parties named in subdivision (m) of this section, to be applied to the work or improvement herein provided for.

(p) To construct, purchase, lease or otherwise acquire works, and to purchase, lease, appropriate, or otherwise acquire surface water and water rights, useful or necessary to make use of water for any of the purposes authorized by this act.

(q) To do any and every lawful act necessary to be done that sufficient water may be available for any present or future beneficial use or uses of lands or inhabitants within the district, including but not limited to, the acquisition, storage, and distribution for irrigation, domestic, fire protection, municipal, commercial, industrial, recreational and all other beneficial uses.

(r) To control flood and storm waters within the district and the flood and storm waters or streams outside the district, which flow into the district; to conserve such waters by storage in surface reservoirs, to divert and transport such waters for beneficial uses within the district; to release such waters from surface reservoirs to replenish and augment the supply of water in natural underground reservoirs and otherwise to reduce the waste of water and to protect life and property from floods within the district; to commence, maintain, intervene in, defend or compromise, in the name of the district, on behalf of the landowners therein, or otherwise to assume the cost and expenses of any action or proceeding involving or affecting the ownership or use of waters or water rights within or without the district, used or useful for any purpose of the district or of the common benefit of any land situated therein, or involving the wasteful use of water therein; to commence, maintain, intervene in, defend and compromise and to assume the cost and expenses of any and all actions or proceedings now or hereafter begun; to prevent interference with or diminution of, or to declare the rights in natural flow of any stream or surface or subterranean supply of waters used or useful for any purpose of the district or of common

benefit to the lands within the district or to its inhabitants; to prevent unlawful exportation of water from said district; to prevent contamination, pollution or otherwise rendering unfit for beneficial use, the surface or subsurface water used or useful in said district, and to commence, maintain and defend actions and proceedings to prevent any such interference with the aforesaid waters as may endanger or damage the inhabitants, lands, or use of water in, or flowing into, the district; provided, however, that said district shall not have power to intervene or take part in, or to pay the costs or expenses of actions or controversies between the owners of lands or water rights which do not affect the interests of the district.

(s) To co-operate and act in conjunction with the United States or with the State of California, or any of its engineers, officers, boards, commissions, departments or agencies, or with any public or private corporation, or with the County of Tehama, in the construction of any work for the controlling of flood or storm waters of or flowing into said district, or for the protection of life or property therein, or for the purpose of conserving said waters for beneficial use within said district, or in any other works, acts, or purposes provided for herein, and to adopt and carry out any definite plan or system of work for any such purpose.

(t) To enter upon any land, to make surveys and locate the necessary works of improvement and the lines for channels, conduits, canals, pipelines, roadways and other rights-of-way; to acquire by purchase, lease, contract, gift, devise or other legal means all lands and water and water rights and other property necessary or convenient for the construction, use, supply, maintenance, repair and improvement of said works, including works constructed and being constructed by private owners, lands for reservoirs for storage of necessary water, and all necessary appurtenances, and also where necessary or convenient to said end, and for said purposes and uses, to acquire and to hold the capital stock of any mutual water company or corporation, domestic or foreign, owning water or water rights, canals, waterworks, franchises, concessions, or rights, when the ownership of such stock is necessary to secure a water supply required by the district or any part thereof, upon the condition that when holding such stock, the district shall be entitled to all the rights, powers and privileges, and shall be subject to all the obligations and liabilities conferred or imposed by law upon other holders of such stock in the same company; to enter into and do any acts necessary or proper for the performance of any agreement with the United States, or any state, county, district of any kind, public or private corporation, association, firm or individual, or any number of them, for the joint acquisition, construction, leasing, ownership, disposition, use, management, maintenance, repair or operation of any rights, works or other property of a kind which might be lawfully acquired or owned by said Tehama County Flood Control and Water Conservation District; to acquire by negotiation only the right to store water in any reservoirs, or to carry water through any canal, ditch or conduit not owned or controlled by the district; to grant to any owner or lessee the right to the use of any water owned or controlled by the district or

right to store such water in any reservoir of the district, or to carry such water through any tunnels, canal, ditch, or conduit owned and controlled by the district; to enter into and do any acts necessary or proper for the performance of any agreement with any district of any kind, public or private corporation, association, firm or individual, or any number of them for the transfer or delivery to any such district, corporation, association, firm or individual or any water right or water pumped, stored, appropriated or otherwise acquired or secured, for the use of the Tehama County Flood Control and Water Conservation District, or for the purpose of exchanging the same for other water, water right or water supply in exchange for water, water right or water supply to be delivered to said district by the other party to said agreement.

(u) To co-operate and contract with the United States under the Federal Reclamation Act of June 17, 1902, and all acts amendatory thereof or supplementary thereto or any other act of Congress heretofore or hereafter enacted permitting co-operation or contract for the purposes of construction of works, whether for irrigation, drainage, or flood control, or for the acquisition, purchase, extension, operation or maintenance of such works, or for a water supply for any purposes, or for the assumption as principal or guarantor of indebtedness to the United States, or for carrying out any of the purposes of the district, and to carry out and perform the terms of any contract so made; and for said purposes the district shall have in addition to the powers specifically set forth in this act, all powers, rights and privileges possessed by irrigation districts as set out in Chapter 2 (commencing at Section 23175) of Part 6 of Division 11 of the Water Code, not inconsistent with the provisions of this act.

(v) Nothing herein contained shall be deemed to permit the district or its board of directors to acquire or interfere in existing water rights and water uses and facilities for distribution of the same on an involuntary basis, but nothing herein shall be deemed to prohibit negotiating and acquisition of existing rights, uses, and privileges in water by negotiation. [Amended by Stats 1961 ch 631 § 1 p 1802.]

§ 3.1. Power to co-operate and contract with United States or this State: Incurrence of indebtedness: When consent of voters necessary: Election procedure

The power of the district to co-operate and contract with the United States or the State of California pursuant to Section 3 shall include the power to incur an indebtedness or liability under any such contract, but no such contract under which the district incurs an indebtedness or liability exceeding the income or revenue for the year in which the contract is proposed to be executed shall be executed without the consent of two-thirds of the votes cast at a special election to be held for that purpose, such election to be called and held, so far as practicable, in the same manner as bond elections for the district. [Added by Stats 1959 ch 940 § 1 p 2968; Amended by Stats 1963 ch 332 § 1 p 1116.]

§ 3.2. Additional powers

In addition to its other powers, the district has all of the powers granted to public agencies by the Davis-Grunsky Act (Chapter 5 (commencing with Section 12880) Part 6, Division 6, of the Water Code). [Added by Stats 1961 ch 2213 § 1 p 4559: Amended by Stats 1967 ch 219 § 1 p 1351.]

§ 4. Establishment of zones: Amending boundaries: Proceedings: Prohibitions

The board of directors of the district created by this act, by resolutions thereof adopted from time to time, may establish zones within the district without reference to the boundaries of other zones, setting forth in such resolutions, descriptions thereof by metes and bounds and entitling each of such zones by a zone number, and institute zone projects for the specific benefit of such zones. The board may, by resolution, amend the boundaries by annexing property to or by withdrawing property from the zones or may divide existing zones into two or more zones or may superimpose a new or amended zone on zones already in existence, setting forth in such resolutions descriptions of the amended, divided or superimposed zones by metes and bounds and entitling each of such zones by a zone number. The board may not form a zone covering areas of land situated both inside and outside the corporate limits of a municipality.

The board, at any regular or special meeting, may adopt a notice of intention to create a zone (or zones). Said notice shall state the reason for the formation of said zone (or zones), the area to be included in each proposed zone, the date, place and time of the meeting of the board at which it is proposed to pass the resolution to form a zone (or zones). The notices of intention to form a zone (or zones) must be posted in at least five public places in each proposed zone, at least 15 days prior to the proposed formation date. Proof of the posting of said notices shall be filed with the clerk, showing the locations in the proposed zone where said notices were posted, together with the date of posting, and signed by the person who did the posting. The clerk shall mail a copy of said notices of intention to form a zone (or zones) to the county assessor and such other parties as ordered by the board. The notice must also state that any interested person may appear before the board at the time when it is proposed to pass the resolution forming the zone (or zones), and urge the formation or protest the formation thereof. At the time set by the board in its notice of intention to form a zone (or zones), or at any time at which the hearing may be continued, the board shall consider all proposals for or against the formation of the zone (or zones). If it appears to the majority of the board that the formation of a zone (or zones) would be beneficial to the area, they may adopt a resolution forming said zone (or zones), and assign each zone a zone number. The clerk shall file a certified copy of the resolution with the county recorder, and one copy each with the county assessor, the Secretary of State, and the State Board of Equalization.

Proceedings for the establishment of such zones may be conducted concurrently with and as a part of the proceedings for the instituting of projects relating to such zones, which proceedings shall be instituted in the manner prescribed in Section 5 of this act. [Amended by Stats 1961 ch 631 § 2 p 1807.]

§ 4.1. Abolishment of zone: Resolution and contents: Notice and hearing: Recording and filing

When the board finds that a zone within the district no longer serves a useful purpose and is not required for the proper functioning of the district, the board may by resolution abolish the zone, if there is no bonded or contractual indebtedness representing a lien on land in the zone. The board shall give the same notice and hearing in the same manner as was given when the zone was formed.

The resolution abolishing the zone shall contain a metes and bounds description of the zone and a map or plat showing the boundaries of the zone. The resolution abolishing the zone shall be recorded in the office of the recorder of the county. A certified copy of the resolution abolishing the zone shall be filed with the assessor of the county and the State Board of Equalization. [Added by Stats 1961 ch 631 § 3 p 1808.]

§ 4.2. Countywide zone for flood control and bank protection projects or for channel clearance: Notice of intention to create: Posting: Mailing: Hearing: Resolution: Filing

Notwithstanding the provisions of Sections 4 and 19.5 of this act, the board of directors of the district by resolution may establish a countywide zone for the purpose of maintaining flood control projects and bank protection projects, including those constructed by federal agencies, including but not limited to, the United States Army, Corps of Engineers, or pursuant to the Watershed Protection and Flood Prevention Act (Public Law 566, Chapter 656, 83d Congress, Second Session), and for channel clearance when, in the judgment of the board, the channels of any stream are in such condition as to impede the flow of flood water.

The board, at any regular or special meeting, may adopt a notice of intention to create a countywide zone. The notice shall state the reason for the formation of the countywide zone, that the zone shall embrace all that territory of the County of Tehama lying within the exterior boundaries of the county, and the date, place and time of the meeting of the board at which it is proposed to pass the resolution to form a countywide zone. The notices of intention to form a countywide zone must be posted in at least five public places in the county, at least 15 days prior to the proposed formation date. Proof of the posting of the notices shall be filed with the clerk, showing the locations in the county where the notices were posted, together with the date of posting, and signed by the person who did the posting. The clerk shall mail a copy of the notices of intention to form a countywide zone to the county assessor and such other parties as ordered by the board. The notice must also state that any interested person may appear before the board at the time when it is proposed to pass the resolution forming the countywide zone, and urge the formation or protest the formation thereof. At the time set by the board in its notice of intention to form a countywide zone, or at any time at which the hearing may be continued, the board shall consider all proposals for or against the formation of the countywide zone.

If it appears to the majority of the board that the formation of a countywide zone would be beneficial to all the territory within the district, they may

adopt a resolution forming the countywide zone. The clerk shall file a certified copy of the resolution with the county recorder, and one copy each with the county assessor, the Secretary of State, and the State Board of Equalization. [Added by Stats 1963 ch 332 § 2 p 1117.]

§ 4.3. Abolition of countywide zone

A countywide zone may be abolished pursuant to the provisions of Section 4.1, except that the resolution abolishing the countywide zone need not contain a metes and bounds description of such zone nor a map or plat showing the boundaries of such zone. [Added by Stats 1963 ch 332 § 3 p 1117.]

§ 5. Institution of projects for single zones or joint projects for two or more zones: Adoption of resolution: Hearing: Publication of notice: Decision of board

The board may institute projects for single zones and joint projects for two or more zones, for the financing, constructing, maintaining, operating, extending, repairing or otherwise improving any work or improvement for the common benefit of such zone or participating zones. For the purpose of acquiring authority to proceed with any project, the board shall adopt a resolution specifying its intention to undertake such project, together with the engineering estimate or the cost of same to be borne by the particular zones or participating zones and fixing a time and place for public hearing of the resolution and which shall refer to a map showing the general location and general construction of the project.

Notice of such hearing shall be given by publication once a week for two consecutive weeks prior to the hearing. The last publication of the notice shall be a least seven days before the hearing in a newspaper of general circulation designated by the board, circulated in such zone or each of the participating zones, if there by such a newspaper. If there is no such newspaper, then by posting notice for two consecutive weeks prior to the hearing in five public places designated by the board, in such zone or in each of the participating zones. The notice must designate a public place in such zone or in each of the participating zones where a copy or copies of the map or maps of the joint project may be seen by any interested person; such map must be posted in each of the public places so designated in the notice at least two weeks prior to the hearing.

At the time and place fixed for the hearing, or at any time to which the hearing may be continued, the board shall consider all written and oral objections to the proposed project. Upon the conclusion of the hearing the board may abandon the proposed project or proceed with the same, unless prior to 30 days after the conclusion of the hearing written protests against the proposed project, signed by either a majority in number of the registered voters or freeholders residing within such zone or participating zones, are filed with the board. In that event, further proceedings relating to such project must be suspended for not less than six months following the date of the conclusion of the hearing, or the proceeding may be abandoned in the discretion of the board.

§ 6. Same: Appointment of advisory committee for each zone: Members: Qualification: Right to attend board meetings: Terms: Vacancies

Within 90 days after a zone has been established the board shall appoint, for each zone, an advisory committee of three persons who own real property within the zone for which they are appointed and whose names appear on the last Great Register of Tehama County, to represent before the board the residents and property owners of that zone. Each person so appointed shall be entitled to participate and be heard at every meeting of the board in which any matter affecting his zone is discussed or considered. The board shall not discuss or consider any matter which affects any zone unless each member of the advisory committee for that zone has been notified in writing as to the time and place of meeting at least five days before the meeting. The board shall take no affirmative action on any matter pertaining to a zone, unless and until said action is approved by a two-thirds majority of the advisory committee in writing and such written consent is filed with the board. After being notified as required by this section, should any member or members of the advisory committee fail to file a written consent, the said failure of said member or members to act shall be deemed as an approval of the act being considered by the board. The members of the first advisory committee appointed for a zone shall be appointed by the board for the following terms: one member for one year, one member for two years and one member for three years. Thereafter each member shall be appointed for a term of three years, and shall hold office until their successors are appointed and qualified. Vacancies on the advisory committee shall be filled by the board for the unexpired term. Nothing in this act shall be construed to require the appointment of a zone committee for a countywide zone. [Amended by Stats 1961 ch 631 § 4 p 1808; Stats 1970 ch 190 § 1. effective June 9, 1970.]

§ 6.1. Same: Appointment of members of first advisory committee: Existing operating advisory committees

On the effective date of this section, or as soon thereafter as practicable, the board shall reappoint the members of any advisory committee, existing prior to the effective date of this section, for the terms specified in Section 6 of this act for the first advisory committee. Thereafter, the appointment of members of all advisory committees shall be governed by Section 6 of this act.

Any operating advisory committees existing on the effective date of this section are continued in existence, with the existing committee members, as advisory committees under Section 6 of this act. [Added by Stats 1961 ch 631 § 5 p 1808.]

§ 7. Dissolution of district: Procedure

Upon the petition of 200 qualified electors of the district, the district may be dissolved in the manner provided for the dissolution of districts by Article 10 (commencing at Section 58300) of Chapter 1 of Title 6 of the Government Code, except for the number of petitioners required, and the district shall be considered a district within the meaning of all the provisions of such article.

§ 8. Board of directors: Members: Qualifications: Terms: Vacancies: Compensation: Election of chairman: Quorum: Powers and duties

The Board of Supervisors of the County of Tehama shall act as the ex officio Board of Directors of the Tehama County Flood Control and Water Conservation District and shall exercise all the powers enumerated in this act except as otherwise provided and shall perform all other acts necessary or proper in their discretion to accomplish the purpose of this act.

The board of directors may adopt and enforce reasonable rules and regulations for the administration and government of the district and facilitate the exercise of its powers and duties herein set forth, and may employ and fix the compensation of all necessary agents and employees to look after the performance of any work or improvements provided in this act. Each member of the board of directors shall receive twenty-five dollars ($25) for each day he is in attendance at official meetings of the board and shall be allowed his actual, necessary, and reasonable expenses incurred in carrying out his duties under this act. The chairman of the board of supervisors shall be the chairman of the board of directors, who shall preside at all meetings of the board and in case of his absence or inability to act, the members present shall, by an order entered in their minutes, select one of their number to act as chairman temporarily. Any member of the board may administer oaths when necessary in the performance of his official duties. A majority of the members of the board shall constitute a quorum for the transaction of business, and no act of the board shall be valid or binding unless a majority of the board concur therein. [Amended by Stats 1969 ch 27 § 1; Stats 1970 ch 190 § 2, effective June 9, 1970.]

§ 9. Interest by directors in contracts awarded by board prohibited: Exceptions: Punishment on violation

No director of the district shall in any manner be interested directly or indirectly, in any contract awarded or to be awarded by the board, or in the profits to be derived therefrom. For any violation of this provision, such person shall be guilty of a misdemeanor, and upon conviction thereof shall forfeit his office. This section shall not be construed to apply to any contract made with a corporation for its general benefit where such a director is a minority stockholder therein.

§ 10. Performance of duties by county officers

The board of directors may appoint the county clerk, county assessor and tax collector, county auditor, county treasurer, district attorney, their assistants, deputies, clerks and employees to be ex officio officers, assistants, deputies, clerks and employees respectively of the district. Upon appointment, the board of directors by board order shall determine the amount of compensation paid each officer for the ex officio duties required under this act. [Amended by Stats 1970 ch 190 § 3, effective June 9, 1970.]

§ 11. Adoption, certification, recording and publication of ordinances, resolutions and other legislative acts: Initiative and referendum powers of electors

All ordinances, resolutions and other legislative acts for the district shall be adopted by the board, and certified to, recorded and published in the same

manner, except as herein otherwise expressly provided, as are ordinances, resolutions or other legislative acts for the county.

The initiative and referendum powers are hereby granted to the electors of the district to be exercised in relation to the enactment or rejectment of district ordinances in accordance with the procedure established by the laws of the State of California for the exercise of such powers in relation to counties.

§ 12. Claims against district: Preparation, presentment, auditing and allowance or disallowance: Manner

Claims against the district shall be prepared, presented, audited and allowed or disallowed in the same manner and within the periods of time specified in the laws of the State of California, now or hereafter enacted, for the preparing, presenting, auditing, and allowance or disallowance of claims against the county.

§ 13. Title to property: Authority of board

The legal title to all property acquired under the provisions of this act shall immediately and by operation of law vest in the district, and shall be held by the district, in trust for, and is hereby dedicated and set apart to, the uses and purposes set forth in this act and all such property is exempt from taxation or assessment by the State, any county, city, or district. The board is authorized to hold, use, acquire, manage, occupy and possess said property, as provided herein if the board determines by resolution duly passed and entered in their minutes, that any district property, real or personal, is no longer necessary to be retained for the uses and purposes of the district, it may thereafter sell or otherwise dispose of said property, or lease the same, in the manner provided by law for the disposition and sale of property of counties, except that the title to real property, water rights or waterworks shall not be conveyed or alienated except by a vote of the electors at an election held for that purpose.

§ 14. Grant of right of way for location, etc., of flood control works across public lands of State: Procedure when power exercised

There is granted to the district the right of way for the location, construction and maintenance of flood control channels, ditches, waterways, conduits, canals, storm dikes, embankments, and protective works in, over and across public lands of the State of California, not otherwise disposed of or in use, not in any case exceeding in length or width that which is necessary for the construction of such works and adjuncts or for the protection thereof. Whenever any selection of a right of way for such works or adjuncts thereto is made by the district the board must transmit to the State Lands Commission, the Controller of the State and the recorder of the county in which the selected lands are situated, a plat of the lands so selected, giving the extent thereof and the uses for which the same is claimed or desired, duly verified to be correct. If the State Lands Commission shall approve the selections so made it shall endorse its approval upon the plat and issue to the district a permit to use such right of way and lands.

§ 15. Contracts exceeding $2,000: Letting to lowest bidder: Call for bids: Bonds: Rejection of bids: Doing work by force account: Purchase of materials and supplies: Limitations: Application of section

All contracts for the construction of any unit of work, except as hereinafter provided, estimated to cost in excess of three thousand five hundred dollars ($3,500) shall be let to the lowest responsible bidder in the manner hereinafter provided. The board shall advertise by three insertions in a daily newspaper of general circulation or two insertions in a weekly newspaper of general circulation published in the district inviting sealed proposals for the construction of the work before any contract shall be made therefor, and may let by contract separately any part of said work. The board shall require the successful bidder to file with the board good and sufficient bonds to be approved by the board conditioned upon the faithful performance of the contract and upon the payment of all claims for labor and material in connection therewith, such bonds to contain the terms and conditions set forth in Chapter 3 (commencing at Section 4200) of Division 5 of Title 1 of the Government Code, and to be subject to the provisions of that chapter. The board shall also have the right to reject any and all bids, in which case the board may advertise for new bids. In the event no proposals are received pursuant to advertisement therefor, where the estimated cost of such work does not exceed the sum of five thousand dollars ($5,000) or where the work consists of emergency work necessary in order to protect life and property, the board of directors, by unanimous vote of all members present, may without advertising for bids therefor have said work done by force account. The district shall have the power to purchase in the open market without advertisement for bids therefor, materials and supplies for use in any work therewith either under contract or by force account; provided, however, that material and supplies for use in any new construction work or improvement, except work referred to in the preceding sentence, may not be purchased if the cost thereof exceeds five thousand dollars ($5,000), without advertising for bids and awarding the contract therefor to the lowest responsible bidder.

The provisions of this section shall have no application to a contract entered into with the United States under the authority of Section 3 of this act, or to a contract authorized by a vote of the electorate of the district. [Amended by Stats 1970 ch 190 § 4, effective June 9, 1970.]

§ 16. Limitations on indebtedness or liability to be incurred

The district shall not incur any indebtedness or liability in any manner or for any purposes exceeding in any year the income and revenue provided for such year, and any indebtedness or liability incurred in violation of this section shall be absolutely void and unenforceable.

This section shall have no application to debts or liabilities incurred pursuant to the provisions of this act, authorizing the issuance of bonds, the levying of special assessments, the execution of contracts with the United States nor to the incurring of any indebtedness or liability authorized by a vote of the electors of the district at an election held for such purpose.

§ 17. General tax levy for district: Manner and time: Amount: Limitations: Increase of tax levied

The board in any year shall have the power to levy a tax, which shall be in addition to taxes for the payment of and interest on any bonded indebtedness, or any other indebtedness to the United States, upon the taxable property in said district. Said tax shall be levied and collected at the same time and in the same manner, together with county taxes and not to exceed, however, the sum of seven cents ($0.07) on each one hundred dollars ($100) of the assessed valuation of all property within the district, measured by the county assessment roll last equalized prior to the levying of said tax, to pay the costs and expenses of surveys, of zoning, compensation for clerical, engineering, legal, printing and advertising of all resolutions, notices, and other matter required to be printed, posted or published, all costs and expenses of legal actions or proceedings, and also the rental or purchase of real or personal property used in connection with such work and surveys, or any other of its purposes and to repay the county any and all moneys loaned to the district for the purposes herein stated and prior to the receipt of taxes.

The board may condition any increase in the tax levied pursuant to this section above the sum of three cents ($0.03) on each one hundred dollars ($100) of the assessed valuation of all property within the district upon the approval of a majority of the registered voters within the district voting at an election called for that purpose and held within the district.

The tax levied pursuant to this section shall be known as the general tax levy for the district. [Amended by Stats 1961 ch 631 § 6 p 1809; Stats 1970 ch 190 § 5, effective June 9, 1970.]

§ 18. Power of board to cause taxes to be levied within any zone: Purposes

The board shall have the power, as provided for in this act, to cause taxes to be levied within any zone for the purpose of paying any obligation of the district created for the district and to accomplish the purpose of the district and of this act.

§ 19. Estimation and determination of amount of money necessary for projects: Procedure: Division of district into zones

The board may estimate and determine the amount of money necessary to be raised to construct or purchase necessary works and acquire the necessary property and rights therefor and otherwise carry out the provisions of this act.

For the purpose of ascertaining the amount of money necessary to be raised for such purposes, or any of them, the board may cause such surveys, examinations, drawings and plans to be made as shall furnish the proper basis for said estimate.

In the estimate of the amount necessary to be raised, the board may include a sum sufficient to pay the interest on the bonds to be issued for a period of three years or less. All such surveys, examinations, drawings, and plans shall be made under the direction of the engineer of the district and shall be certified by him. After receiving such report the board may determine and

declare by resolution whether or not the proposed plan of work is satisfactory and whether or not the project, as set forth in the report, is feasible, and if so, may make an order determining the amount of bonds that should be issued in order to raise the amount of money necessary therefor, and in determining the amount, sufficient shall be included to cover the cost of inspection of works in course of construction.

Prior to the calling of the bond election hereinafter referred to, the board shall cause the entire district, or any portion thereof, to be divided into a zone or zones, if in its opinion such division is necessary because of the varying benefits to the property within the district, together with a statement as to the amount of the sum to be raised from each of such zone or zones for the payment of principal and interest of the bonds of the zone or zones. The district may be divided into as many zones as may be deemed necessary and each zone shall be composed of and include any of the lands in the district which in the opinion of the board will be benefited in substantially the same manner. Each zone shall be designated on a map or plat of the district filed in the office of the board and shall show the separate boundaries of each zone and a statement of the amount to be raised from each zone.

§ 19.5. Areas exempt from inclusion in zones except upon written application to be included

The following areas are exempted from inclusion in any zone within the district except upon written application to be included in all or part of any proposed zone:

(a) Existing irrigation districts.

(b) The operating areas of any existing mutual water companies.

§ 20. Election in connection with zone projects

If after the hearing provided for in Section 5 of this act, the board determines to proceed with any project, the board shall call a special election and submit to the qualified voters of said zone or zones, the following propositions:

1. Shall the report adopted by the board be ratified?
2. Shall the district incur a bonded indebtedness for the purpose of providing for the control and disposition of flood and storm waters of the zone and to protect from damage from such storm and flood waters, the waterways, property, public highways, and public places in the district, and for any other purpose set forth in Section 3 hereof?
3. If a contract with the United States or the State of California is required to be submitted to the voters pursuant to Section 3.1 hereof, shall the district execute such contract?

The resolution calling the special election shall state the estimated cost of the proposed work and improvements, the amount of the principal of the indebtedness to be incurred therefor and shall fix the maximum rate of interest to be paid on said indebtedness which shall not exceed 5 percent per annum, and shall fix the date on which the special election shall be held and the manner of voting for and against the ratification of the report adopted by the board, and for and against the incurring of such indebtedness.

If a contract with the United States or the State of California is submitted for approval of the voters, the resolution shall state the purpose of the contract and the amount of the indebtedness or liability to be incurred thereunder, and shall fix the manner of voting for and against such contract.

For the purpose of the election, the board shall, in its resolution, establish election precincts within the boundaries of the zones affected, and may form election precincts by consolidating the precincts established for general election purposes in the zones, and shall designate a polling place and appoint one inspector, two judges and two clerks for each of such precincts.

In all particulars not recited in such resolution, the election shall be held as nearly as practicable in conformity with the general election laws of the State.

At such election all persons whose names appear on the last Great Register of Tehama County and who own real property within the zone or zones involved shall be entitled to vote as hereinafter provided. The number of votes shall be governed by the assessed value of all real and personal property owned by the elector within the zone involved. Every landowner shall be entitled to one vote for the first one thousand dollars ($1,000) of assessed value or fraction thereof and an additional vote for each additional one thousand dollars ($1,000) of assessed value or fraction thereof.

In the case of land owned by a copartnership or a corporation the method of voting shall be as follows:

Copartners whose names appear on the last Great Register of Tehama County and who own land in the zone or zones affected shall be eligible to vote. In the case of a corporation owning land in the zone or zones affected and who has a stockholder or stockholders whose name or names appear on the last Great Register of Tehama County said stockholder or stockholders shall be eligible electors. A copartnership or corporation may designate which partner or partners and stockholder or stockholders is to represent the owners of land at any election and the percentage to be voted by each copartner or stockholder. The designation is to be made in writing and in the case of a copartnership the document shall be signed by the partners and in the case of a corporation the document shall be signed by the officers and bear the corporate seal and said document shall be delivered to the election board at the time of voting. If the voter is not a resident of the zone or zones affected, his voting precinct shall be the precinct in which his land, or the land he represents, is situated.

Such resolution calling such election shall be published once a day for at least seven days, in some newspaper published at least five days a week in the district, or once a week for two weeks in some newspaper published less than five days a week in such district, and one insertion each week for two succeeding weeks shall be sufficient publication in such newspaper published less than five days a week. No further notice of such election need be given.

Any defect or irregularity in the proceedings prior to the election shall not affect the validity of the bonds or of any contract submitted for approval.

If at such election two-thirds or more of the votes are cast in favor of ratifying the adoption of the report by the board and the incurring of such

bonded indebtedness, then the bonds of the district, for the amounts stated in such proceedings, shall be issued and sold as provided in this act.

If at such election two-thirds or more of the votes are cast in favor of executing a contract submitted for approval, then the contract shall be executed by the district. [Amended by Stats 1959 ch 940 § 2 p 2969.]

§ 21. Period during which another election prohibited where proposition fails to receive required number of votes

Should the proposition be submitted to the electorate as provided in Section 20 fail to receive the requisite number of votes of the qualified electors voting at such election for the purposes specified, the board shall not for one year after such election call or order another election in the district for the same purposes.

§ 22. Contract by municipal corporation or political subdivision within district to pay to district amount assessed against zones within municipality or political subdivision: Effect: Optional procedure:

Notwithstanding any other provision in this act, the governing body of any municipal corporation or political subdivision at any time after the location and extent of zones within the district and the amount to be raised therefrom in each of such zones for the purpose of assessment have been finally fixed and determined by the board as provided in Section 19, but before the calling of the bond election as provided in Section 20 may, with the consent of the board, enter into a contract with the district to pay to the district for the benefit of the bond fund thereof, if a bond issue be authorized and bonds be issued, an amount which shall be equal to the total amount assessed against all zones situated entirely within the corporate limits of the municipality or political subdivision. Thereupon the charges against the zone or zones shall be canceled to the extent of the amount so agreed to be paid, and thereafter the electors residing within the zone or zones shall not be entitled to vote at such bond election. Such contract shall contain such other and additional provisions as the board deems necessary or advisable in order to to protect the interests of the district and to substitute the contract in lieu and instead of the assessments within the zone or zones so assumed by the municipality or other political subdivision.

It shall be wholly optional with the board whether or not to proceed as provided in this section.

§ 23. Form of bonds: Maturity: Times and place of payment: General obligation bonds: Prohibitions and limitations

Subject to the provisions of this act, the board shall prescribe by resolution the form of the bonds and of the interest coupons attached thereto and shall fix the rate of interest said bonds shall bear, not to exceed 5 percent per annum. The bonds shall mature serially in amounts to be fixed by the board, payment of the bonds commencing not later than five years from the date thereof and being completed in not more than 50 years from said date. The board shall fix the place or places (which may be within or without the State of California and which shall be designated in the bonds) where the bonds, together with the interest thereon, shall be payable. The district or the board

of directors thereof are not by this act authorized to issue general obligation bonds for the purpose of conserving or distributing water to be used for agricultural irrigation purposes. The principal amount of general obligation bonds issued shall not exceed in the aggregate that amount allowed by the California Districts Securities Commission but in no event to exceed 15 percent of the assessed value of all the real and personal property of the zone or zones involved.

§ 24. Same: Denominations: Payment: Signatures and countersignatures: Interest coupons: Signatures by officers ceasing to be such

The bonds shall be issued in such denominations as the board may determine, except that no bonds shall be of a less denomination than one hundred dollars ($100) nor of a greater denomination than one thousand dollars ($1,000). The bonds shall be payable on the day and at the place or places fixed therein, and with interest specified therein, which interest shall be payable semiannually, except the interest for the first year which may be paid in one installment. The bonds shall be signed by the chairman of the board or such other member of the board as the board may, by resolution, designate, and countersigned by the treasurer of the district and the seal of said district shall be affixed thereto. The interest coupons of the bonds shall be numbered consecutively and signed by the treasurer of said district by his engraved or lithographed signature. In case any officer whose signature or countersignature appears on the bonds or coupons shall cease to be such officer before the delivery of such bonds to the purchaser the signature or countersignature shall nevertheless be valid and sufficient for all purposes the same as if such officer had remained in office until the delivery of the bonds.

§ 25. Action to determine validity of bonds: Procedure

An action to determine the validity of bonds may be brought pursuant to Chapter 9 (commencing with Section 860) of Title 10 of Part 2 of the Code of Civil Procedure. [Amended by Stats 1961 ch 1493 § 1 p 3338.]

§ 26. Issuance and sale of bonds: Manner: Price: Publication of notice of sale: Rejection of bids: Registration: Payment to registered owner

The board shall issue and sell the whole or any part of the bonds to the highest bidder or bidders for cash at the best price obtainable therefor, but in no event for less than the par value of such bonds and the accrued interest thereon. Before making a sale of any of the bonds, notice of the sale shall be given by publication in at least one newspaper of general circulation, published in the district by two insertions therein; and no sale shall be had prior to the expiration of 15 days from the first publication of the notice. The board shall have the right to reject any and all bids when in its discretion it appears to the best interest of the district to do so, and may thereafter readvertise as provided in this section for original sale. The bonds may be registered with the treasurer in accordance with the provisions of any law applicable to the registration of municipal bonds, and thereafter the principal and interest thereon shall be paid to the proper registered owner thereof.

§ 27. Investments of surplus money in sinking fund authorized: Sale of securities: Cancellation of district bonds purchased

Whenever the district shall have any moneys in any sinking fund established for the purpose of providing for the payment of the principal or interest of any bonded indebtedness, which money is not immediately required for the purpose of making such payment, the same or any part thereof may be invested temporarily in any bonds already issued by such district or in any bonds of the United States of America or the State of California. Such investment may be made by direct purchase of any issue of bonds of the district or any part thereof at the original sale of such bonds or by the purchase of such bonds after they have been so issued. Any bonds so purchased and held in any such sinking fund may from time to time be sold and the proceeds temporarily reinvested in bonds as above provided. Sales of any bonds so purchased and held in the sinking fund shall, from time to time, be made in season so that the proceeds may apply to the purpose for which the sinking fund was created except that if such moneys shall not be required for the purpose of paying the interest or any part of the principal of the outstanding bonds, the bonds of the district purchased from such moneys may be canceled by the treasurer of said district upon order by the board. After such cancellation such bonds shall cease to be an obligation of the district for any purpose whatsoever.

§ 28. Bonds as evidence of regularity, etc., of proceedings: Effect of irregularity, etc., in proceedings: Payment of bonds by revenue derived from taxation

Bonds issued under this act shall be, by their issuance, conclusive evidence of the regularity, validity and legal sufficiency of all proceedings, acts and determinations had or made under this act. No error, defect, irregularity, informality and no neglect or omission of any officer of the district in any procedure, taken hereunder, which does not affect the jurisdiction of the board to order the doing of the thing or things proposed to be done, shall void or invalidate such proceedings or any bonds issued thereunder. The bonds and the interest thereon shall be paid by revenue derived from an annual tax upon the taxable property within the district, and all the taxable property in the district shall be and remain liable to be assessed for such payments as hereinafter provided.

§ 29. Bonds as legal investments

Any bonds which shall be issued under the provisions of this act shall be legal investments for all trust funds, and for the funds of insurance companies, banks, both commercial and savings, and trust companies, and for state school funds. Whenever any money or funds may be, by any law now or hereafter enacted, invested in bonds of cities, cities and counties, counties, school districts or irrigation districts, within the State of California, such money or funds may be invested in the bonds issued under this act. Whenever bonds of cities, cities and counties, counties, school districts or irrigation districts within this State may be, by any law now or hereafter enacted, used as security for the performance of any act or the deposit of any public moneys, the bonds issued under this act may be so used.

§ 30. Proceeds of bonds: Deposit and payments: Uses authorized

All proceeds received from the sale of the bonds hereunder shall be deposited with the County Treasurer of the County of Tehama, and be paid out by him upon authority of the board and by proper warrant. All proceeds in excess of the actual cost of all work and improvement and proceedings thereunder may be used for any lawful purposes for which the district was created as in this act provided. [Amended by Stats 1959 ch 940 § 3 p 2970.]

§ 31. Annual tax levy for bond interest and principal: Amount: Levy and collection: Procedure: Laws applicable: Basis for taxes: Liens: Compensation to county: Disposition of amount collected

The board shall at the time for fixing the general tax levy for district purposes pursuant to Section 17 and in the manner of such general tax levy provided, levy and collect annually each year until the bonds are paid or until there shall be a sum in the treasury of such district set apart for that purpose to meet all sums coming due for principal and interest on said bonds, a tax sufficient to pay the annual interest on said bonds and also such part of the principal thereof as shall become due before the time for fixing the next general tax levy. There may be included in such tax a sum sufficient, in the judgment of the board to take care of anticipated delinquencies, except that if the maturity of the indebtedness created by the issuance of bonds be made to begin more than one year after the date of the issuance thereof, tax shall be levied and collected annually at the time and in the aforesaid manner, in an amount sufficient to pay the interest on said indebtedness as it falls due and also to constitute a sinking fund for the redemption thereof on or before maturity. The tax herein required to be levied and collected shall be in addition to all other taxes levied for district purposes and shall be collected at the time and in the same manner as other district taxes are collected, and be used for no other purpose than the payment of said bonds and accruing interest.

Such tax shall be levied upon all taxable property within the benefiting zones excluding any property belonging to any county, municipality, or political subdivision within the district, or property belonging to the State of California or the United States.

If the district has been divided into zones and the amount to be raised for the redemption of principal and interest of the bonds from each such zone has been determined as provided in this act, the amount of the tax levied shall be divided according to the amount, and the amount to be raised from the taxable property within each zone shall be levied upon and against the property in such zone as hereinbefore provided.

The provisions of law of this state prescribing the time and manner of levying, assessing, equalizing and collecting county property taxes including the sale of property for delinquency, and for redemption from such sale, and the duties of the several county officers with respect thereto, so far as they are applicable, and not in conflict with the specific provisions of this act, are hereby adopted and made a part hereof. Such officers shall be liable upon their several official bonds for the faithful discharge of the duties imposed upon them by this act.

The board shall take the assessment on the equalized roll of the County of Tehama as the basis for district taxes and for its taxes collected by the county officials of said county. On or before the first of August the board shall file with the auditor a certified copy of the map or plat showing the zones and the amount to be raised from each zone. The auditor of such county must, on or before the second Monday of August of each year, transmit to the board a statement in writing showing the total value of all property within the district, which value shall be ascertained from the equalized roll of such county for that year. Said statement shall also show the total value of all property in each of said zones respectively.

The board shall, on or before the first weekday in September, or if such weekday falls upon a holiday, then upon the first business day thereafter, fix the rate of tax for each zone, and designate the number of cents upon each one hundred dollars ($100) on the equalized roll, which rate of taxation shall be sufficient to raise the amount previously fixed by the board as hereinabove prescribed. Such acts by the board shall constitute a valid assessment of the property and a valid levy of the tax so fixed. The board must immediately thereafter transmit to the county auditor a statement of the rate of taxes so fixed by said board for each zone into which the district may be divided and the county auditor shall enter such rate upon the county tax roll. Such taxes so levied shall be collected at the same time and in the same manner as county taxes and when collected the net amount ascertained as hereinafter provided shall be paid to the treasurer of the district under the general requirements and penalties provided by law for the settlement of other taxes.

All taxes levied under the provisions of this act shall be a lien upon the property on which they are levied and unless the board has by resolution otherwise provided the enforcement of the collection of such taxes shall be had in the same manner and by the same means as provided by law for the enforcement of the liens for state and county taxes, all provisions of law relating to the enforcement of the latter being hereby made a part of this act. [Amended by Stats 1961 ch 631 § 7 p 1809; Stats 1970 ch 190 § 6, effective June 9, 1970.]

§ 31.5. Levy of tax on zone: Expenditure of revenues: Tax as additional

After the formation of a zone pursuant to the provisions of Section 4, the board shall have power, in any year, to levy a tax upon the taxable property in any such zone as provided in Section 31 at the time and in the manner set forth therein, to carry out any of the obligations specified in this act and to pay any contractual indebtedness incurred for such zone in accordance with the provisions of Section 3.1. The board shall have power to control and order the expenditures for such purposes of all revenue derived. The tax authorized by this section shall be in addition to any tax levied to meet the bonded indebtedness of the district and all interest thereon. [Added by Stats 1963 ch 332 § 4 p 1118.]

§ 32. Power of board to levy taxes and to control and order expenditures of revenue derived: Tax rate in accordance with resolution: Special election: Apportionment in accordance with zones

After the formation of a zone in the district, the board shall have power, in

any year, to levy a tax upon the taxable property in the benefiting county-wide or intracounty zones as provided in Section 31 at the time and in the manner set forth therein, to carry out any of the objects or purposes of this act, and to pay the costs and expenses of maintaining, operating, extending and repairing any work or improvement of such zones for the ensuing fiscal year. The board shall have power to control and order the expenditures for said purposes of all revenue so derived, except that taxes levied under this section for any one year shall not exceed the rates specified in this section on each one hundred dollars ($100) of the assessed valuation of the property in such zones as said assessed valuation is shown on the last preceding assessment records for state and county purposes.

The board on its own motion may set a tax rate not exceeding five cents ($0.05) on each one hundred dollars ($100) of the assessed valuation of such property. Upon the filing with the board of the unanimous written consent of the advisory committee, if there be a committee, the board may by majority vote set a tax rate not exceeding fifteen cents ($0.15) on each one hundred dollars ($100) of the assessed valuation of such property. The board may call a special election for the purpose of submitting to the voters of the zone a resolution to authorize the board to set a tax rate not exceeding fifty cents ($0.50) on each one hundred dollars ($100) of the assessed valuation of such property during the years specified in the resolution. If a majority of the votes cast at the special election approve the resolution, the board is authorized to set the tax rate in accordance with the resolution.

Such tax shall be in addition to any tax levied to meet the bonded indebtedness of said district and all interest thereon. If the district has been divided into zones, the taxes to be levied as provided in this section shall be apportioned in accordance with the zones established for the levying and collection of taxes to pay the principal and interest of the bonds of the district. [Amended by Stats 1961 ch 631 § 8 p 1811; Stats 1970 ch 190 § 7, effective June 9, 1970.]

§ 33. Exemption of bonds from taxation

Bonds issued by the district and property of the district shall be exempt from taxation as provided by Sections 1 and 1 3/4 of Article XIII of the State Constitution.

§ 34. Provisions relative to performance of official duties, etc., to be deemed directory: Effect of error in computation of amount due on bonds, coupons, assessments, etc.

The provisions of this act relative to the performance of official duty as to any time or place, the form of any resolution, notice, order, list, certificate of sale, deed or other instrument shall be deemed directory. No bond, coupon, assessment, or installment thereof, or of the interest or penalties thereon, or certificate of sale or deed shall be held invalid for error in the computation of the proper amount due on the same; provided, the error be found to be comparatively negligible or be found to be one in favor of the owner of the property affected thereby.

§ 35. Construction of act: Effect of errors, irregularities, etc.

This act shall be liberally construed to the end that the purposes may be effective. No error, irregularity, informality and no neglect or omission of any officer of the district in any procedure taken hereunder which does not directly affect the jurisdiction of the board to order the work done or improvement to be made shall void or invalidate such proceedings or any assessment for the cost of work or improvement done thereunder.

§ 36. Separability provision

If any provision of this act, or the application thereof to any person or circumstance, is held invalid, the remainder of this act, or the application of such provision to other persons or circumstances, shall not be affected thereby.

§ 37. Emergency clause

This act is hereby declared to be an urgency measure necessary for the immediate preservation of the public peace, health or safety within the meaning of Section 1 of Article IV of the Constitution and shall therefore go into immediate effect. A statement of the facts constituting such necessity is as follows:

The effective culmination of planning and application and operation of engineering and fiscal data developed for use in this project requires the development of an immediate and expedient program prior to the flood season. In order to accomplish this purpose and to effect operation at the earliest possible moment under favorable conditions, it is necessary that this act take effect immediately.

§ 38. District as validly created: Necessity that statement and map or plat required by Gov C Tit 5 Div 2 Pt 1 be filed before creation of zones effective: Manner of levying taxes: Assessments as liens: Presumption that assessments are correct assessments: Equalizing assessments: Changing assessments: Prescription by board of necessary ordinances: Application of Gov C Tit 5 Div 2 Pt 1 Ch 8

Notwithstanding Chapter 8 (commencing at Section 54900) of Part 1 of Division 2 of Title 5 of the Government Code, the district is validly created for the purposes of assessment and taxation. The creation of any zone in the district shall not be effective for purposes of assessment or taxation for the fiscal year 1957-58 and shall not be effective for such purposes for any fiscal year thereafter unless the statement and map or plat required by Chapter 8 (commencing at Section 54900) of Part 1 of Division 2 of Title 5 of the Government Code are filed with the county assessor and the State Board of Equalization on or before the first of February of the year in which the assessments or taxes are to be levied. Until such time as the creation of any zone shall be effective for purposes of assessment or taxation, any tax or assessment levied by the board shall be levied at a uniform rate on all property in the district.

For the fiscal year 1957-58, but for no other fiscal year, the assessment and equalization of property for the purpose of district taxation shall be effected as provided in this section.

Assessments of this district for the fiscal year 1957-58 are liens on the property the same as if they were county taxes, except that the district assessment liens attach as of noon on the day after this act becomes effective.

It is presumed that the assessments of property made by the county assessor and by the State Board of Equalization for county taxation purposes for the fiscal year 1957-58 are the correct assessments for purposes of assessment by the district and the rolls prepared by the county assessor and the State Board of Equalization shall be used for purposes of levying and collecting the assessments for the district. If the ownership or taxable situs or value of any property changes between noon on the first Monday in March, 1957, and the date on which attaches the lien for assessments of the district for the fiscal year 1957-58, then, on petition of the taxpayer affected to the assessing authority, suitable entry shall be made on the assessment roll, in the manner prescribed by the State Board of Equalization, to indicate such change in the ownership or taxability or value of the property for purposes of assessment by the district.

In equalizing the assessments made by the county assessor, the Tehama County Board of Equalization, in addition to its regular equalization duties shall also, in the same manner and under the same rules, equalize the valuation of property for purposes of assessment by the district in accordance with the requirements of this section and any such changes made by the county board of equalization in the assessment roll shall be entered in the manner prescribed by the State Board of Equalization.

If, for purposes of assessments by the district, a change in the assessment for county taxation purposes is not sought under this section before the end of the period during which such assessment may be equalized, or corrected on a petition for reassessment, such assessment, if valid for county taxation purposes, is conclusively presumed to be the correct assessment for assessment purposes of the district.

The board may prescribe by ordinance any necessary procedure, in accordance with the policy of this act, for the purpose of assessing, equalizing, levying, and collecting taxes or assessments for the district for the fiscal year 1957-58.

Chapter 8 (commencing with Section 54900) of Part 1 of Division 2 of Title 5 of the Government Code does not apply to the district with respect to any tax or assessment levied by the district for the fiscal year 1957-58. [Amended by Stats 1970 ch 190 § 8, effective June 9, 1970.]

§ 39. Designation of act

This act shall be known as the "Tehama County Flood Control and Water Conservation District Act."

RESOLUTION NO. 5-2021

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT ADOPTING THE GROUNDWATER SUSTAINABILITY PLAN FOR THE BOWMAN SUBBASIN AND AUTHORIZING AND DIRECTING ITS FILING WITH THE CALIFORNIA DEPARTMENT OF WATER RESOURCES

WHEREAS, in 2014 the California legislature adopted, and the Governor signed into law, Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act (SGMA) of 2014 that initially became effective on January 1, 2015, and that has been amended from time-to-time thereafter; and

WHEREAS, the stated purpose of SGMA, as set forth in California Water Code section 10720.1 is to provide for the sustainable management of groundwater basins at a local level by providing local groundwater agencies with the authority, and technical and financial assistance necessary to sustainably manage groundwater; and,

WHEREAS, SGMA requires the designation of Groundwater Sustainability Agencies (GSAs) for the purpose of achieving groundwater sustainability through the adoption and implementation of regulatory programs known as Groundwater Sustainability Plans (GSPs) or an alternative plan for all medium and high priority subbasins within Tehama County; and,

WHEREAS, in November 2015 the Tehama County Flood Control and Water Conservation District Board of Directors adopted Resolution No. 5-2015 electing to be the GSA for all portions of the Rosewood, Bowman, South Battle Creek, Red Bluff, Bend, Antelope, Dye Creek, Los Molinos, Corning, Vina, and Colusa Subbasins located within Tehama County; and

WHEREAS, in March of 2018, the Tehama County Flood Control and Water Conservation District Board of Directors adopted Resolution No. 1-2018 to file a Jurisdictional Modification, returning the southern border of the Millville Subbasin to the Tehama/Shasta County line, thereby returning the Millville and South Battle Creek Subbasin boundaries to their pre-2016 Bulletin 118 Interim Update borders; and

WHEREAS, in June of 2018, the Tehama County Flood Control and Water Conservation District Board of Directors adopted Resolution No. 2-2018 to file a Jurisdictional Modification to consolidate the Bowman and Rosewood Subbasins; and

WHEREAS, the Bowman Subbasin of the Redding Groundwater Basin was reclassified from a medium to very low priority during the DWR 2018 Basin Reprioritization, and

WHEREAS, the Tehama County Flood Control and Water Conservation District has undertaken the process to prepare a GSP for the Bowman Subbasin; and

WHEREAS, the Tehama County Flood Control and Water Conservation District provided the notices required by Water Code section 10727.8, and formed the Tehama County Groundwater Commission, consisting of a diverse group of stakeholders which has reviewed and provided input into the Bowman Subbasin GSP, and

WHEREAS, the Tehama County Flood Control and Water Conservation District Board of Directors and Tehama County Groundwater Commission have held numerous public meetings where elements of the Bowman Subbasin GSP have been presented and discussed, and where the general public has been provided the opportunity to comment on the various elements of the Bowman Subbasin GSP, and

WHEREAS, the Tehama County Flood Control and Water Conservation District has received public comments on the various elements of the GSP, which have been reviewed; and

WHEREAS, the Tehama County Flood Control and Water Conservation District has noticed a public hearing for December 20, 2021, as required by Water Code section 10728.4 for the purpose of considering adoption of the Bowman Subbasin GSP.

NOW, THEREFORE, BE IT RESOLVED, the Board of Directors of the Tehama County Flood Control and Water Conservation District finds as follows:

1. Tehama County Flood Control and Water Conservation District Board of Directors hereby approves and adopts the draft Bowman Subbasin GSP and directs staff to make editorial and non-substantial changes to the final version that will be provided to DWR; and
2. Tehama County Flood Control and Water Conservation District Board of Directors authorizes staff to take such other actions as may be reasonably necessary to submit the GSP to DWR by January 31, 2022 and implement the purpose of this Resolution.

The foregoing resolution was offered on a motion by Director Leach, seconded by Director Moule, and carried by the following vote of the Board:

AYES: Directors Carlson, Garton, Leach, Moule, Williams

NOES: None

ABSENT OR NOT VOTING: None

STATE OF CALIFORNIA)
) ss
COUNTY OF TEHAMA)

I, JENNIFER VISE, County Clerk and ex-officio Clerk of the Board of Directors of the Tehama County Flood Control and Water Conservation District, State of California, hereby certify the above and foregoing to be a full, true, and correct copy of an order adopted by said Board of Directors on this 20th day of December 2021.

DATED: This 21st day of December 2021

JENNIFER A. VISE, County Clerk and ex-officio
Clerk of the Board of Directors of the Tehama
County Flood Control and Water Conservation District,
State of California

By: _____ Deputy

Appendix 1-B

GSA Formation Documents

- Notice of Intent to establish a Groundwater Sustainability Agency
- Resolution No. 05-2015 to establish a Groundwater Sustainability Agency
- November 3, 2015 Public Hearing Notice
- June 2, 2015 Public Hearing Notice
- Ordinance No. 2016-1 to establish the Tehama County Groundwater Commission
- Letters of Support

COUNTY OF TEHAMA
DEPARTMENT OF PUBLIC WORKS
9380 San Benito Avenue
Gerber, CA 96035-9701
(530) 385-1462
(530) 385-1189 Fax

Road Commissioner
Surveyor
Engineer
Public Transit
Flood Control & Water Conservation District
Sanitation District No. 1

November 4, 2015

F-15-032

Mark Nordberg, GSA Project Manager
Sustainable Groundwater Management Section
California Department of Water Resources
P.O. Box 942836
Sacramento, California 94236-0001

Re: Notice of Intent to Become a Groundwater Sustainability Agency for all eleven (11) Groundwater Subbasins located within Tehama County.

Dear Mr. Nordberg,

Pursuant to Water Code Section 10723.8, the Tehama County Flood Control and Water Conservation District (DISTRICT), hereby notifies the California Department of Water Resources (DWR) of its intent to become the Groundwater Sustainability Agency (GSA) for all portions of the eleven Groundwater Subbasins located within Tehama County (See Exhibit A). All applicable information in Water Code Section 10723.8(a) is provided in this notification. The DISTRICT intends to manage the following subbasins or portions of those subbasins located within the County:

- Rosewood (Subbasin number 5-6.02)
- Bowman (Subbasin number 5-6.01)
- South Battle Creek (Subbasin number 5-6.06)
- Red Bluff (Subbasin number 5-21.50)
- Bend (Subbasin number 5-21.53)
- Antelope (Subbasin number 5-21.54)
- Dye Creek (Subbasin number 5-21.55)
- Los Molinos (Subbasin number 5-21.56)
- Corning (Subbasin number 5-21.51)
- Vina (Subbasin number 5-21.57)
- Colusa(Subbasin number 5-21.52)

The Boundaries of the subbasins are as identified in Bulletin 118, Update 2003. Tehama County currently has 1 high priority subbasin: Vina; 7 medium priority subbasins: Bowman, Red Bluff, Antelope, Dye Creek, Los Molinos, Corning, and Colusa; and 3 low priority subbasins: Rosewood, South Battle Creek, and Bend. Although not required by the Sustainable Groundwater Management Act of 2014 (SGMA), the DISTRICT also proposes to become the GSA and complete a Groundwater

Sustainability Plan (GSP) for the 3 low priority subbasins in order to facilitate a holistic approach to managing groundwater in Tehama County. The DISTRICT is not aware of any other GSAs operating within the groundwater basins listed above.

The DISTRICT boundary is identified as the area included within the exterior boundary of the County of Tehama and further identified in the California Water Code Appendix 82-1. The DISTRICT was enacted in 1957 to provide for the control and conservation of flood and storm waters and the protection of watercourses, watersheds, public highways, life and property from damage or destruction from such waters; to provide for the acquisition, retention, and reclaiming of drainage, storm, flood, and other waters and to save, conserve, and distribute such waters for beneficial use in said DISTRICT; to authorize the incurring of indebtedness, the issuance of sale of bonds, and the levying and collection of tax assessments on property within said DISTRICT and in the respective zones thereof; to define the powers of said DISTRICT; to provide for the government , management, and operation of said DISTRICT and for the acquisition and construction of property and works to carry out the purposes of the DISTRICT. The DISTRICT Board of Directors is composed of members of the County Board of Supervisors, which are elected by Supervisorial District. The DISTRICT operates under authority of the Board of Directors with management and oversight delegated to the Tehama County Department of Public Works. The Public Works Director serves as the Executive Director of the DISTRICT. Additionally, no new bylaws, ordinances, or other authorities were adopted in conjunction with the establishment of the GSA.

The DISTRICT has been actively managing groundwater throughout the County for the past 20 years. The County first adopted a Groundwater Management Plan in 1996 and has recently updated this plan in 2012. This plan has been supported extensively throughout the County and will serve as the foundation for the GSP. The DISTRICT has also completed Technical Memorandums that include Basin Management Objectives, such as Groundwater Trigger Levels and Awareness Actions for each of the subbasins located within the County (2008); Countywide Water Inventory & Analysis (2003); Small Water Systems Drought Vulnerability Assessment (2005); Summary Report for Groundwater Recharge Area Location Study (2011), and participated in the California Statewide Groundwater Elevation Monitoring (CASGEM) program since 2010. The DISTRICT installed its first two multi-completion groundwater monitoring wells with assistance from DWR in 2004, and has since installed an additional six wells. The DISTRICT continues to monitor these wells several times a year uploading the data to the CASGEM database. These documents can be located on the DISTRICT website http://www.tehamacountypublic works.ca.gov/Flood/. The DISTRICT also has an active Technical Advisory Committee (TAC) that reports to the DISTRICT Board which is comprised of representatives from Agriculture, Domestic/Industrial Water Providers, Natural Resources, and representatives from the cities of Corning, Red Bluff, and Tehama. This TAC meets at least quarterly and has helped review and provided comment on the previously mentioned documents.

The DISTRICT held a public hearing concerning the formation of the GSA on June 2, 2015. During this meeting several agencies expressed an interest in participating in the GSA governance structure. The DISTRICT developed a governance proposal (See Exhibit C) which included an eleven member Groundwater Commission (Commission) comprised of city and District representatives and other stakeholders. The commission will have broad responsibility for all aspects of GSP development and implementation, and will have decision-making authority regarding permits and enforcement

matters. Letters of support (See Exhibit D) for the proposed Governance Proposal have been received from the City of Corning, City of Red Bluff, City of Tehama, El Camino Irrigation District, and the Rio Alto Water District. These agencies which represent some of the larger groundwater pumpers within the County will have an established seat on the Commission along with the Los Molinos Community Services District. The additional 5 members of the Commission will represent each of the five County Supervisorial Districts, these representatives will be nominated by the seated Commission members and confirmed by the DISTRICT Board of Directors.

The DISTRICT caused notice of its election to serve as a GSA to be published in the Red Bluff *Daily News* on October 21 and 31 (See Exhibit E), as provided by Water Code Section 10723(b) and Government Code Section 6066. Courtesy copies of the notice were also emailed or mailed to:

- City of Red Bluff
- City of Corning
- City of Tehama
- Anderson Cottonwood Irrigation District
- Rio Alto Water District
- Thomes Creek Water District
- Corning Water District
- Deer Creek Irrigation District
- El Camino Irrigation District
- Gerber Las Flores Community Services District (CSD)
- Glenn-Colusa Irrigation District
- Los Molinos Mutual Water Company
- Proberta Water District
- Stanford Vina Ranch Irrigation District
- Paskenta CSD
- Kirkwood Water District
- Orland Unit Water Users Association
- Rancho Tehama Association
- Lake California Property Owners Association
- Mineral Water Company
- Red Bluff Tree Farm
- Golden Meadows Estates CSD
- Los Molinos CSD
- Reeds Creek Estates CSD
- Rio Ranch Estates CSD
- Paskenta Band of Nomlaki Indians
- Tehama Colusa Canal Authority
- Resource Conservation District of Tehama County
- Cattlemen's Association
- Cattlewomen's Association
- Shasta-Tehama Watershed Education Coalition
- Deer Creek Watershed Conservancy
- Mill Creek Watershed Conservancy
- Natural Resources Conservation Service
- California Department of Forestry and Fire Protection
- California Department Of Water Resources
- University of California Cooperative Extension
- Tehama County AB3030 Technical Advisory Committee Members
- Tehama County Board of Supervisors
- Tehama County Administration
- Tehama County, County Counsel
- Tehama County Public Works
- Tehama County Farm Bureau
- Tehama County Environmental health
- Tehama County Planning Department
- Tehama County Sherriff's Office
- Butte County
- Glenn County
- Shasta County

On November 3, 2015, the DISTRICT Board held a second public hearing concerning the formation of the GSA and unanimously approved Resolution No. 05-2015 (See Exhibit B), which directed DISTRICT Staff to complete and submit this Notice of Intent.

Pursuant to Water Code Section 10723.8(a)(4) the DISTRICT will consider the interest of all beneficial uses and users of groundwater, as well as those responsible for implementing GSPs. The Groundwater Commission described in Exhibit C, which the DISTRICT has committed to promptly establish, was carefully designed with stakeholder input to ensure that those parties listed in section 10723.2 have an active, long-term role in developing and implementing the GSP and GSA rules and regulations. In addition, the DISTRICT has communicated with parties interested in the sustainable management of groundwater in the subbasins, and will continue to solicit feedback from those parties as the plan is developed. These interests include, but are not limited to all of the following:

- **Holders of overlying groundwater rights:**
    - Agricultural users: The proposed GSA area contains a significant amount of agricultural users of groundwater. Some of the agricultural users get their water from the water/irrigation districts listed above, but a large portion of the independent pumpers do not have an organized association that represents them. The DISTRICT will perform outreach during GSP development with the assistance of the Tehama County Farm Bureau, the University of California Cooperative Extension, and the Resource Conservation District of Tehama County to reach this group.
    - Domestic well owners: A majority of the residents living within the proposed GSA area use groundwater to fulfill their domestic water needs. The DISTRICT will hold public meetings in several locations throughout the county during the GSP development process to gather input from this demographic. The DISTRICT will work with the Tehama County Environmental Health Department and the Community Action Partnership to assist with outreach to this group.
- **Municipal well operators:** The Cities of Corning, Red Bluff, and Tehama will have representatives on both the Groundwater Commission and the TAC. These three cities and their constituents are also directly represented by their Board of Directors members whose Supervisorial Districts overlay each city's jurisdictions. All three cities will have the opportunity to participate in the GSP development and in future actions taken by the Groundwater Commission.
- **Public water systems:** The DISTRICT provided courtesy notice of their intention to serve as the GSA to the Public Water Systems listed above, and will continue to communicate with and solicit feedback from these agencies as the GSP is developed.
- **Local land use planning agencies:**
    - Butte County: The proposed GSA boundary would split the Vina Subbasin which extends into Butte County. The DISTRICT has met with the Butte County Department of Water and Resource Conservation (BCDWRC), which is the agency most likely to become the GSA for the portion of the Vina Subbasin which lies outside Tehama County. The DISTRICT has coordinated with BCDWRC on

groundwater monitoring activities in the Vina Subbasin over the past 2 decades. Staff from both agencies have agreed to coordinate our efforts on managing the Vina Subbasin through a Memorandum of Understanding (MOU), Coordination Agreement, or similar type document, while each becoming a GSA and submitting a GSP for the portions of the subbasin located within their respective Counties. The District may submit for a Basin Boundary Adjustment to split the subbasin at the county line once DWR releases the regulations on Basin Boundary Adjustments in January 2016.

- Glenn County: The proposed GSA boundary would split both the Colusa and Corning Subbasins which extend into Glenn County. The DISTRICT is planning to submit a Boundary Basin Adjustment to incorporate the small segment of the Colusa Subbasin that lies within Tehama County, into the Corning Subbasin. This 1,300 acre area with 10 individual landowners would get better representation by their local elected officials on the DISTRICT Board, then to be grouped into the large 918,380 acre Colusa Subbasin that spans four counties. The DISTRICT will coordinate with the GSA responsible for the portion of the Colusa subbasin that borders Tehama County. The DISTRICT has met with the Glenn County Department of Agriculture, which is the agency most likely to become the GSA for the portion of the Corning Subbasin which lies outside Tehama County. Staff from both agencies have agreed to coordinate our efforts on managing the Corning Subbasin through a MOU, Coordination Agreement, or similar type document, while each becoming a GSA and submitting a GSP for the portions of the subbasin located within their respective Counties. The DISTRICT may submit for a Basin Boundary Adjustment to split the Corning subbasin at the county line once DWR releases the regulations on Basin Boundary Adjustments in January 2016.
- Shasta County: While Shasta and Tehama Counties do not share any subbasins, the three northern subbasins in Tehama County are part of the Redding Groundwater Basin. The DISTRICT will continue to monitor the GSA development process in Shasta County, and will coordinate with the Groundwater Sustainability Agency(s) that form in subbasins adjacent to Tehama County.
- Other Water and Irrigation Districts outside the GSA boundaries: The DISTRICT provided courtesy notice of their intention to serve as the GSA to the Anderson-Cottonwood Irrigation District and the Glenn-Colusa Irrigation District, and will continue to communicate with and solicit feedback from these neighboring agencies as the GSP is developed.

- **Environmental users of groundwater:** N/A
- **Surface water users, if there is a hydrologic connection between surface and groundwater bodies:** The surface water users listed above were provided courtesy notice of the DISTRICT's intention to serve as the GSA and will be included in the GSP planning process.
- **The federal government, including, but not limited to, the military and managers of federal lands:** NRCS and the Bureau of Land Management (BLM) will be coordinated with during the GSP development process. The BLM owns land in the Northern portion of the County that offers multi-use recreational opportunities. The NRCS works with landowners

throughout the County and helps to implement on farm conservation practices.

- **California Native American Tribes:** The Paskenta Band of Nomlaki Indians have a Reservation located in the Corning Subbasin and were provided a courtesy notice of the DISTRICT's intention to serve as the GSA. They will also be included in the GSP planning process.
- **Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems:** A majority of the communities located within the proposed GSA Boundary are classified as Disadvantaged Communities and a majority of them are served by private domestic wells or small community water systems. The DISTRICT will work with the Tehama County Environmental Health Department and the Community Action Partnership to perform outreach and gather information from these communities to incorporate into the GSP.

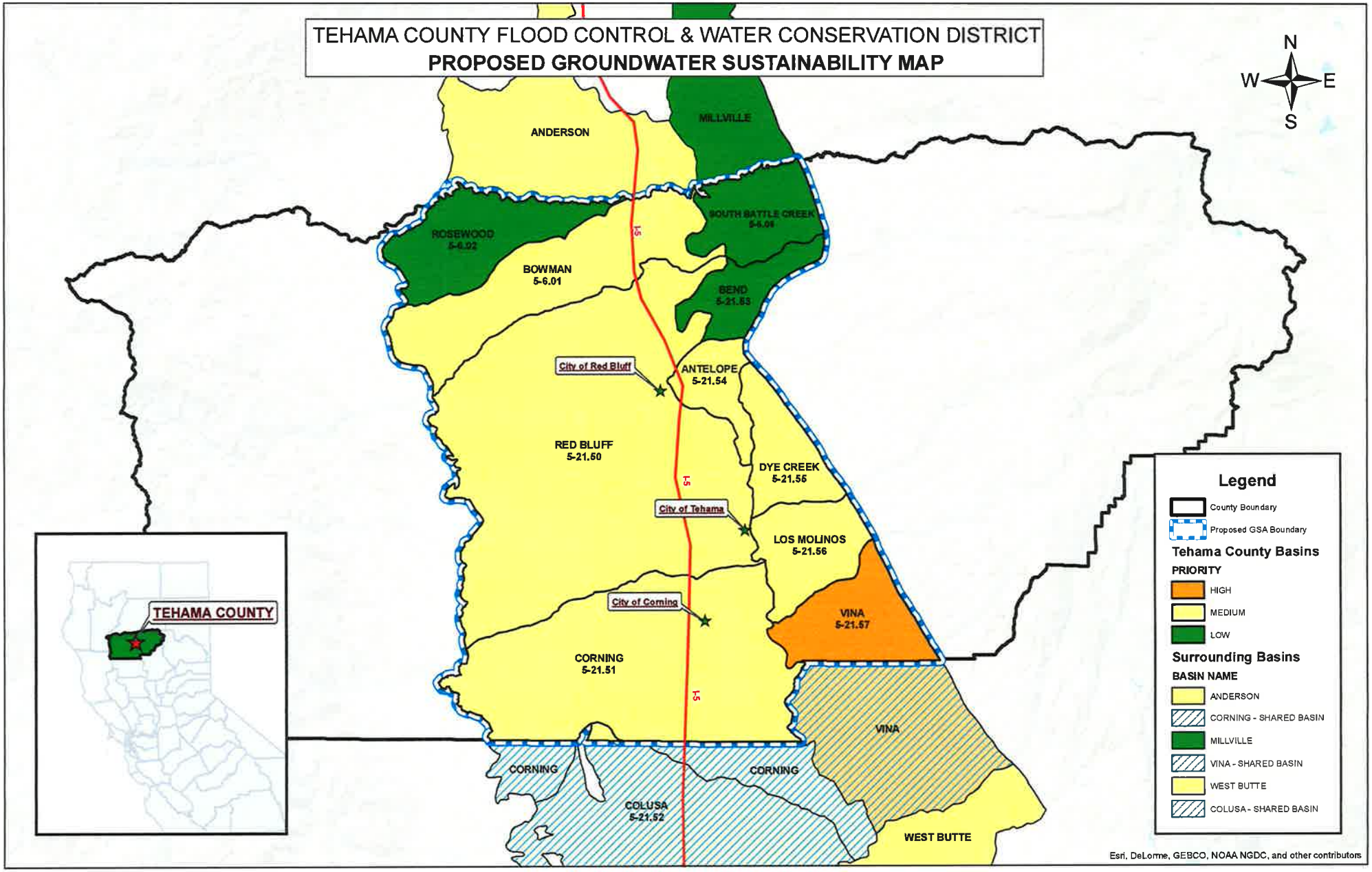
The DISTRICT and other interested stakeholders roles and responsibilities will be further defined in the GSP. The DISTRICT welcomes feedback during this process from the state and any of the agencies or organizations listed herein. If the Department of Water Resources requires anything further prior to the acceptance of this notification of the DISTRICT's election to serve as the GSA for the eleven subbasins or portions of those subbasins located within Tehama County, please contact Ryan Teubert, the Flood Control/Water Resources Manager at (530)-385-1462 x3020 or rteubert@tcpw.ca.gov.

Sincerely,

Gary Antone, Executive Director
Tehama County Flood Control and
Water Conservation District

By_____
Ryan Teubert, Flood Control/Water Resources Manager
Tehama County Flood Control and
Water Conservation District

EXHIBIT A


TEHAMA COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
PROPOSED GROUNDWATER SUSTAINABILITY MAP
N
W
E
S
ANDERSON
MILLVILLE
SOUTH BATTLE CREEK 5-6.04
ROSEWOOD 5-6.02
BOWMAN 5-6.01
BEND 5-21.53
City of Red Bluff
ANTELOPE 5-21.54
RED BLUFF 5-21.50
DYE CREEK 5-21.55
City of Tehama
LOS MOLINOS 5-21.56
City of Corning
VINA 5-21.57
CORNING 5-21.51
VINA
CORNING
CORNING
COLUSA 5-21.52
WEST BUTTE
I-5
TEHAMA COUNTY
Legend
County Boundary
Proposed GSA Boundary
Tehama County Basins
PRIORITY
HIGH
MEDIUM
LOW
Surrounding Basins
BASIN NAME
ANDERSON
CORNING - SHARED BASIN
MILLVILLE
VINA - SHARED BASIN
WEST BUTTE
COLUSA - SHARED BASIN
Esri, DeLorme, GEBCO, NOAA NGDC, and other contributors

RESOLUTION NO. 05-2015

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT ELECTING TO BE THE GROUNDWATER SUSTAINABILITY AGENCY FOR ALL THOSE PORTIONS OF THE ROSEWOOD, BOWMAN, SOUTH BATTLE CREEK, RED BLUFF, BEND, ANTELOPE, DYE CREEK, LOS MOLINOS, CORNING, VINA, AND COLUSA SUBBASINS LOCATED WITHIN TEHAMA COUNTY

WHEREAS, the Legislature has adopted, and the Governor has signed into law, Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act of 2014; and

WHEREAS, the Sustainable Groundwater Management Act of 2014 went into effect on January 1, 2015; and

WHEREAS, the Sustainable Groundwater Management Act of 2014 enables the State Water Resources Control Board to intervene in groundwater basins unless a local public agency or combination of local public agencies form a Groundwater Sustainability Agency or Agencies (GSA) by June 30, 2017; and

WHEREAS, retaining local jurisdiction over water management and land use is essential to sustainably manage groundwater and to the vitality of Tehama County's economy, communities and environment, and

WHEREAS, any local public agency that has water supply, water management or land use responsibilities within a groundwater basin may elect to be the Groundwater Sustainability Agency for that basin; and

WHEREAS, the Tehama County Flood Control and Water Conservation District is a local public agency organized and existing under the Tehama County Flood Control and Water Conservation District Act (Statutes 1957, Chapter 1280; Water Code Appx., ch. 82); and

WHEREAS, under Section 3, subdivision (q) of said Act, the District is responsible for undertaking "any and every lawful act necessary to be done that sufficient water may be available for any present or future beneficial use or uses of lands or inhabitants within the district, including, but not limited to, the acquisition, storage, and distribution for irrigation, domestic, fire protection, municipal, commercial, industrial, recreational, and all other beneficial uses"; and

WHEREAS, under Section 3, subdivision (r) of said Act, the District is further authorized "to prevent interference with or diminution of, or to declare the rights in natural flow of any stream or surface or subterranean supply of waters used or useful for any purpose of the district or of common benefit to the lands within the district or to its inhabitants," and "to prevent unlawful exportation of water from the district," and "to prevent contamination, pollution, or otherwise rendering unfit for beneficial use, the surface or subsurface water used or useful in the district"; and

WHEREAS, the boundary and territory of the District are coextensive with the exterior boundaries of the County of Tehama; and

WHEREAS, the District overlies all those portions of the Rosewood, Bowman, South Battle Creek, Red Bluff, Bend, Antelope, Dye Creek, Los Molinos, Corning, Vina, and Colusa subbasins located within Tehama County; and

WHEREAS, Section 10723.2 of the Sustainable Groundwater Management Act of 2014 requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans; and

WHEREAS, Section 10723.8 of the Sustainable Groundwater Management Act of 2014 requires that a local agency electing to be a GSA notify the Department of Water Resources of its election and its intent to undertake sustainable groundwater management within a basin; and

WHEREAS, the District held a public hearing on this date after publication of notice pursuant to Government Code section 6066 to consider adoption of this Resolution; and

WHEREAS, it would be in the public interest of the people of Tehama County for the District to become the groundwater sustainability agency for all those portions of the Rosewood, Bowman, South Battle Creek, Red Bluff, Bend, Antelope, Dye Creek, Los Molinos, Corning, Vina, and Colusa subbasins located within Tehama County; and

WHEREAS, the District and other local public agencies have a long history of coordination and cooperation on water management; and

WHEREAS, it is the intent of the District to work cooperatively with other local agencies to manage the aforementioned groundwater basins in a sustainable fashion;

NOW, THEREFORE, BE IT RESOLVED, that the Tehama County Flood Control and Water Conservation District hereby elects to become the Groundwater Sustainability Agency for all those portions of the Rosewood (5-06.02), Bowman (5-06.01), South Battle Creek (5-06.06), Red Bluff (5-21.50), Bend (5-21.53), Antelope (5-21.54), Dye Creek (5-21.55), Los Molinos (5-21.56), Corning (5-21.51), Vina (5-21.57), and Colusa (5-21.52) subbasins located within Tehama County.

BE IT FURTHER RESOLVED that the proposed boundaries of the basins that the District intends to manage under the Sustainable Groundwater Management Act of 2014 shall be the entirety of the boundaries for the aforementioned subbasins, as set forth in California Department of Water Resources Bulletin 118 (updated in 2003), that lie within the County of Tehama; provided that the Executive Director is authorized and directed to evaluate whether basin boundaries should be adjusted in a manner that will improve the likelihood of achieving sustainable groundwater management, and communicate the results of that evaluation to the Board of Directors and the Department of Water Resources; and

improve the likelihood of achieving sustainable groundwater management, and communicate the results of that evaluation to the Board of Directors and the Department of Water Resources; and

BE IT FURTHER RESOLVED that within thirty days of the date of this Resolution, the Executive Director is directed to provide notice of this election to the California Department of Water Resources in the manner required by law. Such notification shall include a map of the basins that the District intends to manage under the Sustainable Groundwater Management Act of 2014, a copy of this resolution, a list of interested parties developed pursuant to Section 10723.2 of the Act, and an explanation of how their interests will be considered in the development and operation of the groundwater sustainability agency and the development and implementation of the agency's groundwater sustainability plan.

BE IT FURTHER RESOLVED that the Executive Director and District legal counsel are hereby directed to promptly prepare the appropriate instruments establishing a Groundwater Commission, as set forth in Attachment "1", and present such documents to the Board for adoption.

BE IT FURTHER RESOLVED that the Executive Director shall begin discussions with other local agencies in these basins in order to begin the process of developing groundwater sustainability plans for the basins, or a joint plan with other groundwater sustainability agencies in which the District might join, in consultation and close coordination with other local agencies, as contemplated by the Act.

BE IT FURTHER RESOLVED that the Executive Director directed to report back to the Groundwater Commission and the Board at least quarterly on the progress toward developing the groundwater sustainability plans.

The foregoing resolution was offered on a motion by Director Garton, seconded by Director Williams, and carried by the following vote of the Board:

AYES: Directors Bundy, Carlson, Chamblin, Garton, Williams,

NOES: None

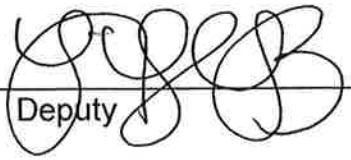
ABSENT OR NOT VOTING: None

CHAIRMAN, Board of Directors

STATE OF CALIFORNIA)
) ss
COUNTY OF TEHAMA)

DATED: This 3rd day of November, 2015.

JENNIFER A. VISE, County Clerk and ex-officio Clerk of the Board of Directors of the Tehama County Flood Control and Water Conservation District, State of California.

By  Deputy

Tehama County Groundwater Sustainability Agency (GSA)

GSA Governing Body - Tehama County Flood Control and Water Conservation District (FCWCD) Board of Directors

1. Final approval authority for GSP and any future amendments, and all GSA ordinances, rules, regulations, and fees.
2. Primary responsibility for funding, resources, and staffing. (Cities/Districts will not be requested to provide or commit funding in order to participate in the Groundwater Commission.)
    - FCWCD will provide staff assistance to Groundwater Commission and Board of Directors throughout the GSP development and implementation process.
    - Where necessary, the Board of Directors will provide additional resources from FCWCD's existing funding or grant opportunities pursued by FCWCD.
    - The Board of Directors will apply for and receive grants to fund GSA activities (with the Commission's recommendation), including responsibility for executing and implementing grant contracts and associated requirements.
    - Further revenue measures, if any, would be reviewed by the Commission prior to adoption by the Board of Directors (and will not be based on GSA participation).
3. Hear and decide appeals (if any) from decisions of the Groundwater Commission on permits, similar entitlements, and enforcement matters.
4. Confirm appointments of the five "Supervisorial District" members of the Groundwater Commission (upon recommendation of the Commission).

Groundwater Commission (Similar to Planning Commission)

1. Develop GSP and any future amendments, and all GSA ordinances, rules, and regulations, including holding public hearings and making final recommendations to Board of Directors.
2. Conduct investigations to determine the need for groundwater management, monitor compliance and enforcement, propose and update fees and making final recommendations to Board of Directors.
3. Review all proposed grant applications, and advise Board of Directors regarding grant funding opportunities.
4. Decision-making authority for permits or similar entitlements issued by the GSA, e.g., well spacing (with appeal).
5. Make quasi-judicial decisions in GSA enforcement matters (with appeal).
6. Membership:
    a. 1- City of Corning (Appointed by City)
    b. 1- City of Red Bluff (Appointed by City)
    c. 1- City of Tehama (Appointed by City)
    d. 1- El Camino Irrigation District (Appointed by District)
    e. 1- Los Molinos Community Services District (Appointed by District)
    f. 1- Rio Alto Water District (Appointed by District)
    g. 5- 1 Representative from each County Supervisorial District
        i. Recommendations to be made by the seated Groundwater Commission members and confirmed by the FCWCD Board of Directors.
        ii. Appointees will be expected to meet certain qualifications:
            - 2 members should represent the interests of surface water agencies or districts;
            - 2 members should represent the interests of private pumpers;
            - 1 member will be an “at large” representative;
            - No agency or district shall be represented by more than 1 member on the Groundwater Commission.

AB3030 Technical Advisory Committee - Provides technical assistance as needed.

EXHIBIT D

City of Corning

794 Third St. Corning, CA 96021 (530) 824-7020 Fax (530) 824-2489

RECEIVED
AUG 17 2015

Ryan Teubert, CFM
Tehama County Flood Control &Water Resource District
9380 San Benito Ave.
Gerber, CA 96035

August 14, 2015

Re: Groundwater Sustainability Agency Governance Structure

Dear Mr. Teubert,

Thank you for appearing at the August 11, 2015 City Council meeting and presenting the information regarding the Sustainability Groundwater Management Act. Your presentation was very well done and informative.

As you know, after your presentation, the consensus of the Corning City Council was to concur with the Governance structure that you had proposed where the Flood and Water Conservation District Board would serve as the Groundwater Sustainability Agency and the cities, including the City of Corning would have seats on the Groundwater Commission.

Please call me if you have any additional questions regarding this matter.

John L. Brewer, AICP
City Manager

EXHIBIT D

CITY OF RED BLUFF

555 Washington Street Red Bluff, California 96080 (530) 527-2605 Fax (530) 529-6878 www.cityofredbluff.org

RECEIVED
OCT 9 2015
TEHAMA COUNTY
PUBLIC WORKS

October 7, 2015

Tehama County Public Works
Attention: Gary Antone
9380 San Benito Avenue
Gerber, CA 96035-9701

RE: County GSA Proposal

Dear Gary:

At its meeting of October 6, 2015, the Red Bluff City Council voted to support designation of the Tehama County Flood Control and Water Conservation District (FCWCD) as the Groundwater Sustainability Agency (GSA) for Tehama County. "Funding, resources, and staffing will be the primary responsibility of FCWCD" as the GSA is created and a Groundwater Sustainability Plan (GSP) is drafted and implemented. (See, 9-29-2015 FCWCD presentation to Red Bluff City Council). Nevertheless, the City will remain actively engaged on this issue to assure that the City's needs and concerns are carefully considered by the FCWCD moving forward. Please provide the undersigned with written advance notice of all meetings of the FCWCD Board, as well as copies of all agendas and back up materials.

Background

The City of Red Bluff is the largest supplier of domestic groundwater in Tehama County. The City supplies water to 4,756 different metered water connections, serving a population of 15,000 residents. The City operates a network of 13 municipal water wells.

The City Water Department was established in 1921 and employs 7 full-time employees (not including management and administrative staff). The Water Department's operating budget for 2015/2016 is approximately $2.1 million. The City extracts, pumps and delivers 1,178,953,000 gallons of groundwater per year.

The City routinely collects data regarding all aspects of the City's water supply and use thereof including water quality monitoring. The City brings the resources of the largest domestic water supplier in the County to the table as an active, participating member of the GSA.

GSA Requirements

"Any local agency or combination of local agencies overlying a groundwater basin may elect to be a groundwater sustainability agency for that basin." (Water Code § 10723(a).) A GSA "*shall* consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans. These interests include [ ] all of the following: [ ] (b) Municipal well operators. (c) Public water systems. (d) Local land use planning agencies. [ ]" (§10723.2)

A notification of intent to form a GSA must include a list of interested parties including municipal well operators, public water systems and local land use planning agencies and "an explanation of how their interests will be considered in the development and operation of the groundwater sustainability agency and the development and implementation of the agency's sustainability plan." (§10723.8(a)(4).) A combination of local agencies may form a groundwater sustainability agency through use of a joint powers agreement or other legal agreement. (§10723.6(a))

The statutory mandate makes clear that the City's interests as the largest supplier of domestic groundwater in the County must be considered. In fact, the notice of intent to form a GSA must explain how the City's interests will be considered in the development and operation of the GSA.

Conclusion

The City looks forward to working cooperatively with the FCWCD to implement the requirements of the Groundwater Sustainability Act.

If you have any comments or questions, please contact me or Bruce Henz.

Very truly yours,

Richard L. Crabtree

cc: City Council
Board of Supervisors
County Counsel

EXHIBIT D

City of Tehama

Incorporated 1908

Post Office Box 70
Tehama, CA 96090
Phone: (530)384-1501
Fax: (530)384-1625

September 10, 2015

Ryan Teubert, CFM
Tehama Co. Flood Control &
Water Resource Manager
9380 San Benito Ave.

At its meeting on September 8, 2015, the Tehama City Council voted to accept the proposal received from you for the Tehama County Groundwater Sustainability Agency (GSA). We appreciate your leadership in bring the various organizations together for this important effort.

Sincerely,

Carolyn Steffan
City Clerk/Administrator

RECEIVED
SEP 14 2015
TEHAMA COUNTY
PUBLIC WORKS

EXHIBIT D

El Camino Irrigation District
8451 Hwy. 99-W
Gerber, CA 96035
530-385-1559
530-385-1503 Fax
ecid1559@att.net

Ryan Teubert, CFM
Tehama County Flood Control & Water Resource Manager

We have read and discussed the Tehama County Groundwater Sustainability Agency proposal.

As the Board for El Camino Irrigation District we are approving the proposal as written and appointing District Manager Mark Weber to the Groundwater Commission.

Mike Gividen-District 1

Kris Lamkin-District 2

Rich Sol-Director 3

Leland Hogan-District 4-Chairman

RECEIVED
SEP 14 2015
TEHAMA COUNTY
PUBLIC WORKS

EXHIBIT D

Rio Alto Water District

22099 River View Drive, Cottonwood, California 96022
Telephone 530-347-3835 • Fax 530-347-1007

RECEIVED
OCT 27 2015

October 22, 2015

Ryan Teubert, CFM
Tehama County Flood Control & Water Conservation District
9380 San Benito Ave.
Gerber, CA 96035

Re: Letter of Support

Dear Ryan:

The Board of Directors of the Rio Alto Water District is in support of Tehama Flood Control & Water Conservation District forming and acting as the Groundwater Sustainability Agency(GSA) for the groundwater basins within Tehama County.

We approve of the proposed governance structure and look forward to participating in the Groundwater Commission. The Board acknowledges that Tehama County Flood Control and Water Conservation District was instrumental in developing a Groundwater Management Plan in compliance with AB3030, and as such are the most qualified candidate to form and act as the GSA. Thank you for taking the lead in this task.

Sincerely,

Martha Slack

Martha Slack
General Manager

NOTICE OF PUBLIC HEARING

NOTICE IS HERBY GIVEN that on November 3, 2015, at 1:30 PM, or soon thereafter as may be heard, in the Board of Supervisors Chambers located at 727 Oak St., Red Bluff, California, the Tehama County Flood Control and Water Conservation District (District) Board of Directors will conduct a public hearing to determine whether to adopt a resolution directing the District to submit a Notice of Intent to the California Department of Water Resources stating that the District will be the Groundwater Sustainability Agency (Agency) for all portions of the eleven (11) Groundwater Subbasins located within Tehama County.

The Sustainable Groundwater Management Act (SGMA) became effective on January 1, 2015 and established a new structure for managing California's groundwater resources at a local level. SGMA mandates that all groundwater basins identified in Bulletin 118 must be managed by a Groundwater Sustainability Agency by June 30, 2017. Each Agency will then develop a Groundwater Sustainability Plan (Plan) by January 30, 2022, which will include measurable objectives and milestones that assist the Agencies in achieving groundwater sustainability within 20 years of Plan adoption.

The District is uniquely qualified to become the Agency for all eleven (11) groundwater basins located within the County due to its current jurisdiction which extends throughout the County, its background in groundwater monitoring and water conservation issues, a Board of Directors which is comprised of elected officials representing the entire County, and additional representation from a technical advisory committee to the Board which is comprised of representatives from Agriculture, Domestic/Industrial Water Providers, Natural Resources, and representatives from the cities of Corning, Red Bluff, and Tehama.

During the June 2, 2015 Public Hearing, staff was directed to work with interested water agencies and incorporate them into the governance structure. As a result, an eleven member groundwater commission comprised of city and district representatives and other stakeholders was proposed. To date, letters of support have been received from City of Corning, City of Red Bluff, City of Tehama and El Camino Irrigation District.

The District will be submitting a Notice of Intent at the November 3, 2015 Public Hearing for the following subbasins or the portions of those subbasins located within the County: Rosewood, Bowman, Red Bluff, Corning, Colusa, Vina, Los Molinos, Dye Creek, Antelope, Bend, and South Battle Creek. For questions or additional information on the Sustainable Groundwater Management Act please contact Ryan Teubert, Tehama County Flood Control/Water Resources Manager, 530-385-1462, ext. 3020 or refer to http://www.water.ca.gov/cagroundwater/.

RESOLUTION NO. 05-2015

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT ELECTING TO BE THE GROUNDWATER SUSTAINABILITY AGENCY FOR ALL THOSE PORTIONS OF THE ROSEWOOD, BOWMAN, SOUTH BATTLE CREEK, RED BLUFF, BEND, ANTELOPE, DYE CREEK, LOS MOLINOS, CORNING, VINA, AND COLUSA SUBBASINS LOCATED WITHIN TEHAMA COUNTY

WHEREAS, the Legislature has adopted, and the Governor has signed into law, Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act of 2014; and

WHEREAS, the Sustainable Groundwater Management Act of 2014 went into effect on January 1, 2015; and

WHEREAS, the Sustainable Groundwater Management Act of 2014 enables the State Water Resources Control Board to intervene in groundwater basins unless a local public agency or combination of local public agencies form a Groundwater Sustainability Agency or Agencies (GSA) by June 30, 2017; and

WHEREAS, retaining local jurisdiction over water management and land use is essential to sustainably manage groundwater and to the vitality of Tehama County's economy, communities and environment, and

WHEREAS, any local public agency that has water supply, water management or land use responsibilities within a groundwater basin may elect to be the Groundwater Sustainability Agency for that basin; and

WHEREAS, the Tehama County Flood Control and Water Conservation District is a local public agency organized and existing under the Tehama County Flood Control and Water Conservation District Act (Statutes 1957, Chapter 1280; Water Code Appx., ch. 82); and

WHEREAS, under Section 3, subdivision (q) of said Act, the District is responsible for undertaking "any and every lawful act necessary to be done that sufficient water may be available for any present or future beneficial use or uses of lands or inhabitants within the district, including, but not limited to, the acquisition, storage, and distribution for irrigation, domestic, fire protection, municipal, commercial, industrial, recreational, and all other beneficial uses"; and

WHEREAS, under Section 3, subdivision (r) of said Act, the District is further authorized "to prevent interference with or diminution of, or to declare the rights in natural flow of any stream or surface or subterranean supply of waters used or useful for any purpose of the district or of common benefit to the lands within the district or to its inhabitants," and "to prevent unlawful exportation of water from the district," and "to prevent contamination, pollution, or otherwise rendering unfit for beneficial use, the surface or subsurface water used or useful in the district"; and

WHEREAS, the boundary and territory of the District are coextensive with the exterior boundaries of the County of Tehama; and

WHEREAS, the District overlies all those portions of the Rosewood, Bowman, South Battle Creek, Red Bluff, Bend, Antelope, Dye Creek, Los Molinos, Corning, Vina, and Colusa subbasins located within Tehama County; and

WHEREAS, Section 10723.2 of the Sustainable Groundwater Management Act of 2014 requires that a GSA consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans; and

WHEREAS, Section 10723.8 of the Sustainable Groundwater Management Act of 2014 requires that a local agency electing to be a GSA notify the Department of Water Resources of its election and its intent to undertake sustainable groundwater management within a basin; and

WHEREAS, the District held a public hearing on this date after publication of notice pursuant to Government Code section 6066 to consider adoption of this Resolution; and

WHEREAS, it would be in the public interest of the people of Tehama County for the District to become the groundwater sustainability agency for all those portions of the Rosewood, Bowman, South Battle Creek, Red Bluff, Bend, Antelope, Dye Creek, Los Molinos, Corning, Vina, and Colusa subbasins located within Tehama County; and

WHEREAS, the District and other local public agencies have a long history of coordination and cooperation on water management; and

WHEREAS, it is the intent of the District to work cooperatively with other local agencies to manage the aforementioned groundwater basins in a sustainable fashion;

NOW, THEREFORE, BE IT RESOLVED, that the Tehama County Flood Control and Water Conservation District hereby elects to become the Groundwater Sustainability Agency for all those portions of the Rosewood (5-06.02), Bowman (5-06.01), South Battle Creek (5-06.06), Red Bluff (5-21.50), Bend (5-21.53), Antelope (5-21.54), Dye Creek (5-21.55), Los Molinos (5-21.56), Corning (5-21.51), Vina (5-21.57), and Colusa (5-21.52) subbasins located within Tehama County.

BE IT FURTHER RESOLVED that the proposed boundaries of the basins that the District intends to manage under the Sustainable Groundwater Management Act of 2014 shall be the entirety of the boundaries for the aforementioned subbasins, as set forth in California Department of Water Resources Bulletin 118 (updated in 2003), that lie within the County of Tehama; provided that the Executive Director is authorized and directed to evaluate whether basin boundaries should be adjusted in a manner that will improve the likelihood of achieving sustainable groundwater management, and communicate the results of that evaluation to the Board of Directors and the Department of Water Resources; and

improve the likelihood of achieving sustainable groundwater management, and communicate the results of that evaluation to the Board of Directors and the Department of Water Resources; and

BE IT FURTHER RESOLVED that within thirty days of the date of this Resolution, the Executive Director is directed to provide notice of this election to the California Department of Water Resources in the manner required by law. Such notification shall include a map of the basins that the District intends to manage under the Sustainable Groundwater Management Act of 2014, a copy of this resolution, a list of interested parties developed pursuant to Section 10723.2 of the Act, and an explanation of how their interests will be considered in the development and operation of the groundwater sustainability agency and the development and implementation of the agency's groundwater sustainability plan.

BE IT FURTHER RESOLVED that the Executive Director and District legal counsel are hereby directed to promptly prepare the appropriate instruments establishing a Groundwater Commission, as set forth in Attachment "1", and present such documents to the Board for adoption.

BE IT FURTHER RESOLVED that the Executive Director shall begin discussions with other local agencies in these basins in order to begin the process of developing groundwater sustainability plans for the basins, or a joint plan with other groundwater sustainability agencies in which the District might join, in consultation and close coordination with other local agencies, as contemplated by the Act.

BE IT FURTHER RESOLVED that the Executive Director directed to report back to the Groundwater Commission and the Board at least quarterly on the progress toward developing the groundwater sustainability plans.

The foregoing resolution was offered on a motion by Director Garton, seconded by Director Williams, and carried by the following vote of the Board:

AYES: Directors Bundy, Carlson, Chamblin, Garton, Williams,

NOES: None

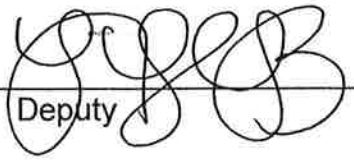
ABSENT OR NOT VOTING: None

CHAIRMAN, Board of Directors

STATE OF CALIFORNIA)
) ss
COUNTY OF TEHAMA)

DATED: This 3rd day of November, 2015.

JENNIFER A. VISE, County Clerk and ex-officio Clerk of the Board of Directors of the Tehama County Flood Control and Water Conservation District, State of California.

By 
Deputy

NOTICE OF PUBLIC HEARING

NOTICE IS HERBY GIVEN that on June 2 2015, at 1:30 PM, or soon thereafter as may be heard, in the Board of Supervisors Chambers located at 727 Oak St., Red Bluff, California, the Tehama County Flood Control and Water Conservation District (District) Board of Directors will conduct a public hearing to determine whether to adopt a resolution directing the District to submit a Notice of Intent to the California Department of Water Resources stating that the District will be the Groundwater Sustainability Agency (Agency) for all portions of the eleven (11) Groundwater Subbasins located within Tehama County.

The Sustainable Groundwater Management Act (SGMA) became effective on January 1, 2015 and established a new structure for managing California's groundwater resources at a local level. SGMA mandates that all groundwater basins identified in Bulletin 118 must be managed by a Groundwater Sustainability Agency by June 30, 2017. Each Agency will then develop a Groundwater Sustainability Plan (Plan) by January 30, 2022, which will include measurable objectives and milestones that assist the Agencies in achieving groundwater sustainability within 20 years of Plan adoption.

The District is uniquely qualified to become the Agency for all eleven (11) groundwater basins located within the County due to its current jurisdiction which extends throughout the County, its background in groundwater monitoring and water conservation issues, a Board of Directors which is comprised of elected officials representing the entire County, and additional representation from a technical advisory committee to the Board which is comprised of representatives from Agriculture, Domestic/Industrial Water Providers, Natural Resources, and representatives from the cities of Corning, Red Bluff, and Tehama.

The District will be submitting a Notice of Intent at the June 2, 2015 Public Hearing for the following subbasins or the portions of those subbasins located within the County: Rosewood, Bowman, Red Bluff, Corning, Colusa, Vina, Los Molinos, Dye Creek, Antelope, Bend, and South Battle Creek. For questions or additional information on the Sustainable Groundwater Management Act please contact Ryan Teubert, Tehama County Flood Control/Water Resources Manager, 530-385-1462, ext. 3020 or refer to http://www.water.ca.gov/cagroundwater/.

NOTICE OF PUBLIC HEARING

NOTICE IS HERBY GIVEN that on November 3, 2015, at 1:30 PM, or soon thereafter as may be heard, in the Board of Supervisors Chambers located at 727 Oak St., Red Bluff, California, the Tehama County Flood Control and Water Conservation District (District) Board of Directors will conduct a public hearing to determine whether to adopt a resolution directing the District to submit a Notice of Intent to the California Department of Water Resources stating that the District will be the Groundwater Sustainability Agency (Agency) for all portions of the eleven (11) Groundwater Subbasins located within Tehama County.

The Sustainable Groundwater Management Act (SGMA) became effective on January 1, 2015 and established a new structure for managing California's groundwater resources at a local level. SGMA mandates that all groundwater basins identified in Bulletin 118 must be managed by a Groundwater Sustainability Agency by June 30, 2017. Each Agency will then develop a Groundwater Sustainability Plan (Plan) by January 30, 2022, which will include measurable objectives and milestones that assist the Agencies in achieving groundwater sustainability within 20 years of Plan adoption.

The District is uniquely qualified to become the Agency for all eleven (11) groundwater basins located within the County due to its current jurisdiction which extends throughout the County, its background in groundwater monitoring and water conservation issues, a Board of Directors which is comprised of elected officials representing the entire County, and additional representation from a technical advisory committee to the Board which is comprised of representatives from Agriculture, Domestic/Industrial Water Providers, Natural Resources, and representatives from the cities of Corning, Red Bluff, and Tehama.

During the June 2, 2015 Public Hearing, staff was directed to work with interested water agencies and incorporate them into the governance structure. As a result, an eleven member groundwater commission comprised of city and district representatives and other stakeholders was proposed. To date, letters of support have been received from City of Corning, City of Red Bluff, City of Tehama and El Camino Irrigation District.

The District will be submitting a Notice of Intent at the November 3, 2015 Public Hearing for the following subbasins or the portions of those subbasins located within the County: Rosewood, Bowman, Red Bluff, Corning, Colusa, Vina, Los Molinos, Dye Creek, Antelope, Bend, and South Battle Creek. For questions or additional information on the Sustainable Groundwater Management Act please contact Ryan Teubert, Tehama County Flood Control/Water Resources Manager, 530-385-1462, ext. 3020 or refer to http://www.water.ca.gov/cagroundwater/.

ORDINANCE NO. 2016-1

AN ORDINANCE OF THE TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT BOARD OF DIRECTORS ESTABLISHING THE TEHAMA COUNTY GROUNDWATER COMMISSION

THE BOARD OF DIRECTORS OF THE TEHAMA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT ORDAINS AS FOLLOWS:

SECTION 1. Purpose and Authority. The purpose of this ordinance is to establish a broadly representative Commission with both decision-making and advisory responsibilities pertaining to groundwater management in the eleven subbasins or portions thereof for which the Tehama County Flood Control and Water Conservation District has been designated as the Groundwater Sustainability Agency under the Sustainable Groundwater Management Act. This ordinance is enacted pursuant to Water Code section 10752.2 and Sections 3, 8, and 11 of the Tehama County Flood Control and Water Conservation District Act (Statutes 1957, Chapter 1280; Water Code Appx., ch. 82).

SECTION 2. Creation. There is hereby created the Tehama County Groundwater Commission, which shall have the powers and duties set forth in this ordinance relating to groundwater management in every subbasin or portion thereof for which the Tehama County Flood Control and Water Conservation District has been designated as the Groundwater Sustainability Agency under the Sustainable Groundwater Management Act.

SECTION 3. Membership. The Commission shall consist of eleven members as set forth in this Section.

(a) The following members shall serve at the pleasure of their respective appointing authority:

(1) One member appointed by the City Council of the City of Red Bluff.

(2) One member appointed by the City Council of the City of Corning.

(3) One member appointed by the City Council of the City of Tehama.

(4) One member appointed by the Board of Directors of the El Camino Irrigation District.

(5) One member appointed by the Board of Directors of the Los Molinos Community Services District.

(6) One member appointed by the Board of Directors of the Rio Alto Water District.

(b) Five members shall be appointed by the Board of Directors of the Tehama County Flood Control and Water Conservation District, upon recommendation of the majority of the members of the Commission then appointed and serving. The term of office of such Commissioners shall be four years, except that the initial members appointed under this subdivision shall classify themselves by lot, with one member serving a term of one year, one member serving a term of two years, one member serving a term of three years, and two

members serving a term of four years, so that the Commissioners' terms are evenly staggered. Thereafter all members shall be appointed for the full term of four years. Notwithstanding the foregoing, any member appointed under this subdivision may be removed by a four-fifths vote of the Board of Directors after consultation with the Commission.

(c) The Commission and Board of Directors shall take into consideration all of the following criteria when recommending and appointing members under subdivision (b). These criteria are neither exclusive nor mandatory, and the Board of Directors may deviate from these criteria upon recommendation of the Commission for good cause.

(1) One member should be a resident, property owner, or groundwater user within Tehama County Supervisorial District One.

(2) One member should be a resident, property owner, or groundwater user within Tehama County Supervisorial District Two.

(3) One member should be a resident, property owner, or groundwater user within Tehama County Supervisorial District Three.

(4) One member should be a resident, property owner, or groundwater user within Tehama County Supervisorial District Four.

(5) One member should be a resident, property owner, or groundwater user within Tehama County Supervisorial District Five.

(6) Two members should represent the interests of agencies or districts that supply surface water.

(7) Two members should represent the interests of private groundwater pumpers.

(8) One member should represent the interests of the general public.

(9) No two members should be officers, employees, or agents of the same agency, district, or public or private corporation.

(d) All Commission members shall exercise their independent judgment on behalf of the interests of the residents, property owners, and the public as a whole in furthering the purposes and intent of this ordinance.

SECTION 4. Powers and Duties of the Commission. The Commission shall have the following powers and duties relating to sustainable groundwater management:

(a) Groundwater Sustainability Plan and Regulations. The Commission shall oversee the development of a Groundwater Sustainability Plan pursuant to Water Code sections 10727 et seq., and any amendments thereto, and any implementing rules and regulations of the District. The Commission shall make a written recommendation to the Board of Directors on the adoption or amendment of a Groundwater Sustainability Plan or any implementing rule or regulation of the District. A recommendation for approval shall be made by the affirmative vote of not less than a majority of the total membership of the Commission. The Commission shall hold at least one public hearing before approving a recommendation on

the adoption or amendment of a Groundwater Sustainability Plan or any implementing rule or regulation of the District.

(b) Investigations. The Commission shall conduct investigations to determine the need for groundwater management, monitor compliance and enforcement, or propose or update fees or other revenue measures, and make recommendations to Board of Directors thereon.

(c) Grants. The Commission shall review all proposed District grant applications relating to groundwater management, and advise the Board of Directors regarding grant funding opportunities.

(d) Legislative Intent – Permits. In the event that the District establishes any discretionary permitting or similar regulations relating to sustainable groundwater management, it is the intent of the Board of Directors to provide for such permits to be issued by the Commission, subject to appeal to the Board of Directors.

(e) Legislative Intent – Enforcement. In the event that the District establishes an administrative enforcement hearing process pursuant to Water Code section 10732, subdivision (b)(2), it is the intent of the Board of Directors to provide for such enforcement hearings to be conducted and decisions rendered by the Commission, subject to appeal to the Board of Directors.

(f) Ongoing Advisory Functions. The Commission shall provide ongoing advice to Board of Directors regarding any other matters relevant to the management in groundwater in Tehama County.

SECTION 5. Meetings. The Commission shall establish a regular meeting schedule in accordance with the Ralph M. Brown Act, which shall provide for at least one meeting in every ninety-day period.

SECTION 6. Bylaws. The Commission shall, subject to the approval of the Board of Directors, adopt their own bylaws and rules of order, and shall select their own officers.

SECTION 7. Compensation and Travel Expenses. The members of the Commission shall receive as compensation the sum of twenty-five dollars each for their attendance at each meeting or special meeting, not to exceed fifty dollars each per month. In addition thereto, each member shall be allowed reasonable travel expenses as provided by the Tehama County Travel Policy for official travel approved by the Commission, provided that appropriations therefor have been included in the District budget.

SECTION 8. This ordinance shall take effect thirty (30) days from the date of its adoption, and prior to the expiration of fifteen (15) days from the adoption thereof shall be published at least one time in the *Red Bluff Daily News*, a newspaper of general circulation in Tehama County.

The foregoing ordinance was duly passed and adopted by the Board of Directors of the Tehama County Flood Control and Water Conservation District, State of California, at a regular meeting of the Board of Directors on the 7th day of June, 2016 by the following vote:

AYES: Directors Burt Bundy, Dennis Garton, Candy Carlson, Steve Chamblin and Robert Williams

NOES: None

ABSENT OR NOT VOTING: None

CHAIRMAN, Board of Directors

STATE OF CALIFORNIA)
) ss
COUNTY OF TEHAMA)

I, JENNIFER A. VISE, County Clerk and ex-officio Clerk of the Board of Directors of the Tehama County Flood Control and Water Conservation District, State of California, hereby certify the above and foregoing to be a full, true and correct copy of an ordinance adopted by said Board of Directors on the 7th day of June, 2016.

DATED: This 9th day of June, 2016.

JENNIFER A. VISE, County Clerk and ex-officio Clerk of the Board of Directors of the Tehama County Flood Control and Water Conservation District, State of California.

By_____
Deputy

City of Corning

794 Third St. Corning, CA 96021 (530) 824-7020 Fax (530) 824-2489

RECEIVED
AUG 17 2015

Ryan Teubert, CFM
Tehama County Flood Control &Water Resource District
9380 San Benito Ave.
Gerber, CA 96035

August 14, 2015

Re: Groundwater Sustainability Agency Governance Structure

Dear Mr. Teubert,

Thank you for appearing at the August 11, 2015 City Council meeting and presenting the information regarding the Sustainability Groundwater Management Act. Your presentation was very well done and informative.

As you know, after your presentation, the consensus of the Corning City Council was to concur with the Governance structure that you had proposed where the Flood and Water Conservation District Board would serve as the Groundwater Sustainability Agency and the cities, including the City of Corning would have seats on the Groundwater Commission.

Please call me if you have any additional questions regarding this matter.

John L. Brewer, AICP
City Manager

CITY OF RED BLUFF

555 Washington Street Red Bluff, California 96080 (530) 527-2605 Fax (530) 529-6878 www.cityofredbluff.org

RECEIVED
OCT 9 2015
TEHAMA COUNTY
PUBLIC WORKS

October 7, 2015

Tehama County Public Works
Attention: Gary Antone
9380 San Benito Avenue
Gerber, CA 96035-9701

RE: County GSA Proposal

Dear Gary:

At its meeting of October 6, 2015, the Red Bluff City Council voted to support designation of the Tehama County Flood Control and Water Conservation District (FCWCD) as the Groundwater Sustainability Agency (GSA) for Tehama County. "Funding, resources, and staffing will be the primary responsibility of FCWCD" as the GSA is created and a Groundwater Sustainability Plan (GSP) is drafted and implemented. (See, 9-29-2015 FCWCD presentation to Red Bluff City Council). Nevertheless, the City will remain actively engaged on this issue to assure that the City's needs and concerns are carefully considered by the FCWCD moving forward. Please provide the undersigned with written advance notice of all meetings of the FCWCD Board, as well as copies of all agendas and back up materials.

Background

The City of Red Bluff is the largest supplier of domestic groundwater in Tehama County. The City supplies water to 4,756 different metered water connections, serving a population of 15,000 residents. The City operates a network of 13 municipal water wells.

The City Water Department was established in 1921 and employs 7 full-time employees (not including management and administrative staff). The Water Department's operating budget for 2015/2016 is approximately $2.1 million. The City extracts, pumps and delivers 1,178,953,000 gallons of groundwater per year.

The City routinely collects data regarding all aspects of the City's water supply and use thereof including water quality monitoring. The City brings the resources of the largest domestic water supplier in the County to the table as an active, participating member of the GSA.

GSA Requirements

"Any local agency or combination of local agencies overlying a groundwater basin may elect to be a groundwater sustainability agency for that basin." (Water Code § 10723(a).) A GSA "*shall* consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans. These interests include [ ] all of the following: [ ] (b) Municipal well operators. (c) Public water systems. (d) Local land use planning agencies. [ ]" (§10723.2)

A notification of intent to form a GSA must include a list of interested parties including municipal well operators, public water systems and local land use planning agencies and "an explanation of how their interests will be considered in the development and operation of the groundwater sustainability agency and the development and implementation of the agency's sustainability plan." (§10723.8(a)(4).) A combination of local agencies may form a groundwater sustainability agency through use of a joint powers agreement or other legal agreement. (§10723.6(a))

The statutory mandate makes clear that the City's interests as the largest supplier of domestic groundwater in the County must be considered. In fact, the notice of intent to form a GSA must explain how the City's interests will be considered in the development and operation of the GSA.

Conclusion

The City looks forward to working cooperatively with the FCWCD to implement the requirements of the Groundwater Sustainability Act.

If you have any comments or questions, please contact me or Bruce Henz.

Very truly yours,

Richard L. Crabtree

cc: City Council
Board of Supervisors
County Counsel

City of Tehama

Incorporated 1906

Post Office Box 70
Tehama, CA 96090
Phone: (530)384-1501
Fax: (530)384-1625

September 10, 2015

Ryan Teubert, CFM
Tehama Co. Flood Control &
Water Resource Manager
9380 San Benito Ave.

At its meeting on September 8, 2015, the Tehama City Council voted to accept the proposal received from you for the Tehama County Groundwater Sustainability Agency (GSA). We appreciate your leadership in bring the various organizations together for this important effort.

Sincerely,

Carolyn Steffan
City Clerk/Administrator

RECEIVED
SEP 14 2015
TEHAMA COUNTY
PUBLIC WORKS

El Camino Irrigation District
8451 Hwy. 99-W
Gerber, CA 96035
530-385-1559
530-385-1503 Fax
ecid1559@att.net

Ryan Teubert, CFM
Tehama County Flood Control & Water Resource Manager

We have read and discussed the Tehama County Groundwater Sustainability Agency proposal.

As the Board for El Camino Irrigation District we are approving the proposal as written and appointing District Manager Mark Weber to the Groundwater Commission.

Mike Gividen-District 1

Kris Lamkin-District 2

Rich Sol-Director 3

Leland Hogan-District 4-Chairman

RECEIVED
SEP 14 2015
TEHAMA COUNTY
PUBLIC WORKS

GERBER LAS FLORES Community Services District

Mike Murphy –General Manager
331 San Benito Avenue
Gerber, CA 96035

Telephone (530) 385-1904
FAX (530) 385-2763

October 1, 2015

Mr. Burt Bundy

727 Oak Street, Red Bluff, CA 96080

RE: Groundwater Sustainability Agency

Burt,

As chairman of the Gerber/Las Flores Community Service District, it has come to my attention our Community Service District shall be represented by you and not an appointed GSA individual from the Gerber District. In order to keep us informed over the next few years of the GSA's plan, and the impact it may have on our community, I am inviting you to attend some of our future board meetings as the GSA commission moves forward. .

Please let myself or Mike Murphy (General Manager) know when you are available to attend our public meetings and provide our members with periodic updates. Our regular board meetings are scheduled on the third Thursday of each month beginning at 5:30 pm. We look forward to staying aligned with Tehama County's GSA's plan, since the North State's critical groundwater levels should be everyone's concern.

Sincerely,

Shannon O. Patterson, Chairman GLFCSD

Cc: Mike Murphy, Gen. Manager GLFCSD

RECEIVED
OCT 1 3 2015
TEHAMA
PUBLIC

LOS MOLINOS COMMUNITY SERVICES DISTRCT

PRESIDENT
Loren Gehrung

VICE-PRESIDENT
Todd Hamer

DIRECTORS
Jodi Henderson
Steve Alexander
Tom Ware

SECRETARY
James Lowden

December 18, 2015

Ryan Teubert, CFM
Tehama County Flood Control & Water Conservation District
9380 San Benito Ave.
Gerber, CA 96035

RECEIVED
DEC 22 2015
TEHAMA COUNTY
PUBLIC WORKS

Re: Letter of Support

Dear Ryan:

The Board of Directors of the Los Molinos Community Services District is in support of the Tehama County Flood Control and Water Conservation District forming and acting as the Groundwater Sustainability Agency (GSA) for the groundwater basins located within Tehama County.

We approve of the proposed governance structure and look forward to participating in the Groundwater Commission. Having served several terms on the AB3030 Technical Advisory Committee I am aware of and acknowledge that the Tehama County Flood Control and Water Conservation District was instrumental in developing and implementing a Groundwater Management Plan in compliance with AB3030, and as such are the most qualified candidate to form and act as the GSA.

Sincerely,

James G Lowden

James G. Lowden
General Manager

P.O. Box 9, Los Molinos, CA 96055
530-384-2737 FAX 530-384-9835

Rio Alto Water District

22099 River View Drive, Cottonwood, California 96022
Telephone 530-347-3835 • Fax 530-347-1007

RECEIVED
OCT 27 2015
TEHAMA COUNTY
PUBLIC WORKS

October 22, 2015

Ryan Teubert, CFM
Tehama County Flood Control & Water Conservation District
9380 San Benito Ave.
Gerber, CA 96035

Re: Letter of Support

Dear Ryan:

The Board of Directors of the Rio Alto Water District is in support of Tehama Flood Control & Water Conservation District forming and acting as the Groundwater Sustainability Agency(GSA) for the groundwater basins within Tehama County.

We approve of the proposed governance structure and look forward to participating in the Groundwater Commission. The Board acknowledges that Tehama County Flood Control and Water Conservation District was instrumental in developing a Groundwater Management Plan in compliance with AB3030, and as such are the most qualified candidate to form and act as the GSA. Thank you for taking the lead in this task.

Sincerely,

Martha Slack

Martha Slack
General Manager

Appendix 1-C

SGMA Glossary

GLOSSARY

This Glossary includes terms from a variety of legal and administrative sources relevant to SGMA and GSP development. These sources include:

- California Water Code Section 10721, Sustainable Groundwater Management Definitions **(CWC Section 10721)**
- California Code of Regulations Title 23 Section 341, Groundwater Basin Boundaries Definitions **(23 CCR Section 341)**
- California Code of Regulations Title 23 Section 351, Groundwater Sustainability Plan Definitions **(23 CCR Section 351)**
- DWR Bulletin 118 Definitions, updated 2003 **(B118, 2003)**
- Locally defined terms used in the GSP

The source of each term is provided in the citation following that term. Page numbers are included when a definition is not found in the referenced document's definitions or glossary. Additional information regarding each source are summarized at the end of this glossary.

Adjudication Action. The action filed in the superior or federal district court to determine the rights to extract groundwater from a basin or store water within a basin, including, but not limited to, actions to quiet title respecting rights to extract or store groundwater or an action brought to impose a physical solution on a basin. **(CWC Section 10721)**

***Administrative Adjustment*.** The basin or subbasin boundary adjustment by the Department that either (1) amends existing basin or subbasin boundary data files to accurately reflect an unambiguous written basin or subbasin boundary description as defined in Bulletin 118 or amended pursuant to this Part, or (2) restates the description of a basin or subbasin boundary to more precisely reflect a mapped basin or subbasin boundary consistent with the original description. **(B118, 2003)**

***Agency*.** The groundwater sustainability agency as defined in the Act. **(23 CCR Section 351)**

Agricultural Water Management Plan. The plan adopted pursuant to the Agricultural Water Management Planning Act as described in Part 2.8 of Division 6 of the Water Code, commencing with Section 10800 et seq. **(23 CCR Section 351)**

***Alternative*.** The alternative to a Plan described in Water Code Section 10733.6. **(23 CCR Section 351)**

Annual Report. The report required by Water Code §10728. **(23 CCR Section 351)**

Aquifer. The three-dimensional body of porous and permeable sediment or sedimentary rock that contains sufficient saturated material to yield significant quantities of groundwater to wells and springs, as further defined or characterized in Bulletin 118. **(B118, 2003)**

Baseline or Baseline Conditions. The historical information used to project future conditions for hydrology, water demand, and availability of surface water and to evaluate potential sustainable management practices of a basin. **(23 CCR Section 351)**

Basin Setting. The information about the physical setting, characteristics, and current conditions of the basin as described by the Agency in the hydrogeologic conceptual model, the groundwater conditions,

and the water budget, pursuant to Sub article 2 of Article 5. **(23 CCR Section 351)**

Basin. Defined in the Sustainable Groundwater Management Act as a groundwater basin or subbasin identified and defined in Bulletin 118. Unless the context indicates otherwise, those terms are further defined as follows: (1) The term ***basin*** shall refer to an area specifically defined as a basin or ***groundwater basin*** in Bulletin 118, and shall refer generally to an aquifer or stacked series of aquifers with reasonably well-defined boundaries in a lateral direction, based on features that significantly impede groundwater flow, and a definable bottom, as further defined or characterized in Bulletin 118. (2) The term ***subbasin*** shall refer to an area specifically defined as a subbasin or ***groundwater subbasin*** in Bulletin 118 and shall refer generally to any subdivision of a basin based on geologic and hydrologic barriers or institutional boundaries, as further described or defined in Bulletin 118. **(B118, 2003)**

Basin. The groundwater basin or subbasin identified and defined in Bulletin 118 or as modified pursuant to Water Code 10722 et seq. **(23 CCR Section 351)**

Beneficial Use. Water in Bulletin 118 references 23 categories of water uses identified by the State Water Resource Control Board. **(B118, 2003)**

Best Available Science*.* The use of sufficient and credible information and data, specific to the decision being made and the time frame available for making that decision, that is consistent with scientific and engineering professional standards of practice. **(23 CCR Section 351)**

Best Management Practice*.* The practice, or combination of practices, that are designed to achieve sustainable groundwater management and have been determined to be technologically and economically effective, practicable, and based on best available science. §351. **(23 CCR Section 351)**

Board**.** The State Water Resources Control Board. **(23 CCR Section 351)**

Bulletin 118*.* The department's report entitled "California's Groundwater: Bulletin 118" updated in 2003, as it may be subsequently updated or revised in accordance with § 12924. **(CWC Section 10721)**

CASGEM. The California Statewide Groundwater Elevation Monitoring Program developed by the Department pursuant to Water Code Section 10920 et seq., or as amended. **(23 CCR Section 351)**

Condition of Long-Term Overdraft*.* The condition of a groundwater basin where the average annual amount of water extracted for a long-term period, generally 10 years or more, exceeds the long-term average annual supply of water to the basin, plus any temporary surplus. Overdraft during a period of drought is not sufficient to establish a condition of long-term overdraft if extractions and recharge are managed as necessary to ensure that reductions in groundwater levels or storage during a period of drought are offset by increases in groundwater levels or storage during other periods. **(CWC Section 10721)**

Coordination Agreement. The legal agreement adopted between two or more groundwater sustainability agencies that provides the basis for coordinating multiple agencies or groundwater sustainability plans within a basin pursuant to this part. **(CWC Section 10721)**

Data Gap*.* The lack of information that significantly affects the understanding of the basin setting or evaluation of the efficacy of Plan implementation and could limit the ability to assess whether a basin is

being sustainably managed. **(23 CCR Section 351)**

Existing Stored Groundwater. Groundwater that is already underground from centuries of accumulated native groundwater. Historic pumping has been diminishing the existing stored groundwater at rates greater than the native groundwater can sustain, causing overdraft and unsustainable conditions. If more water is pumped from a basin than what is added from Native Groundwater and Introduced Groundwater, this water comes from the Existing Stored Groundwater. Continuing to use this previously stored groundwater will continue to exacerbate overdraft conditions. Temporarily using some of this water during the transition to sustainability will likely continue to cause lowering of groundwater levels.

***Groundwater Dependent Ecosystem*.** The ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface. **(23 CCR Section 351)**

Groundwater Flow. The volume and direction of groundwater movement into, out of, or throughout a basin. **(23 CCR Section 351)**

Groundwater in Storage. The quantity of water in the zone of saturation. **(B118, 2003)**

Groundwater Overdraft. The condition of a groundwater basin in which the amount of water withdrawn by pumping exceeds the amount of water that recharges the basin over a period of years during which water supply conditions approximate average conditions. **(B118, 2003)**

Groundwater Recharge or Recharge. The augmentation of groundwater by natural or artificial means. **(CWC Section 10721)**

Groundwater Storage Capacity. The volume of void space that can be occupied by water in a given volume of a formation, aquifer, or groundwater basin. **(B118, 2003)**

Groundwater Sustainability Agency*.** One or more local agencies that implement the provisions of this part. For purposes of imposing fees pursuant to Chapter 8 (commencing with Section 10730) or taking action to enforce a groundwater sustainability plan, ***Groundwater Sustainability Agency also means each local agency comprising the groundwater sustainability agency if the plan authorizes separate agency action. **(CWC Section 10721)**

Groundwater. Water beneath the surface of the earth within the zone below the water table in which the soil is completely saturated with water but does not include water that flows in known and definite channels. **(CWC Section 10721)**

Hydrogeologic Conceptual Model. The description of the geologic and hydrologic framework governing the occurrence of groundwater and its flow through and across the boundaries of a basin and the general groundwater conditions in a basin or subbasin. **(23 CCR Section 341)**

Interconnected Surface Water. The surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted. **(23 CCR Section 351)**

***Interested Parties*.** The persons and entities on the list of interested persons established by the Agency

pursuant to Water Code Section 10723.4. **(23 CCR Section 351)**

Interim Milestone. The target value representing measurable groundwater conditions, in increments of five years, set by an Agency as part of a Plan. **(23 CCR Section 351)**

Introduced Groundwater. Water that is added to the sustainable yield of groundwater supply derived from percolation of imported surface water. This can be the directly through groundwater replenishment projects or groundwater banking or can be indirectly through percolation from irrigation and unlined canals.

Management Area. The area within a basin for which the Plan may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors. **(23 CCR Section 351)**

Measurable Objectives. The specific, quantifiable goals for the maintenance or improvement of specified groundwater conditions that have been included in an adopted Plan to achieve the sustainability goal for the basin. **(23 CCR Section 351)**

Minimum Threshold. The numeric value for each sustainability indicator used to define undesirable results. **(23 CCR Section 351)**

***Monitoring Protocols*.** Designed to detect changes in groundwater levels, groundwater quality, inelastic surface subsidence for basins for which subsidence has been identified as a potential problem, and flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin. The monitoring protocols shall be designed to generate information that promotes efficient and effective groundwater management. §10727.2. Required Plan Elements. **(CWC Section 10721)**

NAD83. The North American Datum of 1983 computed by the National Geodetic Survey, or as modified.

Native Groundwater. Water naturally infiltrating into the groundwater from precipitation and runoff. This is the average quantity of water annually added to the groundwater budget from rain, rivers, and streams, and reflects the portion of estimated sustainable yield of the groundwater supply that is not derived from imported surface water.

NAVD88. The North American Vertical Datum of 1988 computed by the National Geodetic Survey, or as modified. **(23 CCR Section 351)**

***Plain Language*.** The language that the intended audience can readily understand and use because that language is concise, well-organized, uses simple vocabulary, avoids excessive acronyms and technical language, and follows other best practices of plain language writing. **(23 CCR Section 351)**

Plan Implementation. The Agency's exercise of the powers and authorities described in the Act, which commences after an Agency adopts and submits a Plan or Alternative to the Department and begins exercising such powers and authorities. **(23 CCR Section 351)**

***Plan Manager*.** An employee or authorized representative of an Agency, or Agencies, appointed through a coordination agreement or other agreement, who has been delegated management authority for

submitting the Plan and serving as the point of contact between the Agency and the Department. **(23 CCR Section 351)**

***Plan*.** The groundwater sustainability plan as defined in the Act. **(23 CCR Section 351)**

Planning and Implementation Horizon. The 50-year time period over which a groundwater sustainability agency determines that plans and measures will be implemented in a basin to ensure that the basin is operated within its sustainable yield. **(CWC Section 10721)**

Principal Aquifers. The aquifers or aquifer systems that store, transmit, and yield significant or economic quantities of groundwater to wells, springs, or surface water systems. **(23 CCR Section 351)**

Qualified Map*.* The geologic map of a scale no smaller than 1:250,000 that is published by the U. S. Geological Survey or the California Geological Survey, or is a map published as part of a geologic investigation conducted by a state or federal agency, or is a geologic map prepared and signed by a Professional Geologist that is acceptable to the Department. **(23 CCR Section 341)**

Recharge Area. The area that supplies water to an aquifer in a groundwater basin. **(CWC Section 10721)**

Reference Point. The permanent, stationary and readily identifiable mark or point on a well, such as the top of casing, from which groundwater level measurements are taken, or other monitoring site. **(23 CCR Section 351)**

Representative Monitoring*.* The monitoring site within a broader network of sites that typifies one or more conditions within the basin or an area of the basin. **(23 CCR Section 351)**

Safe Yield. The maximum quantity of water that can be continuously withdrawn from a groundwater basin without adverse effect. **(B118, 2003)**

Saturated Zone. The zone in which all interconnected openings are filled with water, usually underlying the unsaturated zone. **(B118, 2003)**

Seasonal High*.* The highest annual static groundwater elevation that is typically measured in the Spring and associated with stable aquifer conditions following a period of lowest annual groundwater demand. **(23 CCR Section 351)**

Seasonal Low. The lowest annual static groundwater elevation that is typically measured in the Summer or Fall and associated with a period of stable aquifer conditions following a period of highest annual groundwater demand. **(23 CCR Section 351)**

Seawater Intrusion. The advancement of seawater into a groundwater supply that results in degradation of water quality in the basin and includes seawater from any source. **(23 CCR Section 351)**

Statutory Deadline. The date by which an Agency must be managing a basin pursuant to an adopted Plan, as described in Water Code Sections 10720.7 or 10722.4. **(23 CCR Section 351)**

***Sustainability Goal*.** The existence and implementation of one or more groundwater sustainability plans that achieve sustainable groundwater management by identifying and causing the implementation of