

## Appendix B. Summary of all stable isotope data for dissolved sulfate and water.

Identifier	GWIC ID	Sample date	Aquifer	Dissolved Sulfate			Water Isotopes	
				$\delta^{34}\text{S}$ , ‰	$\delta^{18}\text{O}$ , ‰	$\text{SO}_4$ , mg/l	$\delta^{18}\text{O}$ , ‰	$\delta\text{D}$ , ‰
Foothills Subdivision								
OSM-01	235488	4/14/2017	MDSN	6.8	0.4	226	-19	-147
OSM-152	235488	8/14/2018	MDSN	6.7	1.1	n.a.	n.a.	n.a.
OSM-201	235488	7/17/2019	MDSN	6.4	1.1	226	-18.8	-146
OSM-03	291365	4/13/2017	MDSN	9.3	3.4	189	-18.9	-146
OSM-04	261984	4/13/2017	MDSN	3.8	-5.8	407	-18.8	-146
OSM-153	261984	8/14/2018	MDSN	5.2	-2	n.a.	n.a.	n.a.
OSM-202	261984	7/18/2019	MDSN	2.9	-4.4	466	n.a.	n.a.
OSM-05	235689	4/14/2017	MDSN	-1.9	-3.4	322	-18.8	-146
OSM-08	281405	6/21/2017	MDSN	4.9	0	274	-18.9	-147
OSM-10	252467	6/20/2017	MDSN	11.2	6.2	123	-18.8	-146
OSM-11	239236	6/21/2017	MDSN	12.6	5.8	154	-18	-143
OSM-12	248664	6/20/2017	MDSN	12.3	5.6	132	-18.8	-146
OSM-13	242151	6/20/2017	MDSN	8.6	1.4	282	-18.9	-147
OSM-15	279108	6/21/2017	MDSN	12.5	5.2	150	-18.9	-146
OSM-16	242153	6/20/2017	MDSN	12	4	156	-18.9	-146
OSM-151	279137	8/14/2018	MDSN	12.4	5.9	144	n.a.	n.a.
Stockett–Sand Coulee, Madison Wells								
DEQ100	P-13	2011	MDSN	14	7.3	100	n.a.	n.a.
DEQ110	C7	2011	MDSN	11.2	6.5	100	-18.3	-143
DEQ103	C5	2011	MDSN	11.6	6.2	97	-18.7	-143
OSM-35	288313	9/13/2017	MDSN	12.6	4.5	131	-18.8	-145
OSM-203	288313	7/18/2019	MDSN	12.8	6.5	124	-18.7	-145
OSM-37	126078	10/19/2017	MDSN	6.9	-0.5	377	-18.8	-146
OSM-204	126078	7/18/2019	MDSN	7.1	0.3	371	-18.9	-147
OSM-38	31892	10/19/2017	MDSN	15.2	6.7	176	-18.9	-147
OSM-205	31892	7/18/2019	MDSN	14.2	5.9	179	-18.8	-146
OSM-39	139022	10/19/2017	MDSN	12.3	8.7	100	-18.7	-145
OSM-40	245668	10/19/2017	MDSN	16.5	12.4	113	-18.7	-144
OSM-206	245668	7/16/2019	MDSN	n.a.	n.a.	n.a.	-18.8	-145
OSM-43	141006	10/20/2017	MDSN	2.8	7.3	127	-18.9	-146
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				$\delta^{34}\text{S}$ , ‰	$\delta^{18}\text{O}$ , ‰	$\text{SO}_4$ , mg/l	$\delta^{18}\text{O}$ , ‰	$\delta\text{D}$ , ‰
Stockett–Sand Coulee, Madison Wells (Cont.)								
OSM-26	276129	7/18/2017	MDSN	1.9	n.a.	5	-18.6	-142
OSM-68	210668	6/20/2018	MDSN	-3.7	-3.3	474	-16.1	-130
OSM-207	210668	7/18/2019	MDSN	-3	-2.9	504	-17.1	-138
OSM-71	149852	6/21/2018	MDSN	6.1	1.3	547	-19	-148
OSM-155	294553	8/14/2018	MDSN	13	6.3	126	n.a.	n.a.
MT1	2309	8/28/2009	MDSN	3.4	-1.6	168	-18.4	-143
OSM-27	2309	7/19/2017	MDSN	8.9	4.6	116	-18.8	-145

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Identifier	GWIC ID	Sample date	Aquifer	Dissolved Sulfate			Water Isotopes	
				$\delta^{34}\text{S}$ , ‰	$\delta^{18}\text{O}$ , ‰	$\text{SO}_4$ , mg/l	$\delta^{18}\text{O}$ , ‰	$\delta\text{D}$ , ‰
OSM-208	2309	7/17/2019	MDSN	5.5	2.3	135	-18.8	-146
MT2	2308	8/28/2009	MDSN	3.3	-0.9	158	-18.7	-146
MT3	167881	8/28/2009	MDSN	12.6	10	128	-19	-146
MT4	205599	8/29/2009	MDSN	8.5	4.5	128	-18.8	-145
OSM-25	205599	7/19/2017	MDSN	10	4.7	122	-18.7	-145
	205599	7/17/2019	MDSN	9.3	4.6	127	-18.8	-146
MT5	2249	8/29/2009	MDSN	7	4.2	134	-18.8	-145
MT6		8/29/2009	MDSN	9.9	5.4	119	-18.7	-146
MT8	2295	8/29/2009	MDSN	10.1	6	120	-18.8	-145
MT9	158293	9/19/2009	MDSN	7.6	4	135	-18.8	-146
MT11	122947	9/19/2009	MDSN	5.7	3.9	116	-18.7	-145
MT12	165613	9/19/2009	MDSN	9.4	5.2	124	-18.7	-145
MT15	210883	9/11/2010	MDSN	11.5	7.4	103	-18.9	-146
MT16	130732	9/11/2010	MDSN	8.3	5.1	108	-18.8	-145
MT18	230156	10/23/2010	MDSN	0.2	-1.9	100	-18.3	-144
MT19	254474	10/23/2010	MDSN	2.5	0.2	93	-19	-147
MT21	149855	10/23/2010	MDSN	6.1	2	134	-18.9	-145
OSM-24	149855	7/19/2017	MDSN	5.3	0.8	159	-18.8	-145
DEQ101		2011	MDSN	-1.7	-2.5	200	n.a.	n.a.
DEQ102		2011	MDSN	-1.9	-2.9	230	n.a.	n.a.
DEQ104		2011	MDSN	3.8	2.1	130	-18.7	-144
DEQ105		2011	MDSN	7.3	4	110	-18.4	-144
DEQ106		2011	MDSN	6	2.9	120	-18.7	-145
DEQ107		2011	MDSN	6	2.4	140	-18.4	-144
DEQ108		2011	MDSN	5.3	2	140	-18.3	-143
DEQ109		2011	MDSN	3.8	3.9	160	-18.3	-143

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				$\delta^{34}\text{S}$ , ‰	$\delta^{18}\text{O}$ , ‰	$\text{SO}_4$ , mg/l	$\delta^{18}\text{O}$ , ‰	$\delta\text{D}$ , ‰
Stockett–Sand Coulee, Madison Wells (cont.)								
MT17		10/23/2010	MDSN	-10.3	-9.5	326	-18.3	-141
MT20		10/23/2010	MDSN	-8.2	-9.2	174	-19.3	-149
MT7	2305	8/29/2009	MDSN	-9.1	-9.7	170	-19.4	-151
MT10	31939	9/19/2009	MDSN	-9.2	-8.2	372	-18.4	-143
OSM-29	31939	7/19/2017	MDSN	-7.2	-7	314	-18.5	-144
MT13	255442	9/11/2010	MDSN	-9.3	-8.9	363	-19.2	-149
OSM-23	255442	7/19/2017	MDSN	-8.5	-8.6	179	-20.1	-156
OSM-209	255442	7/18/2019	MDSN	-8.2	-8.5	229	-19.7	-154

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				$\delta^{34}\text{S}$ , ‰	$\delta^{18}\text{O}$ , ‰	$\text{SO}_4$ , mg/l	$\delta^{18}\text{O}$ , ‰	$\delta\text{D}$ , ‰
Stockett–Sand Coulee, Swift Fm. Aquifer								
MT14	162423	2009/10	SWIFT	-10.1	-6.5	70	-17.6	-139
OSM-41	162423	10/20/2017	SWIFT	-10.4	-6.1	86	-17.4	-139
OSM-42	2174	10/20/2017	SWIFT	-1.2	-4.1	28	-17.2	-137
OSM-02	236507	4/14/2017	SWIFT	-4.4	-10.5	2246	-18.1	-147
OSM-154	236507	8/14/2018	SWIFT	-4	-9.8	n.a.	n.a.	n.a.
Stockett–Sand Coulee, Kootenai Fm. Aquifer								
OSM-44		10/18/2017	KOOT	-0.4	-3.5	83	-16.7	-135
OSM-45		10/12/2017	KOOT	-5.4	-5.3	98	-17.6	-140
OSM-19	30542	8/3/2017	KOOT	4.2	n.a.	23	-18	-139
Stockett–Sand Coulee, Contaminated Alluvium								
OSM-69	2441	6/21/2018	ALVM	-13	-8.7	1061	-18.3	-143
Stockett–Sand Coulee, Morrison Fm. Coal								
OSM-146	152258	5/4/2018	MRSN	-0.9	-0.6	169	n.a.	n.a.
OSM-147	146929	5/4/2018	MRSN	-5.3	-4	77	n.a.	n.a.
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				$\delta^{34}\text{S}$ , ‰	$\delta^{18}\text{O}$ , ‰	$\text{SO}_4$ , mg/l	$\delta^{18}\text{O}$ , ‰	$\delta\text{D}$ , ‰
Giant Springs, City of Great Falls								
OSM-28	2528	7/21/2017	MDSN	11.3	6.5	146	-18.9	-145
	2528	11/18/2005	MDSN	11.5	8.4	138	-18.9	-144
OSM-18	2526	6/20/2017	MDSN	11.1	7.3	161	-18.8	-145
Coal Mine Discharges, Stockett–Sand Coulee Area								
Giffen	291863	11/18/2005	AMD	-12.9	-9.1	721	-18.2	-141
OSM-20	291863	7/20/2017	AMD	-12.1	-10.2	555	-18.3	-143
OSM-60	291863	5/22/2018	AMD	-11.9	-10	549	-18.2	-143
Nelson	291861	11/18/2005	AMD	-14.9	-10.5	12100	-17.1	-137
OSM-30	291861	7/20/2017	AMD	-16.2	-11.8	11366	-17	-138
OSM-56	291861	5/22/2018	AMD	-16.7	-11.7	10214	-16.8	-137
Oregon		11/18/2005	AMD	-16.1	-9.6	2550	-17.6	-140
Oregon	MT-22	1/1/2009	AMD	-15.9	-12.1	1920	-17.4	-138
OSM-21	291858	7/20/2017	AMD	-15.7	-11.5	2628	-18.8	-145
OSM-55	291858	5/22/2018	AMD	-16.2	-11.7	2822	-17.5	-140
C-wood 6	291859	11/18/2005	AMD	-13.9	-10.9	4710	-17.3	-137
OSM-31	291859	7/20/2017	AMD	-14.7	-11	4277	-17.2	-136
OSM-59	291859	5/22/2018	AMD	-14.4	-11.5	4325	-16.3	-135
OSM-33	2276	7/20/2017	AMD	-15.5	-12	7253	-17.1	-138
OSM-32	2262	7/20/2017	AMD	-15.8	-13	4254	-17.4	-139
OSM-70	2262	5/22/2018	AMD	-15.9	-13.2	4301	-17.4	-140
OSM-57	291865	5/22/2018	AMD	-16.2	-13.7	2231	-17.8	-141
OSM-58	291865	5/22/2018	AMD	-16.1	-13.7	3260	-17.9	-142

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				$\delta^{34}\text{S}$ , ‰	$\delta^{18}\text{O}$ , ‰	SO <sub>4</sub> , mg/l	$\delta^{18}\text{O}$ , ‰	$\delta\text{D}$ , ‰
<b>Belt Area, Madison Wells</b>								
OSM-09	196148	6/22/2017	MDSN	-4	-3.8	43	-18.5	-145
Reddish	196148	11/1/2007	MDSN	-5.5	-4	53	n.a.	n.a.
OSM-210	196148	7/19/2019	MDSN	-3.2	-4.1	44	-18.6	-147
OSM-17	32069	6/22/2017	MDSN	-2.9	-7.1	80	-18	-141
Belt-1A	217046	8/3/2005	MDSN	14	12	175	-18.5	-140
Belt	188537	11/1/2007	MDSN	15	11.9	n.a.	n.a.	n.a.
OSM-211	188537	7/17/2019	MDSN	15.3	10.7	129	-18.8	-144
OSM-64	32009	6/20/2018	MDSN	8.4	8.3	207	-18.8	-144
OSM-67	32000	6/20/2018	MDSN	13.7	9.2	121	-18.8	-143
<b>Belt Coal Mine, Mine Pool Water</b>								
Belt-3B	217052	8/5/2005	AMD	-8.9	-9	425	-18.1	-141
Belt-4B	215048	8/5/2005	AMD	-5.4	-5.4	184	-18.3	-139
Belt-4A	217055	8/5/2005	AMD	-9	0.7	320	-18.1	-137
OSM-34	999030	9/14/2017	AMD	-6.7	-8	215	-18.1	-142
OSM-36	999030	9/12/2017	AMD	-1.3	-4.9	350	-18	-142
<b>Belt Mine, AMD Discharges</b>								
OSM-06	217524	4/13/2017	AMD	-9.2	-13.6	3006	-17.9	-141
Fr. Coul	217524	11/18/2005	AMD	-9.3	-12.5	4950	-17.9	-141
OSM-62	217524	5/22/2018	AMD	-9.4	-12.7	2700	-17.6	-139
OSM-07	200616	4/13/2017	AMD	-9.3	-12.9	1634	-17.9	-142
Anaconda	200616	11/18/2005	AMD	-9.4	-11.6	1960	-18.2	-140
OSM-61	200616	5/22/2018	AMD	-9.2	-12.8	1844	-18	-143
<b>Belt Area, Swift Aquifer</b>								
OSM-14	31965	6/22/2017	SWIFT	-8.8	-8.9	291	-18	-141
OSM-65	145604	6/20/2018	SWIFT	4.3	-0.3	53	-18.8	-144
<b>Belt Area, Kootenai Aquifer</b>								
OSM-66	212233	6/20/2018	KOOT	-5.4	-5	191	-18.7	-143
OSM-63	296888	5/23/2018	KOOT	-5.1	-5.2	36	-18.3	-143
OSM-44	MW-102K	10/18/2017	KOOT	-0.4	-3.5	83	-16.7	-135
OSM-45	MW-103K	10/12/2017	KOOT	-5.4	-5.3	98	-17.6	-140
OSM-212	277205	7/18/2019	KOOT	-5.1	1.2	1231	-17.7	-141
<b>Belt Creek Mixing Samples</b>								
OSM-148	8/14/2018	Belt Bridge		0.3	-3.1		-18.1	-141
OSM-149	8/14/2018	Belt Creek Upstream		9.2	5.5		-18.2	-142
OSM-150	8/14/2018	Belt Creek Downstream		1.6	-1.7		-18.2	-141