

Group 6: Massey Draw – 2023

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Table 1. Site information

Site ID	Latitude	Longitude	Site Description
MD1	39°33'31.13"N	105°4'23.86"W	East of Chatfield pedestrian footbridge
MD2	39°33'35.78"N	105°4'49.29"W	Confluence of North and South Massey Draw
NMD1	39°33'36.51"N	105°4'50.69"W	100 feet upstream of confluence on North Massey Draw
NMD2	39°34'8.68"N	105°6'4.57"W	West of Willow Creek residential area, south of the roundabout on Garrison Way
SMD1	39°33'35.56"N	105°4'50.89"W	100 feet upstream of confluence on South Massey Draw
SMD2	39°33'38.58"N	105°6'4.35"W	Surrounded by a pool, Falcon Bluffs middle school, and residential development

Main Findings

- Metals at all sampled sites were higher than in similarly developed areas (ex: Sterling Ranch)
 - Five sites (MD1, NMD1, NMD2, SMD1, SMD2) were above the limit for CDPHE Regulation 38 chronic level for arsenic.
 - Five sites (MD1, MD2, NMD1, NMD2, SMD1) were above the CDPHE Regulation 38 Acute and Chronic levels for selenium.
 - Three sites (MD1, MD2, NMD1) were above the limit for EPA human recreation of thallium.
- All six sites were above the proposed limit for CDPHE Regulation 38 Chronic for total nitrogen with most nitrogen in organic form.
- SMD2 was the only site with detectable phosphorus levels in water, but both soil leachate samples (MD2 and NMD2) were above the CDPHE Regulation 38 Chronic limit.
- MD1, MD2, and SMD1 exceed USDA livestock standard for total coliform but are below *E. coli* limits.

Table 2. Measured water quality parameters and flow rates

Date	Site ID	pH*	Conductivity (µs/cm)	Temp** (°C)	Dissolved Oxygen [▲] (mg/L)	Alkalinity* (mg CaCO ₃ /L)	Turbidity (NTU)	Flow Rate (cfs)
5/16/2023	MD1	8.09	869	13.9	8.25	146.8	13.0	8.9 [#]
5/16/2023	MD2	8.07	886	13.3	8.60	145.2	12.1	N/M
5/16/2023	NMD1	7.98	821	15.5	8.38	132.8	11.9	0.3 [#]
5/16/2023	NMD2	7.96	829	16.2	7.75	139.2	11.1	N/M
5/16/2023	SMD1	7.94	1451	16.2	7.78	265	2.33	N/M
5/16/2023	SMD2	8.01	1322	22.2	10.27	214	2.24	4.8 [#]

N/M = Not Measured; *Standard limit 6.5 to 9 [4]; **Daily Max 24.3°C; [▲]Standard min 6.0 mg/L [4]; [#]Standard limit 20 mg CaCO₃/L [1]; [#]Measurement taken 5/19/2023



Figure 1. Site map

Table 3. Metals, anions, solids, organics, nutrients, and pathogens

2023 Group 6 – Massey Draw			Concentrations												
			Metals (mg/L)					Anions (mg/L)		Solids (mg/L)	Organics (mg/L)	Nutrients (mg/L)		Pathogens (mpn/100 mL)	
			As	Fe	Mn	Se	Tl	NO ₂ ⁻ -N	NO ₃ ⁻ -N	TSS	TOC	P	TN	Coliform	<i>E. coli</i>
EPA	Aquatic Life Chronic [1]		0.15	1.0	-	-	-	-	-	-	-	-	-	-	-
	Aquatic Life Acute [1]		0.34	-	-	-	-	-	-	-	-	-	-	-	-
	Human Recreation [2]		1.8E-05	-	0.05	0.17	2.4E-04	-	10	-	-	-	-	-	-
	Drinking Water [3]		0.01	-	-	0.05	0.002	1	10	-	-	-	-	-	-
	Secondary Drinking Water [3]		-	0.3	0.05	-	-	-	-	-	-	-	-	-	-
CDPHE	Regulation 38 Chronic [4]		2.0E-05*	1.0*	1.7**	0.0046	-	0.05	-	-	-	0.11 [▲]	0.53*	-	126
	Regulation 38 Acute [4]		0.34	-	3.1**	0.0184	-	-	10	-	-	-	-	-	-
USDA	USDA Livestock [5]		0.01	0.3	0.05	0.05	-	10	30	-	-	-	-	200	-
	Detection Limit (mg/L)		0.0168	0.0003	0.0001	0.0109	0.0049	0.1	0.1	-	0.17	0.029	0.17	1	1
Sample	Site ID	Date	As	Fe	Mn	Se	Tl	NO ₂ ⁻ -N	NO ₃ ⁻ -N	TSS	TOC	P	TN	Coliform	<i>E. coli</i>
Water	MD1	5/16/23	0.022	0.050	0.025	0.021	0.011	BDL	0.51	8	8.95	BDL	1.14	659	41.4
	MD2	5/16/23	BDL	0.055	0.030	0.024	0.007	BDL	0.81	0	9.55	BDL	1.43	689	62.2
	SMD1	5/16/23	0.025	0.081	0.026	0.023	BDL	BDL	0.39	4	9.48	BDL	0.91	1200	57.3
	NMD1	5/16/23	0.018	0.022	0.048	0.027	0.005	BDL	2.93	4	7.95	BDL	4.18	51.2	37.7
	SMD2	5/16/23	0.019	0.064	0.032	BDL	BDL	BDL	0.25	8	9.83	0.03	0.88	10.5	12.7
	NMD2	5/16/23	0.017	0.063	0.052	0.033	BDL	BDL	3.95	4	10.7	BDL	4.73	152	17.1
Soil	MD2	5/16/23	BDL	0.055	0.003	0.022	BDL	BDL	0.99	N/M	N/M	0.14	N/M	N/M	N/M
	NMD2	5/16/23	BDL	0.194	0.021	0.022	BDL	BDL	0.47	N/M	N/M	1.12	N/M	N/M	N/M
Notes:								[1] US EPA National Recommended Water Quality Criteria - Aquatic Life Criteria Table; freshwater standards (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table)							
A/BDL = Above/Below Detection Limit								[2] US EPA National Recommended Water Quality Criteria - Human Health Criteria Table; consumption of water & organisms (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table)							
N/M = Not Measured								[3] US EPA Drinking Water (https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations)							
*Total Recoverable Standards (all other standards are for dissolved metals)								[4] CDPHE Regulation 38 for Upper South Platte River Basin (https://cdphe.colorado.gov/water-quality-control-commission-regulations)							
**Calculated using Table Value Standards assuming 111 mg CaCO ₃ /L average low flow hardness [6]								[5] USDA Livestock Drinking Water (https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_051302.pdf)							
▲Phosphorus standard is 0.03 mg/L within Chatfield Reservoir and 0.11 mg/L for most tributaries								[6] Chatfield Reservoir Storage Reallocation Feasibility Study 2013							
• Average of Regulation 38 proposed standards for cold and warm waters															
Bold values represent total metal concentrations. All other concentrations are dissolved.															
For information on other constituents, please see Data Appendix															

Recommendations

- Sample Massey Draw at regular intervals to determine baseline conditions contributing to the overall health of the watershed – both soil and water samples should be collected when appropriate.
- Strengthen erosion banks at the confluence of SMD1, NMD1, and MD2 to prevent further influx of constituents of concern during precipitation events.
- Monitor arsenic, selenium, and thallium concentrations throughout Massey Draw to determine if point sources can be identified and addressed or if remediation efforts would be warranted.
- Investigate major sources of constituents in runoff, especially within the residential neighborhoods, to locate anthropogenic sources of constituents.
- Monitor South Massey Draw for any sources of coliform and/or *E. coli* entering the stream between SMD2 and SMD1.
- Monitor water levels along North Massey Draw as it has a high potential for both phosphorus and nitrogen conveyance into the Chatfield Reservoir, which would negatively impact the overall water quality.
- Given the proposed changes to CDPHE Reg. 38 and preliminary organic nitrogen results, investigate levels and sources of organic nitrogen, and the difficulty of removing organic nitrogen.