Gallatin Local Water Quality District
2024 Groundwater Technical Bulletin

As part of the District's Groundwater Monitoring Network (GWMN), aquifer chemistry is characterized at several areas throughout the Gallatin Valley.

This technical bulletin focuses on the Logan, Manhattan, Belgrade, Bozeman, and Gallatin Gateway areas. The sampled locations and individual wells included in this report are shown in Figure 1.

While the abundance of naturally occurring, dissolved constituents may vary across the valley and through time, these numbers are presented to give readers a snapshot of summertime conditions in this area, so that aquifer users can have a better understanding of typical conditions in the Gallatin Valley Aquifer System (GVAS) during this heavy-use period.

Following standard method, samples were collected with the District's groundwater sampling pump (GeoSub2) and analysis of water samples was conducted at Montana Bureau of Mines and Geology (MBMG) lab in Butte, MT.

The chemical species chosen to be tested for are commonly reported in analyses of drinking water, water used for stock and irrigation. The parameters in Table 2 make up the bulk of the dissolved chemical species commonly found in groundwater in Montana.

Land-use practices and change such as development can impact groundwater chemistry. Gaining an understanding of current conditions will help resource managers make informed decisions in the future.

The parameters in Table 3 primarily represent plant-available forms of nitrogen and phosphorus. Although groundwater is typically beneath the surface and root zone, it is connected to the streams within the valley and often surfaces as springs. Groundwater containing high levels of nutrients and that interacts with surface water may promote nutrient enrichment in otherwise relatively pristine streams. Streams experiencing nutrient enrichment, or eutrophication can have intense aquatic plant and algal growth which can have major implications for stream health and fisheries.

Additionally, nitrate is considered a harmful contaminant in high concentrations (>10 *mg/L* or ppm) as it can cause methemoglobinemia (Blue Baby Syndrome). Nitrate is highly soluble, mobile, and persistent in groundwaters. Sources of nitrate include atmospheric deposition, livestock waste, domestic sewage, fertilizer, and organic soil material. The GLWQD recommends testing drinking water wells for nitrate annually.

Results from nutrient analyses suggest that nitrate is present in 29 out of 38 sampled wells but at low levels compared to the drinking water standard of 10 ppm. While there is no drinking water standard for orthophosphate, results indicate low levels of this nutrient in the groundwater of GVAS.

Samples were also analyzed for boron and several metals, including lead, copper, iron, and manganese. Most sites had undetectable levels of these constituents. The highest boron concentration was found at Van Dyke on Highline Rd, measuring 95.96 *µg/L*. The highest lead concentration (0.25 *µg/L*) was detected at Huttinga, a domestic well located on Little Bear Rd, which may be related to a lead pipe. Richard and Katy Harjes, another domestic well located on Forswall Rd near E Gallatin Rd, had the highest copper concentration (7.35 *µg/L*). The highest iron content (5.537 *mg/L*) was recorded at the Droge site on Amsterdam Rd. Lastly, the highest manganese concentration (0.079 *mg/L*) was reported at the Sales Road 1 well in the Dry Creek area.

It is good practice to know the bulk chemical composition of water used for drinking, stock, and irrigation. Please contact the Gallatin Local Water Quality District if you need assistance determining what analysis is most suitable for your purposes.

Appendix

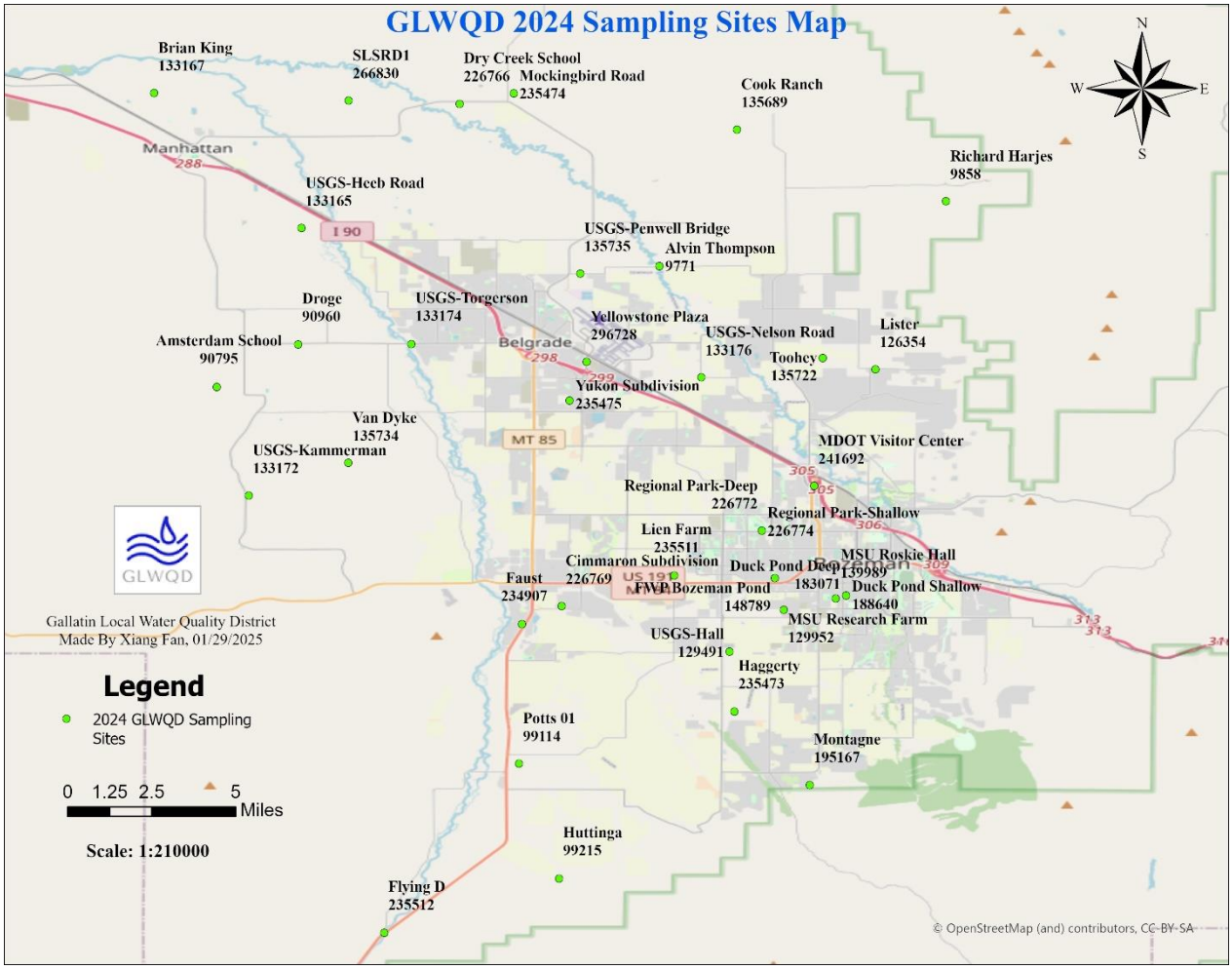

Figure 1. Map showing the location of wells monitored.

Table 1. Drinking Water Standards and Testing Recommendations for Select Analytes		
Parameter	**MCL (mg/L)**	**Recommended Testing Frequency**
Chloride	250	Minimally, at least once
Copper	1.3	Minimally, at least once 3-5 years if bluish green staining
Fluoride	4.0	Minimally, at least once
Iron	0.3	Minimally, at least once
Lead	0.015	Minimally, at least once 3-5 Years if you have lead piping
Manganese	0.3	Minimally, at least once 3-5 years if living in foothills or mountainous location
Nitrate	10	Annually

MCL = Maximum Contaminant Level as set forth by the US EPA for drinking water.

Table 2. Major Ion Chemistry in Monitoring Wells in Gallatin Valley

Site Name	Location Description	Ca	Mg	Na	K	HCO3	SO4	Cl	F
					mg/L				
Mockingbird Road		79.19	25.2	8.8	1.78	309.19	26.66	38.75	0.15
Dry Creek School Well		67.77	19.78	7.03	1.77	297.27	22.41	10.61	0.15
SLSRD1		98.265	33.21	28.255	6.495	450.925	94.445	11.75	0.295
Droge	On Amsterdam Rd	65.6	17.14	16.96	4.07	283.15	42.94	7.71	0.23
Yukon Subdivision	On McMillan Ln near Alaska Rd	68.03	15.29	8.43	3.32	286.78	25.82	5.5	0.13
USGS Obs Well - Heeb Road		58.76	17.89	7.09	2.27	241.42	39.88	6.05	0.17
USGS - FDD Ranch, Brian King		60.13	17.54	23.23	7.39	279.3	48.03	10.23	0.27
HARJES RICHARD AND KATY	On Forswall Rd near Springhill Community Rd	46.23	11.76	4.47	1.48	207.15	10.41	0.91	0.1
Lister - Saddle Mountain Rd		62.85	16.81	3.45	2.08	264.04	8.94	7.92	0.08
USGS OBSERVATION WELL NELSON RD		90.005	25.08	17.085	3.355	372.595	20.705	33.045	0.16
THOMPSON, ALVIN	On Penwell Bridge Rd near E Gallatin Rd	60.26	16.91	11.59	2	265.15	19.34	18.6	0.19
USGS - Kammerman	On Churchill Rd	66.665	9.665	25.79	8.73	251.985	38.485	26.435	0.38
Cimarron Subdivision		51.66	17.32	19.47	4.81	273.05	25.04	4.55	0.26
Faust	In Four Corner	61.71	14.89	5.19	3.2	266.48	17.38	7	0.17
Yellowstone Plaza	Near Airport	74.2	18.81	8.9	3.97	313.81	29.26	11.05	0.12
Cook Ranch	On Reese Creek Rd	74.57	11.9	5.42	2.5	320.93	4.9	2.82	0.16
Penwell Bridge	Near Dry creek Rd	66.45	17.48	18.62	4.13	268.73	22.14	41.58	0.13
MSU Recreation Barn		33	6.59	18.29	10.08	203.35	6	1.57	0.35
Potts 01	In Gallatin Gateway	42.47	8.655	2.11	1.335	189.78	5.945	1.02	0.12
Flying D	Near the Harringer Bridge	36.73	10.25	5.19	1.77	157.8	24.07	4.96	0.19
Huttinga	On Little Bear Rd	69.51	8.09	6.24	1.89	281.1	5.05	3.35	0.13
FWP-Bozeman Pond		84.54	21.9	19.48	5.02	341.81	9.53	65.3	0.13
Amsterdam School		50.13	10.43	24.18	11.82	217.16	50.73	13.62	0.4
MSU Roskie Hall		28.8	5.64	24.74	11.82	205.13	6.92	1.51	0.57
Duck Pond Deep		29.78	7.27	14.7	7.07	173.49	6.63	3.55	0.48
Duck Pond Shallow		84.47	22.81	33.82	6.73	428.3	19.64	24.25	0.42
Haggerty	On S cottonwood Rd near Johnson Rd	35.53	7.41	3.64	2.24	159.93	2.86	2.38	0.15
Montage	On Hodgman Canyon Dr near 19th Ave	30.67	10.91	5.43	2.4	165.72	6.99	0.91	0.06
USGS Hall	On Blackwood Rd near S Cottonwood Rd	63.525	15.655	5.815	3.725	308.345	3.575	2.365	0.09
Toohey		51.67	17.98	2.7	2.03	239.24	7.83	6.97	0.06
MSU Stucky Ag Farm		64	17.97	8.13	4.3	319.03	5.4	4.36	0.1
MDOT	Old MDOT rest area on 19th Ave	104.42	33.52	39.39	8.29	443.64	15.85	101.5	0.32
Lien Farm	On Gooch Hill Rd near Huffine Ln	68.34	17.95	7.52	3.7	308.52	13.91	12.06	0.08
County Regional Park Deep		75.21	16.82	8.11	4.5	315.29	11.31	14.09	0.11
County Regional Park Shallow		75.57	24.99	10.94	5.71	356.04	12.98	14.69	0.19
Van Dyke	On Highline Rd	33.26	19.73	50.18	10.15	291.5	37.63	7.13	0.43
USGS Torgerson	On Amsterdam Rd	34.93	10.29	4.65	1.77	148.35	29.64	1.91	0.2
Maximum		104.42	33.52	50.18	11.82	450.925	94.445	101.5	0.57
Minimum		28.8	5.64	2.11	1.335	148.35	2.86	0.91	0.06

Ca = Calcium; *Mg* = Magnesium; *Na* = Sodium; *K* = Potassium; *HCO3* = Bicarbonate; *SO4* = Sulfate; *Cl* = Chloride; *F* = Fluoride

Table 3. Dissolved Nutrient Concentrations		
Site Name	**Nitrate**	**Orthophosphate**
	mg/L	
Mockingbird Road	4	ND
Dry Creek School Well	1.47	ND
SLSRD1	ND	ND
Droge	3.21	ND
Yukon Subdivision	1.26	0.05
USGS Obs Well - Heeb Road	1.61	ND
USGS - FDD Ranch, Brian King	1.86	ND
HARJES RICHARD AND KATY	1.57	ND
Lister - Saddle Mountain Rd- Saddle Mountain Rd	3.63	0.03
USGS OBSERVATION WELL NELSON RD	6.04	0.025
THOMPSON, ALVIN	1.12	0.02
USGS - Kammerman	3.205	0.035
Cimarron Subdivision	2.92	0.07
Faust	1.43	ND
Yellowstone Plaza	2.91	ND
Cook Ranch	ND	ND
Penwell Bridge	1.59	0.12
MSU Recreation Barn	ND	ND
Potts 01	ND	ND
Flying D	ND	ND
Huttinga	0.44	0.02
FWP-Bozeman Pond	0.98	ND
Amsterdam School	1.9	ND
MSU Roskie Hall	0.4	ND
Duck Pond Deep	0.29	0.07
Duck Pond Shallow	4.42	0.03
Haggerty	0.72	0.05
Montage	ND	ND
USGS Hall	ND	0.06
Toohey	2.93	ND
MSU Stucky Ag Farm	1.04	0.05
MDOT	1.3	0.04
Lien Farm	0.48	0.04
County Regional Park Deep	2.74	0.07
County Regional Park Shallow	4.485	0.08
Van Dyke	2.9	ND
USGS Torgerson	ND	ND
Maximum	6.04	0.12
Minimum	ND	ND