Lewis and Clark County
Water Quality Protection District

Board Meeting Agenda
Tuesday, April 28, 2020
Zoom Meeting

What *(Content)*	How *(Process)*	Who	Page	Time *(When)*
1. Call to Order & Establish Quorum –	Roll Call	Jamie Shell -Chair		5:30 p.m.
2. Review of Agenda	Discuss Vote	Board	1	5:30 p.m.
3. Previous Minutes Review and Approval	Present	Board	2	5:35 p.m.
4. QTR 3 Budget review	Discuss	Jennifer McBroom	7	5:40 p.m.
5. County Flooding Outlook	Present	Pete Schade	10	5:50 p.m.
6. COVID Update – Health Department Activities	Discuss	Drenda Niemann	15	6:05 p.m.
7. Update and Announcements • **Draft Workplan – North Hills** • **Support Letters-- Update**	Discuss	Staff	16	6:25 p.m.
8. Board Member Discussion	Discuss	Board	33	6:45 p.m.
9. Public comment	Present	Board	34	6:55 p.m.
10. Adjourn Meeting	Present	Board		7:00 p.m.

LEWIS & CLARK COUNTY
WATER QUALITY PROTECTION DISTRICT
Helena, Montana

BOARD AGENDA ITEM

Meeting Date	**Agenda Item No.**
April 28, 2020	**2**

___Minutes __X_Board Member Discussion ___Staff & Other Reports ___Action ___Hearing of Delegation

AGENDA ITEMS: Review of Agenda

PERSONNEL INVOLVED: Board Members

BACKGROUND: Time is allowed for board members to review the agenda and place any items under action or to add any new agenda items.

RECOMMENDATION: n/a

___ADDITIONAL INFORMATION ATTACHED

BOARD ACTION: **NOTES:**

	MOTION	SECOND	AYE	NAY	ABSTAIN	OTHER
Frasier						
Harrow						
Good Geise						
Johnson						
Leland						
Ryan						
Schell						
Scott						

LEWIS & CLARK COUNTY
WATER QUALITY PROTECTION DISTRICT
Helena, Montana

BOARD AGENDA ITEM

Meeting Date	**Agenda Item No.**
April 28, 2020	**3**

_X_Minutes ___Board Member Discussion ____Staff & Other Reports _X_Action ___Hearing of Delegation

AGENDA ITEMS: Minutes of the February 25, 2020, meeting

PERSONNEL INVOLVED: Board Members

BACKGROUND: Upon approval, the minutes represent official actions of the Water Quality Protection District. Every effort is made to have these recommended minutes accurately portray the proceedings and procedures of the board.

RECOMMENDATION: Approval

_X_ADDITIONAL INFORMATION ATTACHED

BOARD ACTION: **NOTES:**

	MOTION	SECOND	AYE	NAY	ABSTAIN	OTHER
Frasier						
Good Geise						
Harrow						
Johnson						
Leland						
Ryan						
Schell						
Scott						

LEWIS AND CLARK COUNTY
WATER QUALITY PROTECTION DISTRICT
BOARD MEETING
316 North Park, Room 226
Helena, MT 59623
February 25, 2020

Members Present
Mayor Jamie Schell, chair
Jeff Ryan, vice-chair
Commissioner Susan Good Geise
Kammy Johnson (arrived at 5:33 pm, departed at 7:05 p.m.)
Catherine Scott (arrived at 5:35 pm, departed at 7:06 p.m.)

Staff
Kathy Moore
Jennifer McBroom
Peter Schade
James Swierc
Jolene Helgerson
Drenda Niemann

Members Absent
Stan Frasier
Amanda Harrow
Ryan Leland

Guests Present
Connor Mertz, Big Sky Watershed Corps
Mikayla Moss, Big Sky Watershed Corps

Mayor Jamie Schell, chair, called the 243rd meeting of the Lewis and Clark County Water Quality Protection District (WQPD) Board of Directors to order at 5:31 p.m. A quorum was not established. Introduction of Board members and public were made.

A quorum was established at 5:33p.m.

REVIEW OF AGENDA
Commissioner Susan Good Geise requested that board members work with staff to discuss zoning rules, approval, and public comments. Jennifer McBroom, WQPD Program Supervisor, announced that the Citizen Requested Policy discussion would require board approval and a vote. No public comment was given.

MINUTES
Mayor Schell asked if there were any corrections or additions to the December 10, 2019, minutes. Mayor Schell and Catherine Scott provided grammatical changes to the minutes. Ms. Scott made a motion to approve the amended minutes as written. Kammy Johnson seconded the motion. The motion carried 5-0**.** No public comment was given.

FINANCE REPORT/FISCAL YEAR 2021 UPDATE
Ms. McBroom presented the WQPD 2020 fiscal year cash flow statement and cash flow analysis budget (see Attachment "A"). As of February 28, 2020, we are 58% through the fiscal year, beginning cash is $189,251; total revenues received are $254,463 or 62% amount budgeted; total expenditures are $251,222 or 52% amount budgeted; revenues are over expenditures by $3,241; ending cash balance is $197,961.

Kathy Moore, Environmental Services Division Administrator, referenced the cash flow analysis along with the WQPD Financial Data FY2016-2019 sheet (see Attachment "A") during her discussion of the upcoming FY21 budget. Ms. Moore has determined that at this time the WQPD Board should not recommend a district fee increase to the Lewis and Clark County Commission. No public comment was given.

EAST NORTH HILLS PRESENTATION

James Swierc, Hydrogeologist, gave an update on the East North Hills (ENH) presentation he gave in October 2019 to the community of the ENH and surrounding area regarding potential groundwater depletion from residential growth and the response to a citizen request for the WQPD to petition the Montana Department of Natural Resources for a Controlled Groundwater Area (on pages 25-65 of the board packet). Mr. Swierc discussed water level studies, water quality, water isotopes, aquifer geology, ground water temperature and the District'sWQPD's conclusion during his update that a controlled ground water area was not warranted at this time. In answer to a question from Commissioner Good Geise, Mr. Swierc gave further explanation of water levels, hydrographs, recharge, and static water level measurements. In answer to a question from Valerie Stacey, Mr. Swierc stated that he did not include other wells that may have been part of the 2004, 2006 and later studies because those wells only had a limited amount of data, insufficient to include seasonal trends. In answer to a question from Jeff Ryan, Mr. Swierc stated that a well's chemistry could change over timegets older depending on the geology, and the location of the well. In answer to a question from Commissioner Good Geise, Mr. Swierc stated that appropriate acreage size was reasonable for consideration regarding future subdivision development to reduce the risk of groundwater depletion. The best way to do that would be to allow for zoning controls. After further board member discussion, no public comment was given.

DATA APPLICATIONS

Due to equipment malfunction, the data application discussion will be moved to the March agenda.

UPDATES AND ANNOUNCMENTS

DEQ Comments: Peter Schade, Water Quality Specialist, presented the comments submitted by the WQPD to the Department of Environmental Quality (DEQ) Opencut Mining Section regarding the Opencut Mining Permit #3088-Valley Sand and Gravel, LLC-McHugh 2 Gravel Pit (see Attachment "B"). Mr. Schade stated that if a flood permit were required that it would likely change the design of their gravel permit. Mr. Ryan noted that if a gravel pit is not allowed the residents of that area could see further housing development that would also affect the area. Mr. Ryan suggested that having a wetland as a post-mine landuse could be beneficial. theWQPDNo public comment was given.

PFAS Update: The National Guard has received the results of PFAS (per- and polyfluoralkyl substances) samplingresults of 4 domestic wells near Fort Harrison. The results showed that the 4 wells were below the 70 parts per trillion Montana groundwater standards for PFAS. All wells sampled were also below Fort Harrison's action level of 40 parts per trillion. Fort Harrison's next step is to move forward with the Superfund process. The WQPD is also participating in the development of a statewide PFAS action plan, under the guidance of a DEQ-led work group by the Montana DEQ. No public comment was given.

Citizen Request: Ms. McBroom presented the Lewis and Clark County Water Quality Protection District Policy on Citizen Requested Water Resource Studies for adoption. Commissioner Good Geise made a motion to approve the Lewis and Clark County Water Quality Protection District

Policy on Citizen Requested Water Resource Studies. Ms. Johnson seconded the motion. The motion carried 5-0.

BOARD MEMBER DISCUSSION

Mr. Ryan shared photos of last phase of the Prickly Pear Land Trust Greenway Stream Restoration Project along Prickly Pear Creek. Mr. Ryan recommended that the Board take a tour of the restoration this summer.

Mr. Ryan also looked at a new stream restoration site along Beaver Creek by Hauser Dam. Phase one of the project will begin this summer. The Lewis and Clark Conservation District will sponsor the grant to fund the second phase of the restoration project.

Mayor Schell announced that the East Helena City Council is touring the Prickly Pear Land Trust Greenway Stream Restoration site. Mayor Schell thanked Jennifer McBroom for her WQPD presentation to the East Helena City Council.

Adam Strainer the new Helena area Montana Fish, Wildlife and Parks Fisheries Biologist gave a presentation to the East Helena City Council at their last meeting.

Ms. Moore announced that the Board of Health would adopt the revised wastewater regulations at their February 27 meeting.

There being no public comment, the meeting adjourned at 7:11 p.m.

_____

Mayor Jamie Schell, Chair

Action Items from the February 25, 2020 board meeting

- The Data Application presentation by Valerie Stacey will be added to the March agenda.
- WQPD Staff will set a time for the Board to tour the Prickly Pear Land Trust Greenway Stream Restoration Project.

LEWIS & CLARK COUNTY
WATER QUALITY PROTECTION DISTRICT
Helena, Montana

BOARD AGENDA ITEM

Meeting Date	**Agenda Item No.**
April 28, 2020	**4**

__Minutes __Board Member Discussion __X__Staff & Other Reports __Action ___Hearing of Delegation

AGENDA ITEMS: Fiscal Year 2020 3rd Quarter Budget Report

PERSONNEL INVOLVED: Jennifer McBroom,

BACKGROUND: Ms. McBroom will present the quarterly budget report for review and discuss the upcoming FY21 budget process.

RECOMMENDATION: n/a

X ADDITIONAL INFORMATION ATTACHED

BOARD ACTION: **NOTES:**

	MOTION	SECOND	AYE	NAY	ABSTAIN	OTHER
Frasier						
Good Geise						
Harrow						
Johnson						
Leland						
Ryan						
Schell						
Scott						

WATER QUALITY DISTRICT
FUND 203.4430.441

75% Through the Year
4/21/2020

4/21/2020
payroll
73%

EXPENDITURES: DESCRIPTION		BUDGETED FY 2020	JANUARY	FEBRUARY	MARCH	YEAR TO DATE	BUDGET REMAINING	% USED	Prior Year
11.01	SALARIES & WAGES: PERM	239,796	16,580.74	16,359.62	16,886.61	$167,445.10	$72,350.90	69.8%	144,740.32
11.02	SALARIES & WAGES: TEMP					$0.00		--	2,796.30
13.01	TERMINATION PAY					$0.00		--	
15-17	EMPLOYER CONTRIBUTIONS	75,260	5,635.57	5,558.28	5,740.46	$54,211.28	$21,048.72	72.0%	46,466.51
	TOTAL PERSONNEL	$315,056	$22,216	$21,918	$22,627	$221,656.38	$93,399.62	70.4%	194,003.13
21.10	OFFICE SUPPLIES	2,000		72.07		$241.01	$1,758.99	12.1%	273.52
21.20	MINOR EQUIPMENT	16,000				$4,022.45	$11,977.55	25.1%	5,674.90
22.10	OPERATING SUPPLIES	2,000				$1,253.73	$746.27	62.7%	8,649.08
22.27	SAMPLING	13,600	700.00			$3,309.00	$10,291.00	24.3%	10,841.25
23.10	REPAIR & MAINTENANCE	1,500				$500.00	$1,000.00	33.3%	56.95
23.20	GAS & OIL	1,500	74.83	40.01	28.49	$559.46	$940.54	37.3%	652.44
31.20	POSTAGE	750	108.96		115.75	$397.89	$352.11	53.1%	205.51
31.40	VEHICLE PARKING	804		204.00		$612.00	$192.00	76.1%	603.00
31.45	VEHICLES-REGISTRATION	0				$42.75	($42.75)	--	
32.10	PRINTING	5,000			117.88	$383.54	$4,616.46	7.7%	1,170.52
33.20	ADVERTISING	1,000				$0.00	$1,000.00	0.0%	2,019.69
33.50	MEMBERSHIP	1,100				$0.00	$1,100.00	0.0%	250.00
33.70	EDUCATION AWARENESS	4,000				$280.50	$3,719.50	7.0%	1,473.70
33.80	HEALTH CLUB DUES	300				$10.00	$290.00	3.3%	7.50
34.50	TELEPHONE	2,153	62.72	62.72	561.47	$1,771.76	$381.24	82.3%	1,096.46
35.10	PROFESSIONAL SERVICES	0				$222.60	($222.60)	--	505.10
36.20	OFFICE MACHINES	0			78.00	$234.00	($234.00)	--	102.90
36.30	REPAIR&MAINTmotor veh				13.00	$35.00	($35.00)	--	
37.10	TRAVEL	5,000	4.64			$1,364.37	$3,635.63	27.3%	2,470.25
37.50	BOARD MEETING EXPENSES	500		2.50		$2.50	$497.50	0.5%	0.00
38.10	TRAINING	10,000	550.00			$3,955.00	$6,045.00	39.6%	879.65
39.10	CONTRACTED SERVICES (usg	60,000				$36,469.02	$23,530.98	60.8%	13,563.75
50.10	county admin fees	6,569			1,642.25	$4,926.75	$1,642.25	75.0%	3,251.00
50.11	ADMIN FEES	0				$0.00	$0.00	--	700.00
50.20	INSURANCE	2,925			732.00	$2,195.00	$730.00	75.0%	1,538.00
50.30	RENT	15,352		3,838.04		$11,514.12	$3,837.88	75.0%	11,514.12
50.40	TECHNOLOGY	10,360			2,590.00	$7,770.00	$2,590.00	75.0%	5,294.00
80.15	CAPITAL TRANSFER	4,274				$2,137.00	$2,137.00	50.0%	2,137.00
	TOTAL O&M	$166,687	$1,501.15	$4,219.34	$5,878.84	$84,209.45	$80,340.55	50.5%	74,930.29
TOTAL EXPENDITURES		**$481,743**	**$23,717.46**	**$26,137.24**	**$28,505.91**	**$305,865.83**	**$173,740.17**	**63.49%**	**$268,933.42**

REVENUES: DESCRIPTION		BUDGETED FY 2020	JANUARY	FEBRUARY	MARCH	YEAR TO DATE	BUDGET REMAINING	% RECEIVED	Prior Year
331.00-00	FEDERAL GRANTS					$0.00	$0.00	--	7,000.00
334.00-00	STATE GRANTS	25,000			5,000.00	$41,317.25	($16,317.25)	165.3%	2,723.75
344.09-40	WELL MONITORING (USGS)	3,200	1,350.00		675.00	$2,025.00	$1,175.00	63.3%	1,649.70
362.01-00	OTHER MISC					$0.00	$0.00	--	0.00
363.01-00	MAINTENANCE ASSESSMEN	365,000	4,767.94	2,937.53	2,320.14	$212,130.17	$152,869.83	58.1%	207,663.84
363.04-00	MA PENALTY & INTEREST	0	104.11	108.23	86.68	$982.50	($982.50)	--	1,002.90
365.02-00	DONATIONS-PRIVATE					$0.00	$0.00	--	0.00
383.01-00	HEALTH INSURANCE CREDIT	17,942				$9,136.39	$8,805.61	50.9%	8,414.43
TOTAL REVENUE		**$411,142**	**$6,222.05**	**$3,045.76**	**$8,081.82**	**$265,591.31**	**$145,550.69**	**64.60%**	**$228,454.62**

	BEGINNING CASH BALANCE				
beg cash	fund 203 unrestricted	189251.62	$197,961.89	$174,870.41	$154,446.32
Lake Helena Working Group Restricted cash		5469.22	$0.00	$0.00	$0.00
	total	194720.84	$197,961.89	$174,870.41	$154,446.32

Total WQPD Cash Available
$154,446.32

Total LHWG Cash Available
$0.00

WQPD Donated Funds

Fund 140 WQPD Gage and Rewatr Donations

75% Through the Year

grant year 7/1-6/30

4/21/2020

payroll 73%

EXPENDITURES: DESCRIPTION		BUDGETED FY 2020	JANUARY	FEBRUARY	MARCH	YEAR TO DATE	Contract budget Remaining	% USED
35.10	PROFESSIONAL SERVICES	15,220				$7,500.00	$7,720.00	49.3%
39.10	CONTRACTED SERVICES	4,230				$0.00	$4,230.00	0.0%
	TOTAL O&M	$19,450	$0.00	$0.00	$0.00	$7,500.00	$11,950.00	38.6%
TOTAL EXPENDITURES		**$19,450**	**$0.00**	**$0.00**	**$0.00**	**$7,500.00**	**$11,950.00**	**38.56%**

REVENUES: DESCRIPTION		BUDGETED FY 2020	JANUARY	FEBRUARY	MARCH	YEAR TO DATE	BUDGET REMAINING	% RECEIVED
365.02-00	Gage Donations	3750				$1,500.00	$2,250.00	40.0%
365.02-00	Rewatr Donations	15,220				$10,000.00	$5,220.00	65.7%
TOTAL REVENUE		**$18,970.00**	**$0.00**	**$0.00**	**$0.00**	**$11,500.00**	**$5,220.00**	**60.62%**

		GAGE	REWATR	
beginning cash bal gage	**$7,800.00**	**beg bal**	($1,500.00)	$54,340.00	
beginning cash bal rewatr	**$4,560.00**	revenue	$1,500.00	$10,000.00	
		expenditures	$0.00	$7,500.00	
		current cash bal	$0.00	$56,840.00	$56,840.00

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LEWIS & CLARK COUNTY
WATER QUALITY PROTECTION DISTRICT
Helena, Montana

BOARD AGENDA ITEM

Meeting Date	**Agenda Item No.**
April 28, 2020	**5**

Minutes _X_Board Member Discussion ___Staff & Other Reports __Action __Hearing of Delegation

AGENDA ITEMS: County Flooding Outlook

PERSONNEL INVOLVED: Pete Schade, Water Quality Specialist

BACKGROUND: Mr. Schade will give an update on the county flooding outlook.

_X_ADDITIONAL INFORMATION ATTACHED

BOARD ACTION: **NOTES:**

	MOTION	SECOND	AYE	NAY	ABSTAIN	OTHER
Frasier						
Good Geise						
Harrow						
Johnson						
Leland						
Ryan						
Schell						
Scott						

Hydrologic Forecast for Augusta/Elk Creek

CONDITIONS 04/17/2020

Lewis & Clark County Water Quality Protection District

SUMMARY
Elk Creek is a non-gauged stream, therefore USGS gauging station 0608220 (Sun River below Willow Cr) is used as a surrogate to evaluate the timing of spring runoff and can be used to track rising river stage in the area. Presently, streamflows fall within values expected at this time of year. Temperatures in April have been cool thus far, and recent snowfall has increased snowpack slightly to above average SWE. Temperatures are projected to reach the 60's over the next week which is expected to increase streamflows as low-elevation snowpack melts.

Residents should keep track of weather patterns for increasing temperature and precipitation events which could change conditions quickly. With snowpack slightly above average levels for this time of year, intense and sustained snow-melt runoff is not expected, however precipitation events can contribute to flooding in any year, as evidenced in 2019.

The following data and information is used to evaluate hydrologic conditions in the Elk Creek drainage. Hydrologic response of Elk Creek is predominantly a result of three factors.

1. Surrogate **streamflow** measured at the Sun River below Willow Creek USGS Stream Gauging Station west of Augusta
   https://waterdata.usgs.gov/monitoring-location/06082200
2. **Snowpack** snow water equivalent (SWE) at the Wood Creek SNOTEL Station west of Augusta
   https://www.nwrfc.noaa.gov/snow/snowplot.cgi?WODM8
3. Short-term Augusta 5-day weather (**precipitation and temperature)** projection from the National Weather Service
   https://forecast.weather.gov/MapClick.php?lat=47.4927&lon=-112.3938#.XpooZUZKjGg

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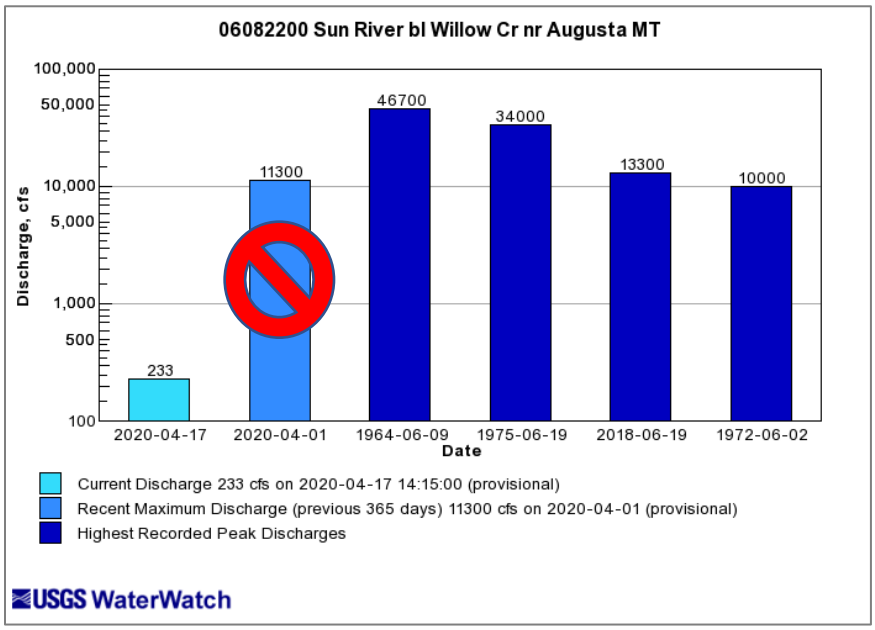
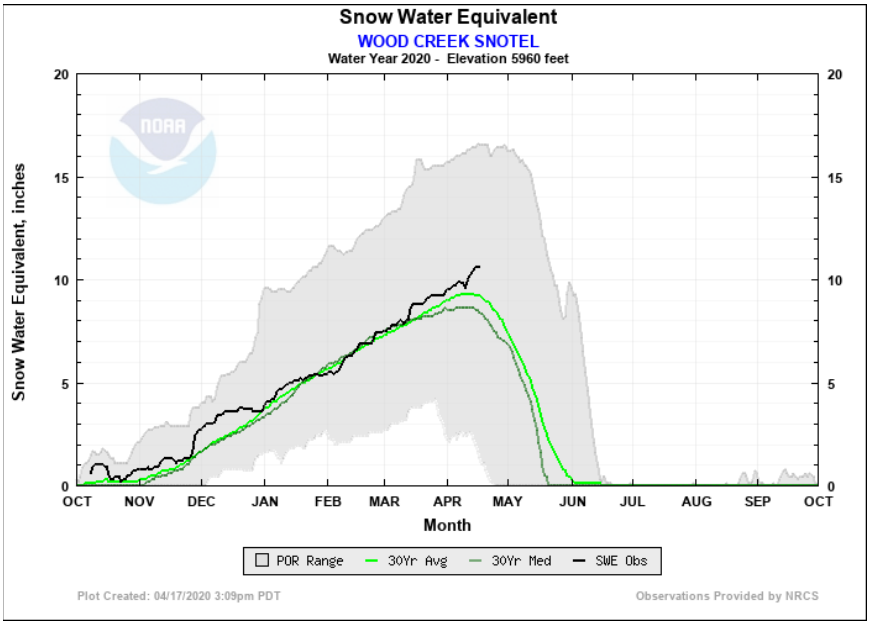
1. **STREAMFLOW**
   Streamflow on 04/17/20 was recorded at 233 CFS
   Median flow on 4/17 is 238 CFS
   Flood stage has not been established



2. **SNOWPACK (SWE)**
   SWE at Wood Creek is at 10.6" which is slightly above average at 115%. 30-yr average SWE is 9.2".



3. **WEATHER**
   Sunday through next Friday...A high pressure ridge will build back into the forecast area to begin next week, bringing drying and warming conditions. Highs in the 60s are likely for lower elevations Monday through Wednesday, as lows only fall into the 30s.

Hydrologic Forecast Tenmile Creek

CONDITIONS 04/17/2020

Lewis & Clark County Water Quality Protection District

SUMMARY
Tenmile Creek is presently flowing slightly below the median streamflow at this time of year, and flows have not increased significantly due to spring runoff yet. Temperatures in April have been cool thus far, and recent snowfall has increased snowpack slightly to above average SWE. Temperatures are projected to reach the 60's over the next week which is expected to increase streamflows as low-elevation snowpack melts.

Residents should keep track of weather patterns for increasing temperature and precipitation events which could change conditions quickly, and cause small creeks such as Tenmile Creek and Silver Creek to rise.

The following data and information is used to evaluate hydrologic conditions in the Tenmile Creek drainage. Hydrologic response of Tenmile Creek is predominantly a result of three factors.

1. **Streamflow** measured at Williams St USGS Stream Gauging Station west of the city of Helena https://waterdata.usgs.gov/monitoring-location/06062500
2. **Snowpack** snow water equivalent (SWE) at the Frohner Meadow SNOTEL Station west of Augusta https://www.nwrfc.noaa.gov/snow/snowplot.cgi?FRHM8
3. Short-term Helena 5-day weather (**precipitation and temperature)** projection from the National Weather Service https://forecast.weather.gov/MapClick.php?lat=46.5924&lon=-112.0403#.XpoTqkZKjBQ

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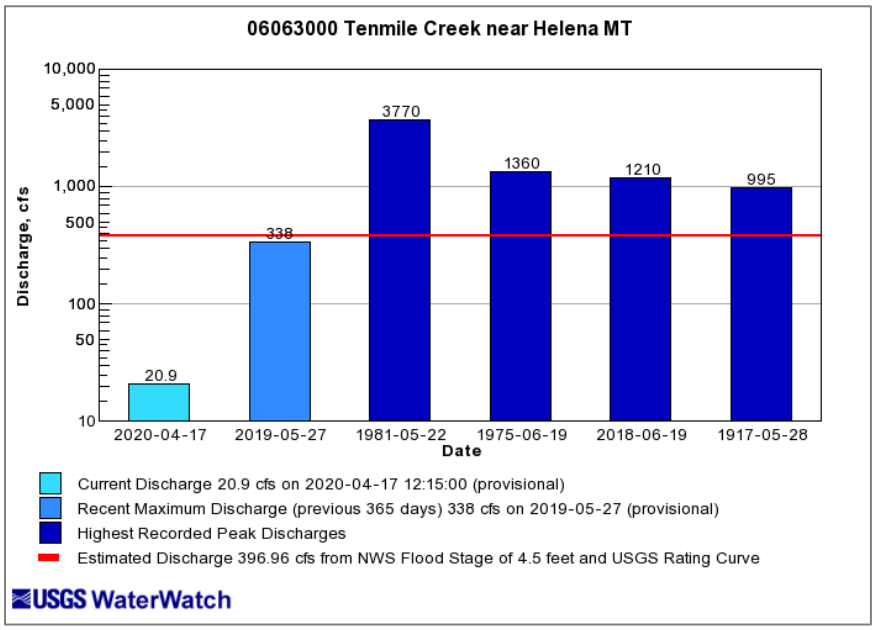
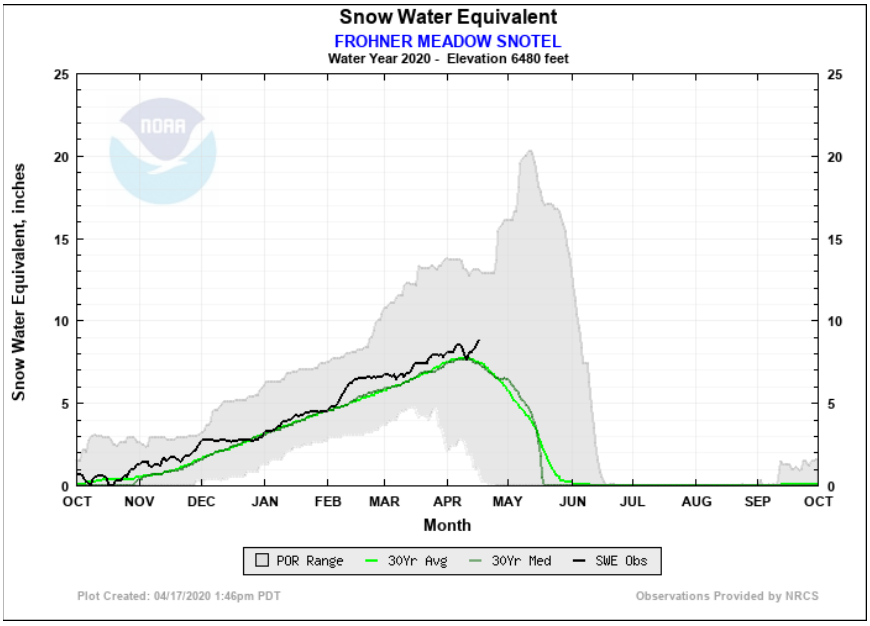
1. **STREAMFLOW**
   Streamflow on 04/17/20 was recorded at 21 CFS
   Median flow on 4/17 is 33 CFS
   Flood stage is ~ 397 CFS



2. **SNOWPACK (SWE)**
   SWE at Frohner Meadows is at 8.8" which is slightly above average at 119%. 30-yr average SWE is 7.4".



3. **WEATHER**
   Sunday through next Friday...A high pressure ridge will build back into the forecast area to begin next week, bringing drying and warming conditions. Highs in the 60s are likely for lower elevations Monday through Wednesday, as lows only fall into the 30s.

LEWIS & CLARK COUNTY
WATER QUALITY PROTECTION DISTRICT
Helena, Montana

BOARD AGENDA ITEM

Meeting Date	**Agenda Item No.**
April 28, 2020	**6**

Minutes _X_Board Member Discussion ___Staff & Other Reports __Action __Hearing of Delegation

AGENDA ITEMS: COVID-19 Update

PERSONNEL INVOLVED Drenda Niemann, Health Officer

BACKGROUND: Ms. Niemann will give a brief COVID-19 update.

__ADDITIONAL INFORMATION ATTACHED

BOARD ACTION: **NOTES:**

	MOTION	SECOND	AYE	NAY	ABSTAIN	OTHER
Frasier						
Good Geise						
Harrow						
Johnson						
Leland						
Ryan						
Schell						
Scott						

LEWIS & CLARK COUNTY
WATER QUALITY PROTECTION DISTRICT
Helena, Montana

BOARD AGENDA ITEM

Meeting Date	**Agenda Item No.**
April 28, 2020	**7**

___Minutes _X_Board Member Discussion _X_Staff & Other Reports ___Action __Hearing of Delegation

AGENDA ITEMS: Updates and Announcements

PERSONNEL INVOLVED: Staff/board

BACKGROUND: Updates will be given on the following: Draft North Hills Work Plan; Support Letters

_X_ADDITIONAL INFORMATION ATTACHED

BOARD ACTION: **NOTES:**

	MOTION	SECOND	AYE	NAY	ABSTAIN	OTHER
Frasier						
Good Geise						
Harrow						
Johnson						
Leland						
Ryan						
Schell						
Scott						

North Hills Hydrogeologic Conditions 2020 Study – Work Plan (DRAFT)

Urban residential growth in the North Hills area of the Helena Valley have created concerns for long-time residents over the sustainability of local groundwater resources. Hydrogeologic studies of current water resource properties in the area are consistent with the mission of the Lewis & Clark Water Quality Protection District (WQPD) "to protect, preserve and improve water quality and quantity within district boundaries." Protection of water resources requires an understanding of the components of the system, so that the impacts from differing management strategies can be assessed. The Montana Bureau of Mines and Geology (MBMG) completed two separate studies characterizing hydrogeologic conditions in the North Hills (Madison, 2006; Waren et al., 2012). More recently, WQPD completed a detailed study of a smaller area on the east side of the North Hills (Swierc, 2020 *in review*). This work plan provides an outline of a data collection program to expand on previous work completed in the area, and provide information to determine the impact of approximately 10 years of development on water availability and water quality in the area. The field program includes additional monitoring in the east North Hills study area, and other areas where only limited data is available.

Purpose and Objectives

The primary purpose of the 2020 study will be to determine whether changes in water quality and water availability have occurred in the North Hills area during the last 10 years. The program will focus on the conditions at the same monitoring locations used for the previous studies. The secondary purpose of the program will be to assess baseline conditions in areas where no or only limited data exists. The study area is presented in Figure 1.

The study will include the area north of the Helena Valley Irrigation Canal and Silver Creek, with a focus on aquifer conditions north of the Helena Valley Aquifer. The goal will be to collect sufficient data to characterize the hydrogeologic conditions in the different general aquifers in the region. The aquifers in the Helena area, including the study area, generally comprise (Briar & Madison, 1992; Waren et al., 2012):

1) bedrock fracture flow systems,
2) aquifers in semi-consolidated sands and clay rich Tertiary deposits, and
3) the geologically recent sand and gravel deposits of the Helena Valley aquifer.

For the North Hills area, the assessment will expand on the results from the recently completed study of the East North Hills (Swierc, 2020 *in review*), which further divided the different aquifers in the area. The Tertiary aquifers comprise the clay-rich Climbing Arrow Formation at the base of the Tertiary, deposited on a bedrock surface; and coarser, undifferentiated Tertiary sediments at the top of the sequence. Different conditions in bedrock aquifers are present where bedrock aquifers are exposed at the surface and where they are present under several hundred feet of clay-rich Tertiary deposits. In addition, in the East North Hills, the hydrogeologic conditions in the developed area north of the main Helena Valley Fault, generally identified by the tree-line at the northern part of the Helena Valley, are poorly understood with only limited data available.

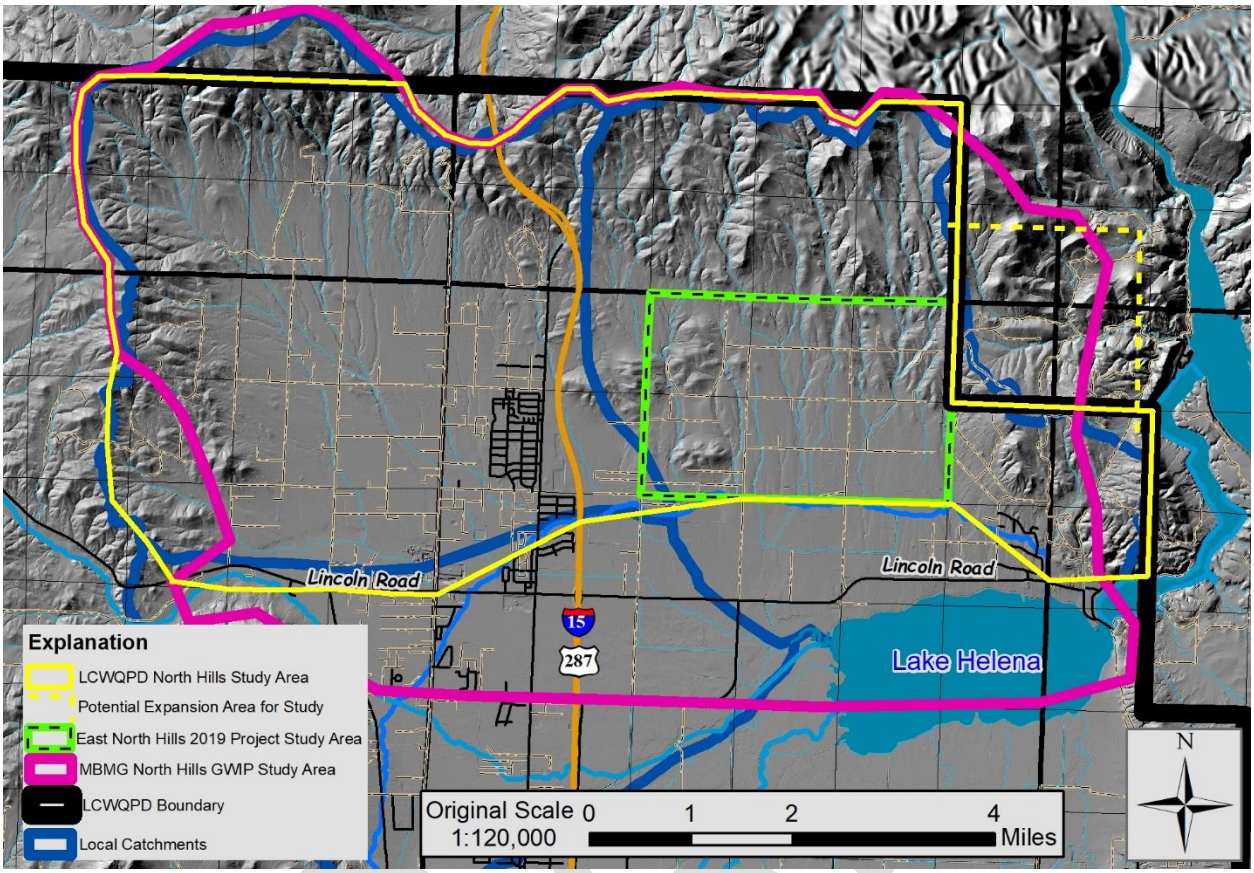


Figure 1 – North Hills Study Area(s)

Overview of Field Program

The field data collection program comprises collecting water levels and water quality samples from wells in the study area. Monitoring will primarily utilize private, potable wells and a limited number of monitoring wells. All field data and sample collection activities will be conducted in accordance with the Quality Assurance Manual for field activities for WQPD (LCWPQD, 2020). The monitoring locations for the proposed program includes both specific locations from previous studies, and general locations in areas where only a limited amount of historical data exists.

Potential water level monitoring locations are summarized in Table 1 and depicted in Figure 2; however, the final locations require permission from residents and will likely not include all the specific locations listed, and likely include some new locations not listed. Water levels will be collected from wells to determine groundwater flow directions, and the magnitude of vertical gradients between and within the different aquifers, if present. Water levels will be collected at a minimum frequency of monthly from all wells in the study, with more frequent collection using datalogging sensors at selected wells. Water level data from wells with historical data will be used to determine the magnitude, if present, of groundwater depletion from pumping. The total number of wells will be determined during the initial phase of the project.

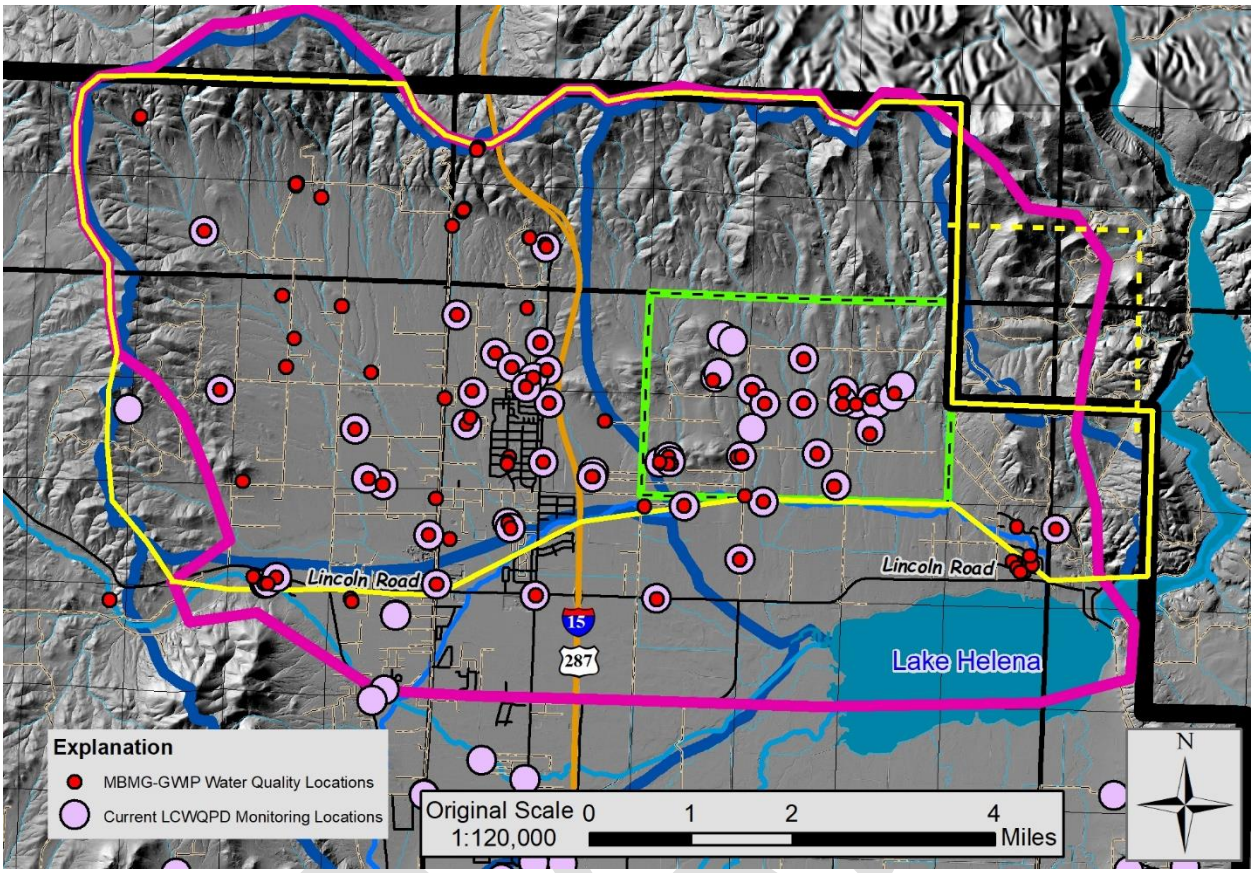


Figure 2 – Water Level Monitoring Locations in the North Hills Study Area

Water quality and water isotope samples will be collected from selected wells, for determination of major ion water quality type, nutrients, selected trace elements and water isotopes. The primary sample location comprise wells included with the most recent MBMG study (Waren et al., 2012), with additional wells in areas where only limited data is present. Nutrient data collected from the same wells previously sampled may provide data to assess the efficacy of county programs to ensure that residential onsite wastewater treatment systems operate at peak efficiency. Previous water quality sample locations are listed in Table 2, and depicted in Figure3. The water chemistry and isotope data will help assess groundwater recharge mechanism, natural background water quality conditions, and potential impacts to water quality from development in the area.

Rain gauges will be installed at locations in both the east and west parts of the study area to obtain specific information on the timing and magnitude of local rain events. This data, coupled with water level data obtained using dataloggers in wells, will allow for a direct assessment of the magnitude of groundwater recharge from the direct infiltration of precipitation in parts of the study area with different geologic conditions.

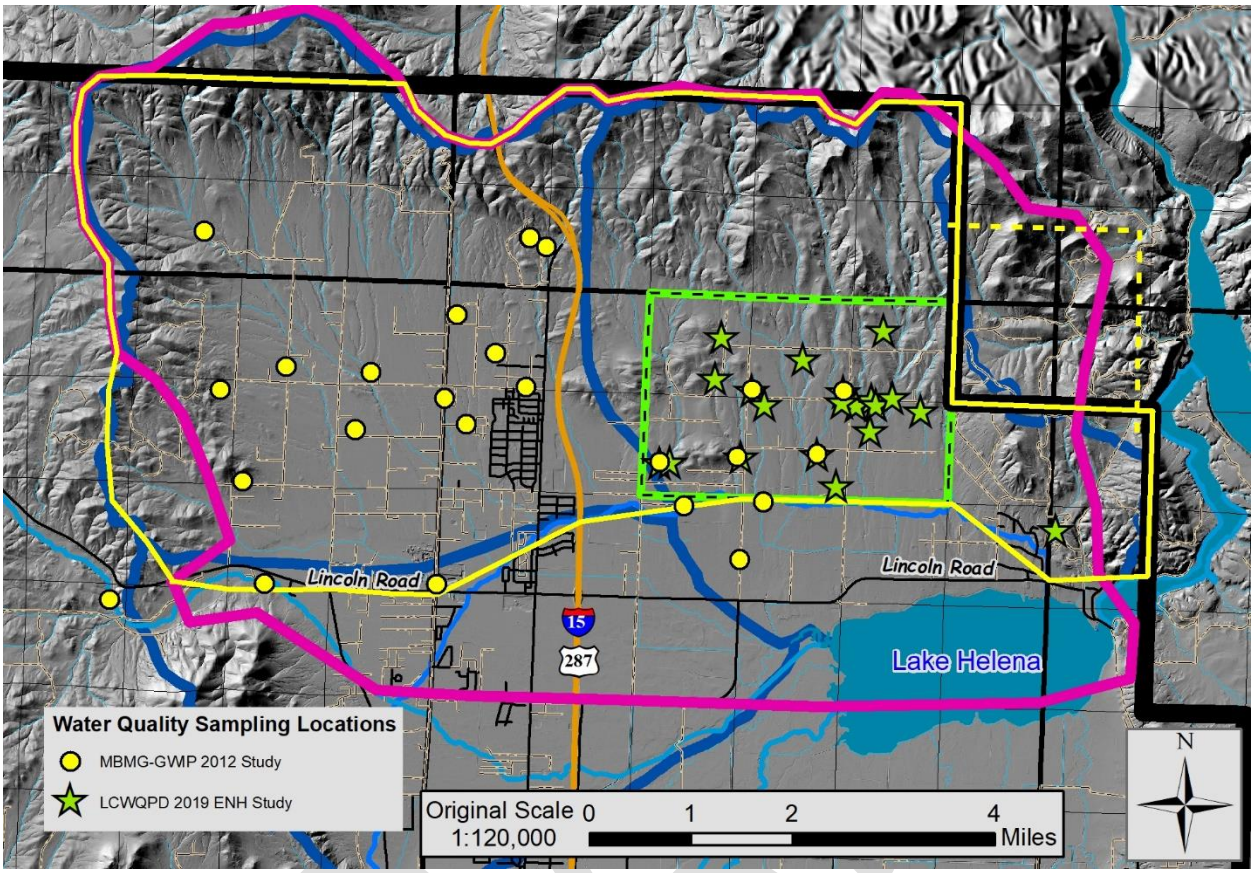


Figure 3 – Water Quality Monitoring Locations in the North Hills Study Area

Specific Study Area Objectives.

Several specific issues are present to different areas in the North Hills. The initial component of the study will comprise compiling all the available data on these issues, to use for developing the final monitoring locations for this program. This work plan will be updated with a more specific monitoring program during the initial stage of the project. The following specific objectives will be addressed for each of the specific areas:

East North Hills

Water quantity issues are present in the area, addressed by the recent report completed on hydrogeologic conditions in the area (Swierc, 2020 *in review*). While the report evaluated conditions in the central part of the study area, only preliminary data was collected from wells on the northern and eastern sides of the main Helena Valley Faults across the study area. The preliminary data showed that different water chemistry and groundwater recharge mechanisms were present in the area, distinct from conditions south of the fault. The following specific data issues will be addressed with this program:

- The only hydrograph present for the area across the fault, well 170202, shows that annual high water levels have declined approximately 30 feet since 2000. With additional houses in the area north and upgradient from this well, additional water levels will provide a method to determine the

groundwater flow direction in this area. The data will be used to determine whether the declining water levels are related to climate change, from pumping from other wells in the area, or both.

- The area north of the Helena Valley Fault monitored in the East North Hills study showed different water chemistry and water isotopes, reflecting a different recharge source than other areas. In addition, the water surface elevation is lower across the fault, reflecting a different hydrogeologic regime. Water levels from this area will help determine the location of the groundwater divide, which is not coincident with the drainage divide, as expected. Since this area has deep wells compared to others in the Helena area, this information will help landowners predict conditions for developing new wells in the area.

- The Helena Valley Irrigation Canal provides recharge to the southern part of the study area, upgradient from the canal. Additional data will help determine the magnitude of this recharge, so that the impacts from potential lining of the canal to reduce stream loss can be estimated. The data will also help define the northern boundary of the Helena Valley Aquifer, present at an east-west fault present north of the canal.

- There are reports of replacement wells installed along Wooten drive. A residence at the west end of this area has two wells where water levels have been monitored. The shallower well, 64740, is installed to a total depth of 220 feet and the water level has been approximately 85-90 feet below surface since 2010. The well log for this shows "clay" from 40 to 220 feet (total depth). A second well at the same location, well 207290, is installed to a total depth of 535 feet, with "clay" to 430 feet, and decomposed/soft shale to 535 feet (total depth). The hydrograph for the deeper well shows a water level approximately 40 feet below surface from 2003 through 2011, declining to approximately 160 feet or more in 2018. Where there was once a vertical upward gradient from the deeper well in bedrock into the overlying clay-rich deposits, the gradient has reversed to vertically downward at this time. This data demonstrates the difference between the deeper bedrock and shallow aquifers in this area. In addition, the drawdown in the deeper well corresponds with drawdown measured at the Department of State Lands (DSL) well 64755 discussed in conditions in the West North Hills.

West North Hills

Water quantity issues in this area were evaluated in detail with the modeling effort presented in the most recent MBMG study for the area (Waren et al., 2012). This area has experienced the bulk of the residential growth in the North Hills area. Water levels in the DSL well 64755 show significant lowering of water levels are depicted in a hydrograph in Figure 4. The hydrograph of wells along the North Montana corridor shows significant drawdown of greater than 150 to 200 feet, seasonally, below the standard pool level for Lake Helena at 3650 feet msl. Since Lake Helena is the discharge point for both surface and groundwater (Briar & Madison, 1992), this indicates an area of depletion of groundwater to lower than this base level. While the source of the depletion has not been established at this time, the closest significant pumping source are Public Water Supply (PWS) wells for the North Star subdivision. This connection was established when drawdown was detected in the DSL well during the pump test for the North Star well(s) in 2011 (Waren et al., 2012). The drawdown in well 207290, further east of the DSL well, shows the same pattern (Figure 4). Water level monitoring data will be reviewed to identify if other depletion areas are present, and the water level monitoring program may be adjusted accordingly during implementation of the project.

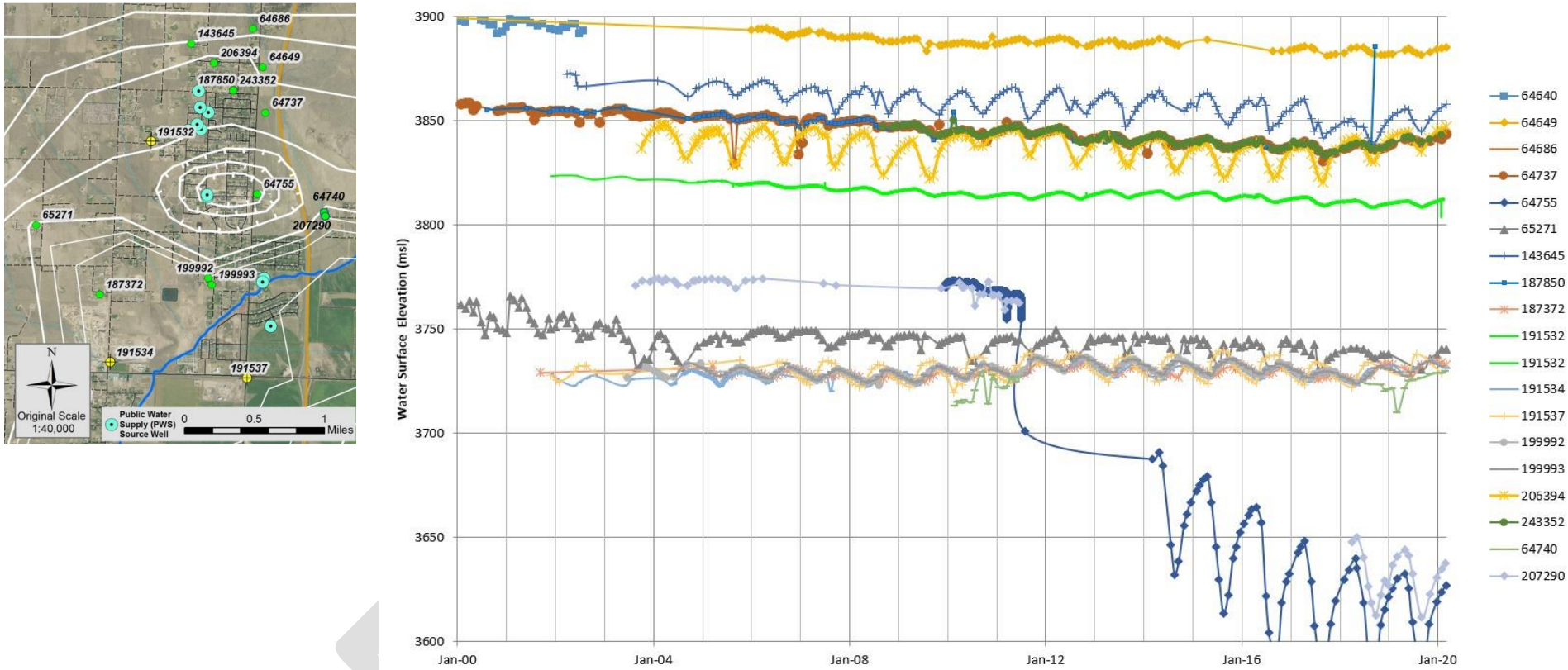


Figure 5 – Hydrograph of Water Levels along North Montana Corridor.

Water Quality Conditions

The primary water quality issues in the Helena area, including the North Hills, comprise impacts from onsite waste water treatment (a/k/a septic systems), and the presence of naturally occurring elements at background concentrations exceeding drinking water standards. Water quality sampling will be conducted at the same locations as in 2011, potentially providing data to assess the efficacy of the septic maintenance program for the area. Data from other areas will help with the assessment of background water quality conditions, and for potential impacts to water quality from urban growth in the area.

Water quality sampling will include the full suite of major ions, nutrients and trace elements arsenic, uranium and fluoride. All samples analysis will be conducted at Energy Laboratories, in Helena. Water isotope samples will also be collected as part of the assessment of recharge sources for groundwater, with analyses completed at the Stable Isotope Laboratory at the Montana Bureau of Mines and Geology.

Schedule

Project implementation will begin during Spring/Summer 2020, with the final start date determined by conditions for social distancing in response to the Covid-19 pandemic. The following lists general target dates and time periods for major project components

Spring 2020, or until end of social distancing protocols): The preliminary components of the project, including developing this conceptual work plan, and compiling all historical data for the project area. Potential monitoring locations with data from previous studies are listed in Tables 1 and 2. The data review will be used to identify areas of concern where water levels are falling, and the need to locate additional monitoring locations.

Spring/Summer 2020: Implementation of water level monitoring program for the study area, including locating and adding additional locations in areas of concern. For wells in selected wells in areas where groundwater depletion is suspected, water level dataloggers may/will be installed to determine relationship between pumping sources and drawdown in nearby wells. During this period, rain gauges will be installed, coupled with water level dataloggers in wells near these locations.

The water quality sampling program will be implemented in a phased approach. Assuming that all social distancing restrictions are lifted, the following represents general sampling timing and objectives. The final sampling locations will be determined based on locations, available data from previous studies, sampling budget and landowner permissions. The different sampling periods include:

- October/November 2020, during seasonal groundwater level low periods. All wells will be sampled for the full analytical suite developed for the project.
- March 2021, selected wells lacking data from previous studies may be sampled for a limited analytical suite, including nutrients and trace elements.
- May/June 2021, during seasonal groundwater level high periods. All wells will be sampled for the full analytical suite developed for the project.
- September/October 2021, selected wells lacking data from previous studies may be sampled for a limited analytical suite, including nutrients and trace elements.

December 2021: All specific field activities for the project, such as water level collection, will be completed. Water level monitoring a long-term locations will continue.

Winter 2022: The report of investigation results will be prepared, and published through MBMG.

References

Briar, D.W. and J.P. Madison, 1992. Hydrogeology of the Helena valley-fill aquifer system, west-central Montana: U.S. Geological Survey Water-Resources Investigations Report 92-4023, 92 p.

LCWQPD, 2020. Quality Assurance Plan; Environmental Sampling Programs. Lewis & Clark Public Health and Lewis & Clark Water Quality Protection District. Unpublished, available upon request.

Madison. J.P., 2006. Hydrogeology of the North Hills, Helena, Montana: Montana Bureau of Mines and Geology Open-File Report 544, 41 p., 3 sheets, scale 1:24,000

Swierc, J.E., 2020. East North Hills Hydrogeology Report, Helena Valley, Montana; Summary of Investigations. Open File Report under Review at Montana Bureau of Mines and Geology

Thamke, J.N., 2000. Hydrology of the Helena area bedrock, west-central Montana, 1993-98, *with a section on* Geologic setting and a generalized bedrock geologic map, by Mitchell Reynolds: U.S. Geological Survey Water-Resources Investigations Report 00-4212, 119 p., 3 pl.

Waren, K., Bobst, A., Swierc, J., and Madison. J.D., 2012. Hydrogeologic Investigation of the North Hills Study Area, Lewis and Clark County, Montana, Interpretive Report: Montana Bureau of Mines and Geology Open-File Report 610, 99 p.

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Table 1 – Current and Potential Water Level Monitoring Locations

Gwic Id	Site Name	Status	Twn	Rng	Sec	Q Sec	Td	Date	Aquifer	First Date	Last Date
5846	USGS * LINCOLN RD EAST	Current	11N	03W	21	BBAA	46.4	9/15/1978	110ALVM	9/26/1978	9/4/2019
64640	TRALLES, STEVE	past/dry	11N	03W	5	CCBC	70	1/1/1961	400SPKN	10/26/1995	1/29/2014
64649	Wilks, Warren & Theresa (f/k/a Tralles)	Current	11N	03W	5	CCBC	110	8/2/1988	400SPKN	10/19/1995	3/2/2020
64686	Aaron, Katherine (f/k/a Sing, Jue K)	Current	11N	03W	6	DAAA	95	9/21/1976	400SPKN	9/16/2002	3/2/2020
64730	HEDDEN, BRETT AND KIRA		11N	03W	7	BBBC	170	4/23/1988	400SPKN	5/26/1989	5/31/2011
64737	STATE OF MT - DEPT OF STATE LANDS	Current	11N	03W	8	BBCB	208	8/4/1982	400SPKN	10/31/1990	3/2/2020
64740	Skillman, Dan (west well)	Current	11N	03W	8	DCBB	220	3/2/1977	400SPKN	2/24/2010	3/1/2020
64755	OFFICE OF STATE FORESTER	Current	11N	03W	8	CBCC	441	1/1/1967	400GRSN	12/22/2009	3/2/2020
64771	PURCELL WILLIAM		11N	03W	9	CB	135	3/27/1986	400GRSN	3/18/2011	7/28/2011
64774	Cole, Connie & David	WQPD Ducer	11N	03W	10	DBAA	420	3/31/1983	400SPKN	11/10/2004	1/31/2020
64798	Richardson, Charles (f/k/a Chase)	Current	11N	03W	15	BBAA	85	5/24/1988	110ALVM	1/31/2010	1/31/2020
65271	McLaughlin, Jack (f/k/a Garrick, Galen)	Current	11N	04W	12	CDDD	176	11/16/1973	400SPKN	7/19/1990	3/2/2020
65294	WIGGINS DONALD		11N	04W	13	AAAD	150	10/12/1975	110ALVM	11/10/1993	9/21/2000
65315	SMELKO DANIEL B		11N	04W	14	CCDA	80	5/14/1985	400SPKN	2/14/2010	2/14/2010
65316	Smelko - by creek (house side)	Current	11N	04W	14	CDCD	97	3/31/1971	110ALVM	2/14/2010	3/4/2020
65432	DRAKE RON AND VIVIAN	MBMG Ducer	11N	04W	24	BBAB	120	4/14/1981	400SPKN	10/31/1995	2/13/2020
66319	WALTHER JAMES		12N	03W	31	ADCC	300	12/17/1974	400SPKN	3/3/2010	3/3/2010
125628	ROSE CURT		11N	03W	18	BCDC	124	11/9/1991	120SDMS	3/3/1994	8/19/2014
128054	Lisa Tucker	Current	11N	03W	3	DDDB	390	4/30/1992	400SPKN	11/10/2004	1/31/2020
138527	WALTHER JAMES		12N	03W	31	ADCC	356	8/23/1993	400SPKN	3/3/2010	6/20/2011
143641	Largis, Jon and Bonita	CurrentENH	11N	03W	3	DBBC	178	2/16/1994	120SDMS		
143645	SALISBURY, JEFF	Current	11N	03W	6	DBC	174	4/4/1994	400SPKN	3/28/2002	3/2/2020
144725	Stolp, Staci & Justin gate combination: 4222	Current	11N	03W	3	CCCB	192	4/6/1994	400SPKN	1/23/2010	1/31/2020
144726	Crowley, Patricia	Current	11N	03W	16	BAA	240	9/30/1992	120SDMS	3/15/2004	1/31/2020
145955	Barkemeyer, Brian	CurrentENH	11N	03W	2	CDCD	254	4/11/1994	400RVLL		
145957	Purcell, William & Joyce - House Well 115' (next to well house)	Current	11N	03W	9	CBDB	115	7/11/1994	400GRSN	10/20/2010	3/1/2020
148259	JAFFE, VAL	MBMG WellNTel	11N	03W	11	BBBA	350	6/17/1993	120SDMS	10/19/1995	4/24/2019
152551	HEDDEN, ROGER		11N	04W	2	CDAD	170	7/31/1992	400GRSN	11/21/2009	6/20/2011
154817	Teigen, Alan & Susan	CurrentENH	11N	03W	10	ABB	458	9/18/1995	400BELT		

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168598	Nuss, Terry & Helen	CurrentENH	11N	04W	12	CDDD	203	5/8/1998	na		
170202	JACOBS, JOHN	Current	11N	02W	18	BBCD	300	10/10/1997	400SPKN	4/21/2000	3/1/2020
176010	Fred Collins	Current	11N	03W	9	DAAD	259	8/11/1999	120SDMS	11/10/2004	1/31/2020
176011	PURCELL WILLIAM S		11N	03W	9	CACB	240	1/20/1999	400GRSN	12/17/2004	5/16/2006
176012	Purcell, William & Joyce	Current	11N	03W	9	CABC	140	1/21/1999	400GRSN	12/17/2004	3/1/2020
176014	Rasmussen, Roy & Gina	CurrentENH	11N	03W	10	DD	180	3/5/1999	ua		
178089	Dargan, Chris (front of shop)	CurrentENH	11N	03W	2	CDD	365	2/24/1999	ua		
180458	DRIVER, SHAWN AND EVELYN		11N	03W	7	BBAA	125	11/20/1998	120SDMS	2/21/2002	10/27/2009
180976	Donahue, Dave	Current	11N	04W	10	AABD	370	12/28/1999	400SPKN	11/21/2009	1/27/2020
187372	Gilskey, Barbara & Daryl (f/k/a Fladland, Jason)	Current	11N	04W	13	ADDB	137	9/20/2000	400SPKN	9/10/2001	3/2/2020
187438	Njos, Kalvin & Tami	Current	12N	03W	31	DAAC	120	8/14/2000	400SPKN	1/19/2010	1/27/2020
187850	WOEHL HERMAN	past/dry	11N	03W	6	DDCD	100	6/3/1972		8/11/2000	9/19/2018
191532	LCWQPD North Hills	MBMG Ducer	11N	03W	7	BCDA	100	11/28/2001	110ALVM	11/28/2001	2/13/2020
191534	LCWQPD - Gravel Pit Well	Current	11N	03W	18	CCCC	100	11/28/2001	110ALVM	11/28/2001	3/2/2020
191537	LCWQPD - LINCOLN AND MONTANA WELL	Current	11N	03W	20	BBBB	43	11/28/2001	110ALVM	11/28/2001	1/31/2020
194435	Hedden, Michael & Cristie	Current	12N	04W	34	DBBD	57	12/19/2001	400SPKN	11/14/2009	1/27/2020
194850	DRAKE RON AND VIVIAN		11N	04W	24	BBAC	180	6/13/2001	211SCGR	4/26/2005	8/22/2007
196245	FORSYTHE REESE AND RITA		11N	04W	2	DBBC	80	3/19/2002	400GRSN	6/26/2003	6/20/2011
198749	RAND MICHAEL AND CYNTHIA		11N	04W	11	CCDB	340	8/15/2002	400SPKN	11/12/2003	6/20/2011
199992	CRAWFORD, LARRY		11N	03W	18	ACAA	134	10/26/2001	110ALVM	6/26/2003	8/21/2018
199993	TANGEN, AMBER AND LLOYD	Current	11N	03W	18	ACAD	135	7/22/2002	110ALVM	6/3/2004	1/27/2020
199997	RATCLIFF RUSSELL AND KENDALL		11N	04W	2	BADB	121	7/24/2002	400GRSN	11/6/2003	6/20/2011
202175	WINSLOW, LYNN AND TRUDY		11N	04W	1	CDBC	98	3/28/2003	400GRSN	6/26/2003	6/20/2011
204043	MEDEMA, WARREN		11N	04W	2	AADD	170	5/7/2003	400GRSN	6/26/2003	11/30/2010
205626	Baughman, Miles and Marieke	CurrentENH	11N	03W	10	BBAC	420	7/14/2003	ua		
206026	Brensdahl, Ken	Current	11N	04W	12	BCDB	200	8/1/2003	400SPKN	10/1/2003	3/2/2020
206393	Lewis, Chris & Ramona (f/k/a Krei Robert D)	Current	11N	03W	6	BCBA	177	6/2/2003	400SPKN	10/1/2003	1/27/2020
206394	Woting, Jan (f/k/a Parsley, Rick & Tracy)	Current	11N	03W	6	DCAB	200	8/4/2003	400SPKN	10/1/2003	3/2/2020
207290	Skillman, Dan (east well)	Current	11N	03W	8	DCBC	535	7/29/2003	120SDMS	8/20/2003	3/1/2020
211387	FOLEY MICHEAL AND JANELL		11N	03W	6	AACC	260	4/24/2004	400SPKN	6/3/2004	7/21/2011
213253	WILSON, LANCE & CHRISTIE R (old well in pasture)	CurrentENH	11N	03W	4	DCDB	324	7/26/2004	400BELT		
218593	NYSTRAND ROBERT		11N	03W	9	DAAC		8/10/1999	120SDMS	11/10/2004	7/28/2011

219845	Boedecker, Brandon - Pro Outfitters	CurrentENH	11N	03W	11	BCAD	221	4/26/2005	ua		
223525	Wilson, Tyrel and Mellisa	CurrentENH	11N	03W	10	AAA	530	12/5/2005	ua		
227906	STEVENS, JERRY		11N	04W	21	AACA	49	8/7/2006	110ALVM	11/23/2009	6/17/2011
228212	PERLINSKI, JEREMY		11N	04W	25	CAAC	370	7/10/2006	211SCGR	2/28/2010	6/20/2011
237167	Smelko - in field	Current	11N	04W	14	CDCD	465	8/23/2000	400SPKN	2/14/2010	3/4/2020
237331	VALLEY CONSTRUCTION		12N	04W	35	ABDA	200	7/18/2007	400SPKN	7/18/2007	7/21/2011
237990	Patelle, Deborah (f/k/a Brelin)	Current	11N	03W	6	DDA	266	7/11/2007	400SPKN	9/10/2008	3/2/2020
239744	Dargan, Chris (on hillside)	CurrentENH	11N	03W	2	CDD	526	10/19/2007	ua		
243352	Kurvink, Greg & Kelly (New Well - taller wellhead) (f/k/a Woehl)	Current	11N	03W	6	DDC	156	3/17/2008	400SPKN	9/10/2008	1/27/2020
246101	Smelko - irrigation (rock on top)	Current	11N	04W	14	CDDA	49	1/1/1918	110ALVM	2/14/2010	3/4/2020
251595	RICHARDS, CHAD & LISA		11N	03W	13	DA	134	7/3/2008	120SDMS	10/23/2009	12/18/2009
251596	SCHULTZ, JAMES & CHRISTINE		11N	03W	13	DBDA	134	7/3/2008	120SDMS	10/23/2009	12/18/2009
251598	KAVAJECZ, JAMES J & NATALIE B		11N	03W	13	DBA	181	6/5/2009	120SDMS	10/28/2009	11/30/2009
251599	HILL, RICHARD J & JOCELYN R		11N	03W	13	DBA	147	5/23/2009	120SDMS	10/23/2009	3/30/2011
251600	NELSON, KELSEY		11N	03W	13	ADCD	190	5/5/2009		10/23/2009	10/23/2009
251602	NIDERMAIER, WILLIAM E & MYRA		11N	03W	13	DABC	168	5/21/2009	120SDMS	10/23/2009	12/18/2009
251605	SNOOK, KENT M. & GAYLE M.		11N	03W	13	DBA	162	7/29/2009	120SDMS	11/18/2009	11/30/2009
252818	PANORAMIC MEADOWS SUBDIVISION LOT 17		11N	03W	13	ABDD			400SPKN	10/23/2009	10/23/2009
252835	PANORAMIC MEADOWS SUBDIVISION LOT 14		11N	03W	13	ABDD	260	5/19/2006	400SPKN	10/23/2009	11/30/2009
253818	DIAMOND HILLS - SHALLOW		12N	03W	31	BCCB	92.35		400SPKN	12/9/2009	7/21/2011
254356	MBMG VX-PW1	MBMG Background	12N	04W	35	BAAA	200	1/26/2010	400SPKN	1/28/2010	12/2/2010
254357	MBMG VX-OW1	MBMG Background	12N	04W	35	BAAA	200	1/27/2010	400SPKN	1/28/2010	12/2/2010
254359	MBMG VX-OW2	MBMG Background	12N	04W	35	BAAA	200	1/28/2010	400SPKN	1/29/2010	12/2/2010
254360	MBMG VX-OW3	MBMG Background	12N	04W	35	BAAA	200	1/27/2010	400SPKN	1/28/2010	12/2/2010
254361	MBMG VX-OW4	MBMG Background	12N	04W	35	BAAA	200	1/28/2010	400SPKN	1/29/2010	12/2/2010
254459	NORTHSTAR DEVELOPMENT PHASE 6 WELL #1		11N	03W	7	DBDC	140		110ALVM	9/16/2009	10/28/2009
254464	NORTH STAR PHASE 6 WELL#2		11N	03W	7	DBDC	110		110ALVM	9/16/2009	12/9/2009

254487	NORTH STAR PHASE 6 WELL#3		11N	03W	7	DBDA	475		400SPKN	9/16/2009	12/9/2009
254596	NJOS CAL AND TAMMY		12N	03W	31	DAAA	60	1/23/2010	400SPKN	1/23/2010	1/23/2010
257001	MBMG VX-OW5	MBMG Background	12N	04W	35	BAAA	120	6/3/2010	400SPKN	6/5/2010	12/2/2010
257064	MBMG -COLLINS ROAD NEW WELL-WEST	Current	11N	03W	16	DAAD	55	7/6/2010	110ALVM	7/8/2010	1/31/2020
257065	MBMG - Purcell, 360' (by pond outlet)	WQPD Ducer	11N	03W	9	CABB	360	7/14/2010	400HELN	8/12/2010	1/31/2020
257066	O'REILLY, HENRY T.		11N	03W	8	ACBA	260	7/22/2010	400GRSN	8/13/2010	7/28/2011
257067	OREILLY, HENRY T.		11N	03W	8	ACBA	45	7/23/2010	400GRSN	8/13/2010	7/28/2011
258290	MBMG SLE-1	MBMG Background	12N	03W	30	CACB	345	9/22/2010	400SPKN	9/24/2010	7/21/2011
258294	MBMG SLE-2	MBMG Background	12N	03W	30	CBDA	350	9/24/2010	400SPKN	10/20/2010	7/21/2011
258401	LEE, SCOTT * MBMG HVF-1	MBMG Background	12N	03W	31	BCBA	255	4/1/2010	400SPKN	5/17/2010	6/1/2010
258402	MBMG HVF-2	MBMG Background	12N	03W	31	BCAB	265	4/7/2010	400SPKN	5/12/2010	7/21/2011
258454	MBMG SLW-1	MBMG Background	12N	04W	28	ADDB	160	9/28/2010	400SPKN	4/9/2011	7/21/2011
258456	MBMG SLW-2	MBMG Background	12N	04W	28	ADDB	160	9/30/2010	400SPKN	11/9/2010	7/21/2011
258597	MBMG HVF-3	WQPD Ducer	12N	03W	31	BBDC	260	4/16/2010	400GRSN	5/12/2010	7/21/2011
268684	GROTBO, BENJAMIN & TATIYANA		11N	03W	13	DA	160	5/30/2006	120SDMS	10/23/2009	12/18/2009
286769	WILSON, LANCE & CHRISTIE R (new well to east of house)	CurrentENH	11N	03W	4	DC	170	3/11/2016	ua		
290440	Ken "Butch' Neil & Fred Pfeiffer	CurrentENH	11N	03W	10	BC	187	11/30/2016	ua		
295393	Fenstermaker, Jerry	CurrentENH	11N	03W	8	DCBB			ua		
706002	HARRIS JAMES		11N	03W	10	CCCC	97		210CRCS	11/2/1993	9/20/1996
892125	LONGMIRE BOB		11N	03W	16	BBBB	125		120SDMS	11/3/1993	5/16/2006
892138	TAYLOR TREVOR		11N	03W	7	BDBB	110		400SPKN	4/28/1989	7/26/1990

DRAFT

Table 2 – Current and Potential Water Quality Monitoring Locations

** - Wells sampled in 2012 MBMG-GWIP Study

East North Hills Area

Gwic Id	Site Name	2019 Study	Comp Date
64774	Cole**	xxx	3/31/1983
64798	Chase**		5/24/1988
128054	Tucker**	xxx	4/30/1992
143641	Largis	xxx	2/16/1994
144725	Stolp**	xxx	4/6/1994
144726	Crowley**		9/30/1992
145955	Barkemeyer	xxx	4/11/1994
145957	Purcell**	xxx	7/11/1994
148259	Jaffe	xxx	6/17/1993
150348	Copenhaver	xxx	2/9/1995
170202	Jacobs	xxx	10/10/1997
176010	Nystrand**	xxx	8/11/1999
176012	Purcell		1/21/1999
176014	Rasmussen	xxx	3/5/1999
178089	Dargan	xxx	2/24/1999
198421	Benchmark Services	xxx	9/9/1996
205626	Baughman	xxx	7/14/2003
213253	Wilson, L	xxx	7/26/2004
216824	Frisch	xxx	10/14/2004
219845	Boedecker	xxx	4/26/2005
223525	Wilson, T	xxx	12/5/2005
257064	MBMG Collins Drive**	xxx	7/6/2010
257065	Purcell MBMG	xxx	7/14/2010
297133	Brown	xxx	6/20/1994

West North Hills Area

Gwic Id	Site Name	Comp Date
64730	Hedden, B**	4/23/1988
65316	Smelko**	3/31/1971
66319	Walther**	12/17/1974
138527	Walther**	8/23/1993
143645	Salisbury**	4/4/1994
152551	Hedden, R**	7/31/1992
180976	Donahue**	12/28/1999
187438	Kjos**	8/14/2000
191532	LCWQPD North Hills**	11/28/2001
191534	LCWQPD Gravel Pit**	11/28/2001
194435	Hedden, M**	12/19/2001
198749	Rand**	8/15/2002
202175	Winslow**	3/28/2003
206026	Brensdahl**	8/1/2003
206393	Krei**	6/2/2003
227906	Stevens**	8/7/2006
243352	Woehl**	3/17/2008

Note – Additional water quality monitoring locations may be added during implementation of the project

DRAFT

Grizzly Gulch Reclamation Project

Lewis and Clark County Water Quality Protection District has sponsored the Grizzly Gulch Reclamation Project for a Department of Natural Resources (DNRC) Reclamation and Development Project Grant (RDG). The project aims to reclaim the Pretty Girl Placer Mine to a functional stream and floodplain. The mine is located in Grizzly Gulch, approximately 4 miles south of downtown Helena.

Existing Condition

- Placer mining over the past century has completely obliterated the stream and riparian area of Grizzly Gulch
- Groundwater – surface water interaction is disrupted and not functioning naturally
- Persistent standing water:
    - Haven for bugs, algae
    - Unnatural for geomorphic setting
    - Evaporative loss decreases aquifer storage
- Steep, unstable side slopes adjacent to Grizzly Gulch Drive are hazardous to vehicular and pedestrian traffic
- No wildlife habitat
- Lack of vegetation creates unnatural warming
- Disturbed soils are haven for noxious/invasive weeds
- Sediment and thermal degradation to water quality

Photo 1. Pretty Girl Placer Mine view north

Photo 2. Pretty Girl Placer Mine view south

Proposed Condition

The proposed reclamation design reviewed several alternative approaches to restore the natural function of the Grizzly Gulch riparian area. The existing conditions characterize a substantial material deficiency resulting from over a decade of material removal from the site. The cost-effective restoration solution selected utilizes material available on the site to restore a continuous floodplain gradient through the site. The consistent gradient, coupled with a meandering stream channel and aggressive revegetation strategy, will reclaim the site through restoration of hydrologic function, enhancement to water quality, creation of wildlife habitat, and improvements to public safety and recreation access. A design overview is shown in Figure 1.

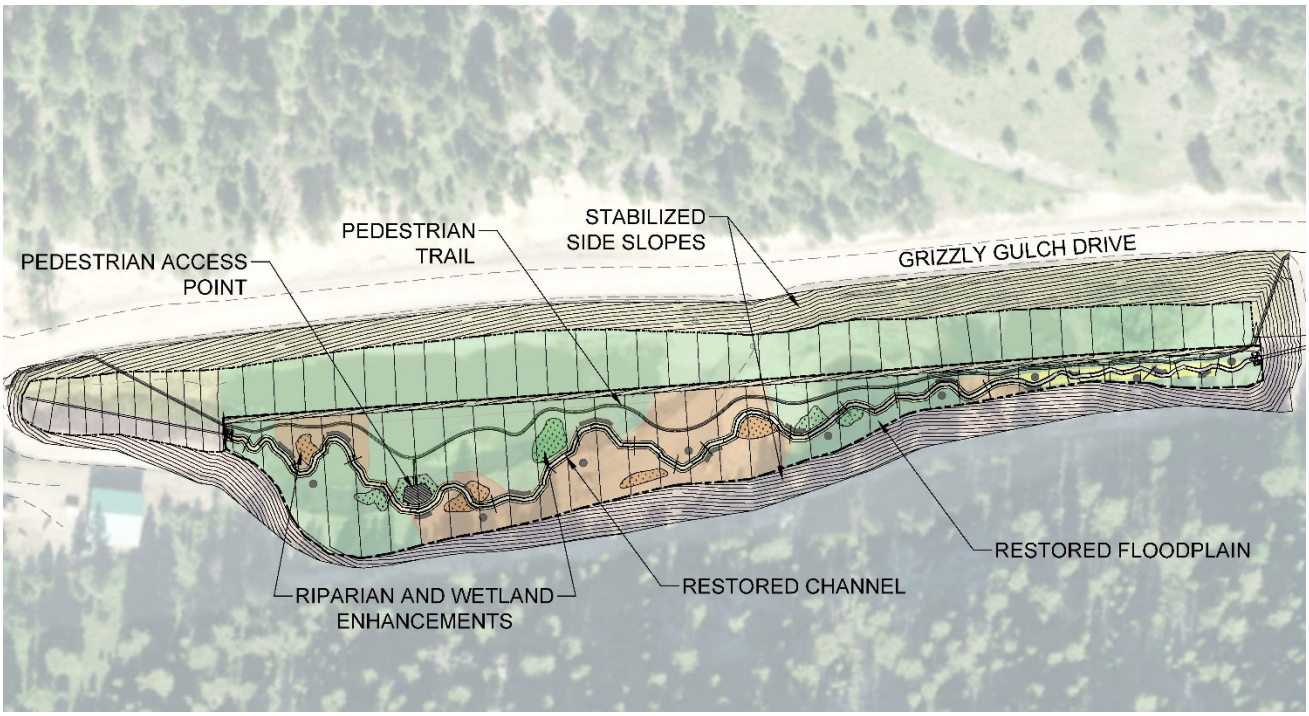


Figure 1. Grizzly Gulch Reclamation Project – Design Overview

Design Features

- Restores:
  - Groundwater-surface water hydrology
  - Stream and floodplain connectivity
  - Wetland and riparian function
  - Upland, riparian, and aquatic habitat
- Creates:
  - 1,000' of new stream channel
  - 1.20 acres of wetland area
  - 3.30 acres of total revegetated area
  - 1,100' of pedestrian trail with a dedicated stream access point
- Enhances water quality with:
  - Vegetated slopes that reduce erosion and sedimentation
  - Culverts that eliminate overtopping outflows from standing water areas which cause erosion
  - Riparian vegetation shading stream flow keeping water cool
- Improves:
  - Traffic safety with flatter side slopes, new guardrail, separation of pedestrian traffic from roadway
  - Visual aesthetics by replacing degraded system with a natural, functioning system

Groundwater Modeling Web App.

Factsheet

Background

- DNRC received a crucial state need grant to do a pilot project looking at the applicability of using a groundwater modeling web application in the pre-application phase of the water right permitting process.

- Two groundwater models (Flathead Valley and West Billings area) were uploaded into the web. These are the top two locations in Montana for groundwater permit applications.

- DNRC is coordinating with MBMG on their groundwater web application project and have the same contractor.

Pilot Study to Evaluate Web App

- A user will be able to insert a well at a specific location on a map, enter a well depth and pumping rate into the web application. The web application will run the model and generate a groundwater contour map and identify the surface water that may be impacted if a well was developed at that location.

- After some initial testing and QA/QC, these models will be used by the DNRC regional office hydrologists for water right pre-application meetings to show applicants which nearby wells or streams may be potentially impacted by a proposed groundwater development.

- A report documenting the groundwater model web applications usefulness to applicants, DNRC, and statewide application will be completed during the one-year pilot period.

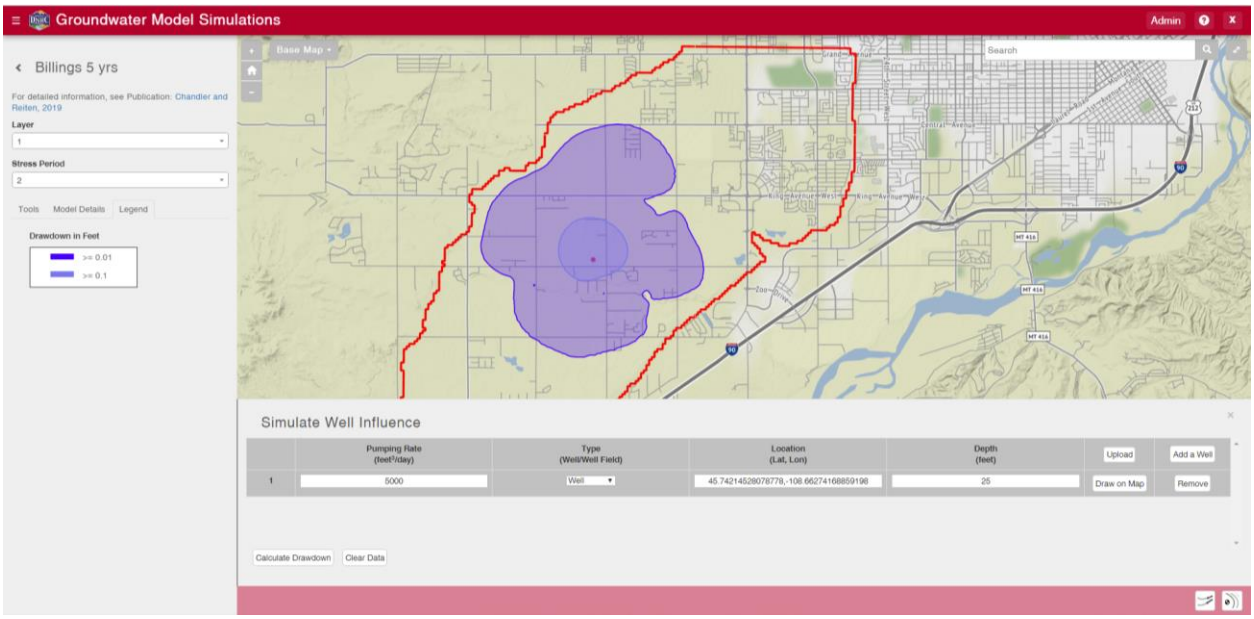
Future Work

- Additional funding will be needed to upload more groundwater models for DNRC and potentially for public consumption in the future.

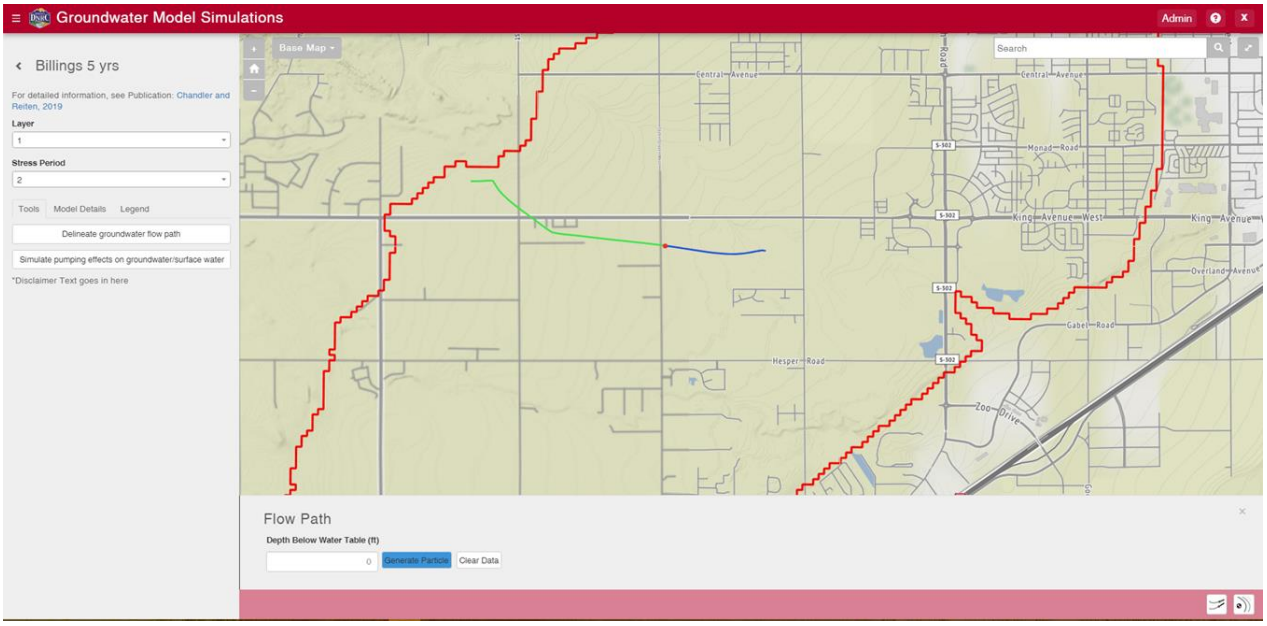
- In conclusion, the groundwater modeling web application allows a user who doesn't understand a groundwater modeling software (e.g., MODFLOW) or its graphical user interface the ability to understand the potential impacts that a proposed well may have on an aquifer and surface water. In the future, this web application will make it possible for future groundwater models to be more readily used by the public.

Example Web App Outputs

1) Drawdown in Source Aquifer



2) Particle Tracking in Source Aquifer



LEWIS & CLARK COUNTY
WATER QUALITY PROTECTION DISTRICT
Helena, Montana

BOARD AGENDA ITEM

Meeting Date	**Agenda Item No.**
April 28, 2020	**8**

___Minutes _X_Board Member Discussion ____Staff & Other Reports __Action ___Hearing of Delegation

AGENDA ITEMS: Board Member Discussion

PERSONNEL INVOLVED: Board Members

BACKGROUND: This time has been set-aside for the board members to bring up any topics they would like to discuss or add to the agenda of future meetings.

_ADDITIONAL INFORMATION ATTACHED

BOARD ACTION: **NOTES:**

	MOTION	SECOND	AYE	NAY	ABSTAIN	OTHER
Frasier						
Good Geise						
Harrow						
Johnson						
Leland						
Ryan						
Schell						
Scott						

LEWIS & CLARK COUNTY
WATER QUALITY PROTECTION DISTRICT
Helena, Montana

BOARD AGENDA ITEM

Meeting Date	**Agenda Item No.**
April 28, 2020	**9**

___Minutes __X_Board Member Discussion ___Staff & Other Reports ___Action ___Hearing of Delegation

AGENDA ITEMS: Public Comment

PERSONNEL INVOLVED: Public and Board Members

BACKGROUND: Time is allowed for public comment on matters within the Water Quality Protection District's boundaries not mentioned on the agenda.

RECOMMENDATION: n/a

___ADDITIONAL INFORMATION ATTACHED

BOARD ACTION: **NOTES:**

	MOTION	SECOND	AYE	NAY	ABSTAIN	OTHER
Frasier						
Good Geise						
Harrow						
Johnson						
Leland						
Ryan						
Schell						
Scott						

For Your Information

Lewis & Clark City-County
Water Quality Protection District
316 North Park
Helena, MT 59601

Lewis & Clark County
Water Quality
Protection District

FISCAL YEAR 2020

3RD QUARTER

JANUARY 1 - MARCH 31

Our mission is to preserve, protect and improve water quality and quantity within District Boundaries

Our Values

- We strive for **competent, knowledgeable stewardship** of the environment
- We practice **transparent** and **accountable** service.
- We maintain a **culture of leadership, service, commitment,** and **integrity**
- We **collaborate** with partners, customers, and our community to preserve, protect, and improve water resources.

Goal 1

Improve the public's support for and understanding of the WQPD Mission

1.1 Provide educational opportunities to improve understanding of water issues

3 12 total Goal: 8
Education and outreach events partnering with other agencies or organizations

839 Goal: 1550
4th and 5th graders participated in the Water Watchers water education program

0 Goal: 2
High school classes participating in Water Watchers water education program

1 2 total Goal: 3
Events hosted by the WQPD to share water-related information to the public

1.2 Provide access to clear, concise data and info on public platforms

Data management system and master database created

Mapping application created that allows public to access all WQPD collected data

Quality Assurance documentation created for WQPD data collection activities

Create Story Maps to share data and information

1.3 Encourage public participation across all District activities

1 4 total Goal: 5
Promote messaging through social media and printed materials

11 45 total Goal: 40
Number of Well-Educated Kits distributed

1.4 Coordinate and assist with the operation of the watershed groups

Staff member coordinates Lake Helena Watershed Group meetings and events

0 3 total Goal: 5
Projects or events carried out through partnership with the Lake Helena Watershed Group

312 Goal: 315
People receiving watershed-related news through E-Newsletters

"The art of teaching is an art of assisting discovery."
- Mark Van Doren

Jim Darcy Kid's College Days

In March, the WQPD participated in Jim Darcy Elementary School's Kid's College Days. This is Jim Darcy's 18th year, many of which the WQPD has participated in. This event gives all 1st and 2nd graders an opportunity to experience all types of career paths including becoming a Police Officer, or a Fish, Wildlife and Parks Specialist. Kid's College Days takes place on three Friday afternoons for one hour.

This year, the WQPD led students through several hands on-activities, including a fun and interactive experiment that teaches students how water moves through the earth, demonstrating key concepts that a Water Quality Specialist uses daily to understand how pollution impacts water sources (see photo, left).

Unfortunately, this year we were only able to get in one class before Jim Darcy canceled the event due to the Coronavirus outbreak.

Using celery, water, and food coloring, this simple experiment helps children (and adults!) understand how pollution can get into our water, and pumped up through our wells (and through plants).

Practicing Transparency and Accountability:

The WQPD endeavors to provide proper documentation on its environmental monitoring and data collection programs. Several planning and reporting documents were developed during the third quarter of this fiscal year in support of the District's groundwater and surface water monitoring programs. These documents ensure that data is collected using appropriate procedures. In concert with the below documentation, the WQPD has also developed an on-line map viewer **(https://arcg.is/b14q9)** that allows the public to access and view groundwater levels collected by the District, and is presently developing a similar on-line interface that will allow the public to access and view water quality data collected by the District. Collectively, these efforts will provide a comprehensive system for the District's environmental data collection, data management and storage, and public data delivery. The Quality Assurance Plan, as well as the East North hills Summary FAQ Sheet, are attached to this report and can be found in the last pages. The other documents can all be found on the District's website at: **lccountymt.gov/health/water**

Quality Assurance Plan: Environmental Sampling Programs
This document provides information on how the WQPD collects and manages hydrologic data. It includes methods, protocols, quality assurance, and data management processes employed by the WQPD.

2020 Groundwater Monitoring and Sampling Plan
This document provides details on the WQPD's planned efforts to collect well water levels and groundwater quality samples. It includes locations and frequencies of water level data collection for calendar year

2020 Tenmile Creek Groundwater Monitoring Plan
This document provides details on the WQPD's plan to collect groundwater level data within the Tenmile Creek and Silver Creek flood zones. It includes locations and frequencies of water level data collection for calendar year 2020.

2020 Streamflow Monitoring Plan
This document provides details on the WQPD's plan to collect streamflow data on Prickly Pear Creek, Tenmile Creek, Sevenmile Creek, and Silver Creek. It includes locations and frequencies of streamflow data collection for calendar year 2020.

Tenmile Creek Groundwater Monitoring Program: 2019 Summary Report
This document reports on the results of 2019 groundwater level monitoring in the Tenmile Creek and Silver Creek flood zones.

East North Hills Summary FAQ Sheet
This FAQ sheet is a brief summary of water quality and water level results from the WQPD's East North Hills hydrologic assessment efforts. A detailed technical report has been prepared and is currently in review by the Montana Bureau Of Mines & Geology.

Goal 2

Design and implement projects that protect and improve water quality and quantity

2.1 Operate surface water and groundwater monitoring networks

209/250
Groundwater level measurements

Collect surface water measurements according to annual sampling plan

3/5
Sampling and analysis plans reviewed and updated for future monitoring

2.2 Identify, prioritize, and implement project opportunities

Work with landowners and partners to improve riparian areas and implement other water-related projects

Work with partners on water resources and other related projects

2.3 Encourage public participation across all District activities

20 **20 total Goal: 30**
Number of volunteers recruited for projects and events

0 **0 total Goal: 3**
Number of landowner connections made to implement projects

2.4 Identify, prioritize and implement funding opportunities

Evaluate and update the Lake Helena Restoration Plan

Research and apply for appropriate grant opportunities

Goal 3

Inform public policies for the management of water quality and quantity

3.1 Provide issue-specific information to stakeholders and decision makers.

- ✓ Generate District reviewed summary materials on water quality or quantity issues
- ⊖ Attend County planning meetings

3.2 Advocate for legislation that supports the District`s activities.

- ⊖ Provide or present information to Legislative Committees
- ⊖ Research and track bills that affect the District or water resources

Goal 4

Optimize internal organizational capacity to support the District's activities

4.1 Provide technical training to staff and Board.

0 **0 total**
Goal: 4

Provide WQPD staff workforce development training

0 **1 total**
Goal: 2

Provide the WQPD Board with board development and orientation

1 **8 total**
Goal: 4

Provide WQPD staff with professional development

4.2 Develop internal policies and procedures that enhance District operations

Write policy that directs WQPD responses to public requests and queries

Develop, implement and evaluate work plans, reporting and data review procedures including project and funding requests

Develop procedures and protocols for external and internal review of documentation that is for public consumption

4.3 Identify and implement Quality Improvement projects

Evaluate District activities and conduct a QI project when necessary

Tracking Customer Service:

A quality improvement project

WQPD staff are in and out of the office frequently due to commitments to field work, attending meetings, conferences and training, or responding to public investigation requests. Often, people calling the WQPD for any number of reasons will leave messages on more than one staff member's answering machine. Tracking down whether the individual has received the service or information they were looking for can be challenging. In order to eliminate that confusion and to improve our customer service, we created an online database that tracks any public interaction (phone call, field visit, or in-person visit), and important details associated with that interaction such as: the date of interaction, what type of request was received, whether or not the request was satisfied, who resolved the request, and any additional comments.

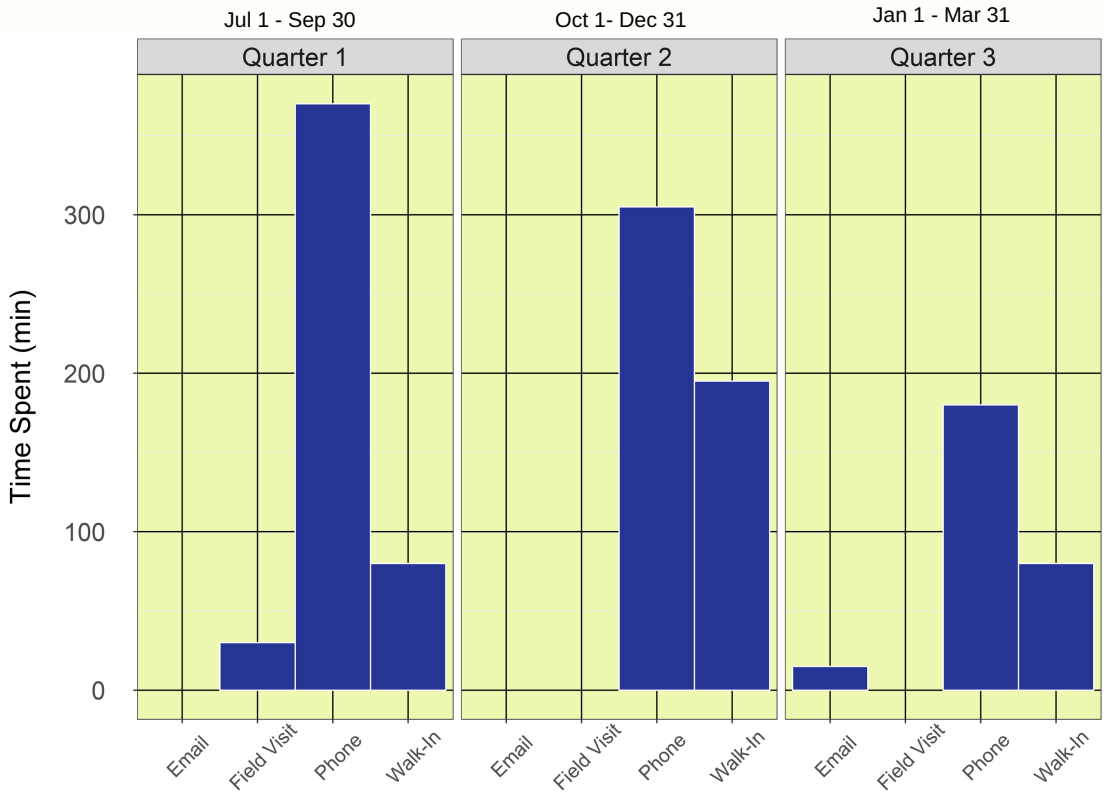
Staff can now check the database to see whether or not the individual already received service through another staff member. Additionally, tracking this information has shed light on the amount and types of services that people are most concerned with. Through this database, we also improved our tracking of the number of well-educated kits distributed.

A quick look at the stats for Q3:

This quarter, time spent with the public was a bit less than the previous two quarters, probably in large part due to the COVID-19 outbreak and the stay-at-home order that has impacted all of us.

The time we did spend was also more evenly spread across a number of topics compared to previous quarters, and the majority were related to personal water quality concerns of individuals wanting to test their well water.

Total time spent (minutes) per type of interaction



Quarter 3 stats:

11 Well-Educated Kits Distributed
45 total distributed YTD

0 Site Visits
Total time spent: 0 min

19 Phone Calls
Total time spent: 3.0 hours

1 Email
Total time spent: 0.25 hours

5 Walk-Ins/ Meetings
Total time spent: 1.3 hours

Tracking Customer Service: types of interactions

As the WQPD began tracking the number and types of calls and requests that they receive as of July 1st, 2020 (Fiscal Year 2020), we have been able to get a better idea of the most common needs and concerns of residents living in the District.

Concern/Complaint
Example(s): reporting of improper sprinkler use, concern of unlawful dumping of sewage or other contaminents near waterways or near wells

Information Request/Assistance
Example(s): requests for professional opinions on development (such as gravel pit or subdivision), discussions of Harmful Algae Blooms (HABs), requests for guidance on flood-related issues, or interpreting water quality results

Surface Water: general
Example(s): discussions regarding surface water flows

Water Quality: other
Example(s): concerns regarding private water supply (discolorations or odors, for example)

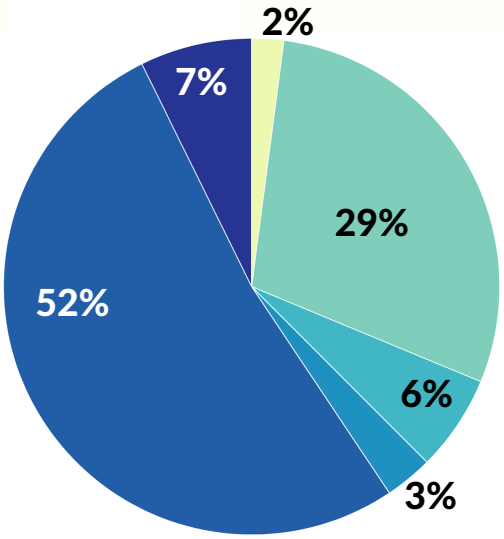
Water Quality: well testing
Example(s): need for well testing by third party to comply with FHA loans, general requests for well testing (usually in response to a concern of potential contamination), distributing Well-Educated kits

Water Quantity
Example(s): concerns of water supply or yields, requests for water level monitoring, general discussions of local groundwater conditions or trends

WQPD Business
Example(s): discussions with partners and the public of upcoming meetings or events, other disucssions with external companies or services

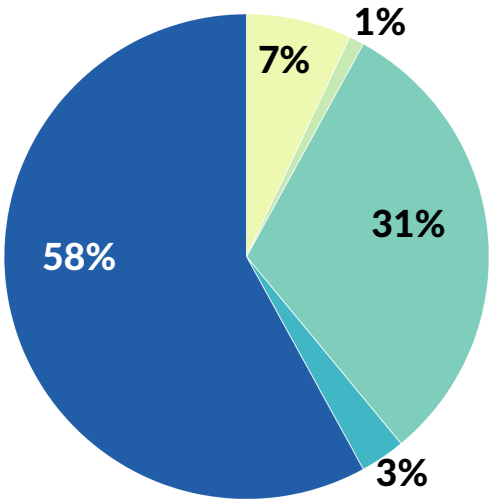
Time Spent per Issue

Quarter 1 (Jul 1-Sep 30)



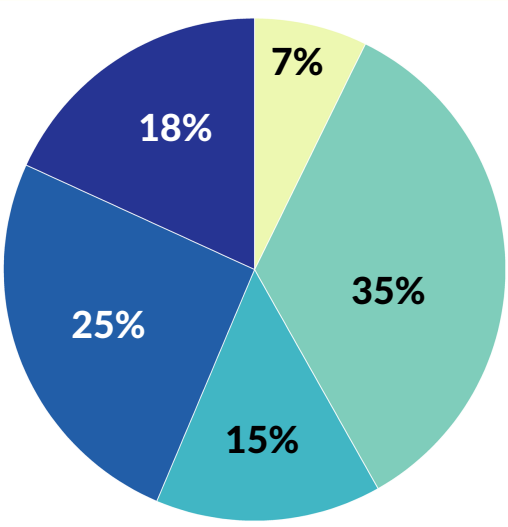
480 min
or ~8 hours

Quarter 2 (Oct 1-Dec 31)



500 min
or ~8.25 hours

Quarter 3 (Jan 1-Mar 31)



275 min
or ~4.58 hours

Attachments

Lewis and Clark County
Water Quality
Protection District

East North Hills
Hydrogeology Investigation

SUMMARY

With increased development activity for the East North Hills area, residents expressed concern about impacts to long-term availability of water. With limited information in this area, the Lewis and Clark County Water Quality Protection District (WQPD) conducted an investigation to gain a better understanding of the current condition of water supplies.

What we did:

- WQPD staff measured water levels and collected water quality samples from residential wells throughout the East North Hills area, beginning in the summer of 2018
- We collected water levels in 2018-2019 and compared those to the levels collected 15 and 10 years ago by the Bureau of Mines and Geology (MBMG), to determine if depletion has occurred
- We collected water quality samples to help us identify the different sources of water, and the quality of each of those water sources

Water Levels Accessible Online

To view water levels in the East North Hills, as well as valley-wide, please visit: arcg.is/b14q9

What we learned:

- 8 of the 11 wells that had historic data showed water levels that were similar to those over 15 years ago
- Three wells did show a decline of about one foot per year over the past 15 years
- The three main sources of water ("aquifers") in the area are:
  - Shallow bedrock aquifer: located in the western part of the East North Hills, generally produces reliable yields
  - Clay-rich aquifer: less reliable in terms of yields, and has a higher risk of depletion due to its limited recharge (it's harder for water to travel through clay)
  - Deep bedrock aquifer: underneath the clay-rich aquifer (deeper), with more reliable water supply

*A full technical report is currently in review by the Montana Bureau of Mines and Geology. Upon publication, this report will be available to view online.

View looking North at the East North Hills study area (box)

Published: March 2020

Lewis and Clark County Water Quality Protection District
406-457-8584; lccountymt.gov/health/water

East North Hills
Hydrogeology Investigation

FAQ

Will development of new homes and wells impact future water supplies?

Not necessarily. Drilling new wells deep into bedrock should limit the impacts of new wells to existing wells. Bedrock aquifers are more reliable and generally produce better yields than wells drilled into the clay-rich aquifer.

How will climate change impact the future of our water supply?

While it's not possible to predict exactly how future changes in climate will impact the East North Hills, we would expect to see impacts to water supplies that are linked closely to snowpack and precipitation patterns. The Montana Climate Assessment states:

- "A warming climate will strongly influence Montana's snowpack, streamflow dynamics, and groundwater resources, with far-reaching consequences for social and ecological systems"
- "Earlier onset of snowmelt and spring runoff will reduce late-summer water availability in snowmelt-dominated watersheds"

  Please visit: montanaclimate.org for more information

This study was conducted after two very wet years. Does that influence the conclusions of the study?

No. By looking at wells with a data record over a 15-year period, we accounted for the yearly and seasonal variation when we evaluated the long-term trend (stable or declining).

Why wasn't data presented from all wells in the area?

To determine trends, we needed to compare water levels to the levels observed over the past 15 years. For this reason, only wells with multiple years of data were included in the analysis.

What is the Water Quality Protection District doing now that the study is complete?

WQPD staff will continue to monitor wells in the East North Hills, and will continue to track water levels throughout the area. All current water level data can be accessed by visiting: arcg.is/b14q9

What can I do to conserve water?

There are a variety of practices, big and small, that you can do to save water in your home. Outdoor irrigation is the biggest use of water in any household, and presents the biggest opportunity for water-saving. Below are a few tips:

- Update the timing (only watering early in morning or late at night) and structure (drip irrigation vs. high-powered sprinklers) of your irrigation
- Mulch! (fewer weeds, less water)
- Capture storm runoff by installing rain gardens and rain-barrel collection systems
- Try "Xeriscaping" when possible: the use of drought-tolerant plants and materials that require very littler water to maintain
- Installing low-flow and high efficiency toilets, faucets, and shower heads in the home can also save a household hundreds of gallons of water each year

QUALITY ASSURANCE PLAN
ENVIRONMENTAL SAMPLING PROGRAMS

LEWIS & CLARK PUBLIC HEALTH
LEWIS & CLARK WATER QUALITY PROTECTION DISTRICT

Approval:

_____ _____

Jennifer McBroom, Lewis & Clark County Water Quality Protection District Supervisor Date

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1.0 Introduction

This document presents a *Quality Assurance Plan (QAP)* for environmental sampling conducted by Lewis & Clark Public Health Water Quality Protection District (WQPD). The QAP presents the field and laboratory activities, and methods for monitoring and sampling of surface water and groundwater within the Lake Helena watershed and adjacent areas.

The QAP is intended to provide a consistent and acceptable approach to data collection and management that will facilitate achievement of program objectives. Implementation of this QAP will ensure that data collected, compiled, and generated for WQPD projects are complete, accurate, and of the type, quantity, and quality required for their intended use.

In addition to this QAP, individual **Project Plans** are developed for specific data collection projects initiated by the WQPD. Project Plans include individual project details such as: project map, monitoring stations, monitoring frequency & timeline, sampling parameters/analytes, and other vitals specific to each project (see Appendix C). In many cases, WQPD collects single samples for analysis, or measures individual wells that are not associated with a Project per se but are still a component of WQPD's environmental assessment activity. In these cases, methods, analyte lists, and field forms contained herein are sufficient to document monitoring activity.

2.0 Field Activities and Sampling Methods

Field activities addressed by this QAP consist primarily of groundwater and surface water monitoring in the Helena Valley area of West-Central Montana. Groundwater monitoring includes measurement of water levels from wells, and collection and analysis of groundwater quality samples. Surface water monitoring includes channel cross-section and streamflow measurements, and collection and analysis of surface water quality samples. Where appropriate, data loggers are installed at some groundwater and surface water monitoring stations to record continual water level or stage measurements.

All sampling activity, as outlined in the following sections, follows standard protocols for environmental sampling to ensure data quality. For all field monitoring, field sheets are used to record appropriate field information at each monitoring station. Copies of these sheets are provided in Appendix A.

2.1 Groundwater Monitoring

Groundwater monitoring includes groundwater quality sampling and groundwater level measurements conducted at both dedicated monitoring wells and private residential wells. Field forms for the collection of groundwater samples, field parameters and water levels are provided in Appendix A. Appendix B includes common analyte lists used by the WQPD for laboratory analysis of groundwater samples. Individual WQPD Project Plans typically employ one of these analyte lists.

2.1.1 Water Level Measurement

Water levels are measured manually using either an electric sounding tape or a sonic water level meter. When measuring water levels using an electric sounding tape, measurements are collected following procedures found in USGS publication Groundwater Technical Procedures of the U.S. Geological Survey (Cunningham and Schalk, 2011). Sonic water level measurements are collected using a Ravensgate Model 300 Sonic Water Level Meter, operated in accordance with manufacturer's specifications.

In addition to manual water level measurements, data loggers that measure and store water level and water temperature data at established intervals (typically one hour) are deployed in several wells and may be moved among wells within the network as warranted. A variety of data loggers from manufacturers, Onset and Solinst, are deployed and operated in accordance with manufacturer's specifications.

2.1.2 Groundwater Quality Sampling

Groundwater quality sampling addressed in the QAP, only covers those wells where aquifer-quality samples are desired. Samples collected for the purposes of assessing drinking water quality are not covered under this QAP as they have different objectives and require different sampling methods depending on sampling objectives.

Groundwater samples will be collected after purging the well casing to induce flow into the well screen. During sampling, field parameters pH, specific conductivity, temperature and dissolved oxygen will be monitored to verify that recovered water is representative of groundwater conditions at the sample location. The purging method will be determined based on well construction and the depth to the water table. When possible, low-flow methods for well purging will be utilized to minimize the disturbance to the water column, with a goal of pumping at a rate that matches the recharge rate of the well, so that no drawdown is observed in the well. All purged water will be discharged to the ground away from the wellhead. Samples will be collected in acid-washed, polyethylene containers obtained from the project laboratory. Sampling methods are summarized as follows:

- An electric pump will be used for monitoring wells with a diameter equal to or greater than 2-inches. Parameters will be monitored using an in-line flow cell during well purging. The sample will be collected only after consecutive readings demonstrate stability of groundwater chemistry.
- A peristaltic pump will be used for piezometers with a diameter less than 2-inches, and a water level less than 25 feet below ground surface. Parameters will be monitored using an in-line flow cell during well purging. The sample will be collected only after consecutive readings demonstrate stability of groundwater chemistry.
- Bailers will be used for monitoring wells where pumping methods will not work. A new, disposable bailers will be used at each well. Purge volumes will be monitored, and parameters measured after each well volume has been removed. Sample filtration will be completed using the peristaltic pump.
- For private, potable water wells, samples will be collected from frost-free hydrants prior to any treatment for the wells. The well discharge will be split, with primary flow discharged away from the well head, and a lesser flow directed to an in-line flow cell for parameter monitoring. Samples will be collected after consecutive readings demonstrate stability of groundwater chemistry.
- Groundwater sampling equipment pumps will be decontaminated between each well by scrubbing exposed components with an alconox detergent solution, followed with a rinse in distilled water. The internal components of the pump will be washed by recirculation pumping the alconox solution through the pump and tubing, followed by a distilled water rinse using the same solution.

2.1.3 Groundwater Field Parameter Measurement

Field parameters pH, specific conductivity, temperature and dissolved oxygen will be monitored using a *YSI Professional Plus* multi-parameter meter. For groundwater sampling, a YSI flow cell will be connected to the pump discharge tube for in-line monitoring of parameters without atmospheric

exposure. The meter will be calibrated each day prior to use following manufacturer's instructions. All calibration data will be logged for verification.

2.2 Surface Water Monitoring

Surface water monitoring includes surface water flow measurements and water quality sampling at established stream monitoring stations. **Field forms** for collection of water quality samples, field parameters, and discharge measurements are provided in Appendix A. Appendix B includes common analyte lists used by the WQPD for laboratory analysis of surface water samples. Individual WQPD Project Plans typically use this analyte lists, however individual Project Plans may include modified parameter suites.

2.2.1 Surface Water Flow Measurement

Surface water flow measurement consists of measuring in-stream flow manually, and stream stage using data loggers at established monitoring stations: both *Onset* loggers and *Tru-Track* loggers are used. Data loggers record continual stage (water height) at pre-selected time intervals throughout the monitoring season (May-October). Data loggers are attached to vertical steel stakes driven into the stream channel (**Figure 1**). In order to associate the stage measurements collected by the data loggers to stream discharge in cubic-feet/second (CFS), manual in-stream flow measurements at a variety of different stages are collected. Discharge measurements provide the basis of development of a rating curve, which allows correlation of stage with discharge.

Monitoring activity consists of installing the data logger devices and an accompanying staff gage at each monitoring station, and then collecting several manual flow measurements at different stages using a *Marsh-McBirney Flow Meter*. At the end of each monitoring season, data from the loggers is downloaded to a computer and flow rating curves for each station are established. Streamflow measurement methodology follows procedures established in *Montana DEQ Water Quality Planning Bureau Field Procedures Manual for Water Quality Assessment Monitoring* (DEQ, 2012).

When measuring discrete flows from drains or springs, discharge is measured by collecting all flow into a five-gallon bucket and measuring the amount of time required to fill the bucket. The flow measurement is completed three times to verify flow rates.

2.2.2 Surface Water Quality Sampling

Surface water quality sampling consists of acquiring water quality grab samples from streams, springs, effluent streams, irrigation canal, drains, lakes and ponds. Water quality sampling methodology follows procedures established in *Montana DEQ Water Quality Planning Bureau Field Procedures Manual for Water Quality Assessment Monitoring* (DEQ, 2012).

2.2.3 Surface Water Field Parameter Measurement

Field surface water parameters pH, specific conductivity, temperature and dissolved oxygen are measured using a YSI Professional Plus multi-parameter meter. The meter will be calibrated each day prior to use following manufacturer's instructions. All calibration data will be logged for verification. The parameter measurements collected during sampling will be recorded on the surface water sampling form included in Appendix A.

2.3 Sample Handling and Identification

All water samples will be placed into an ice-packed cooler for storage immediately after collection. Proper chain of custody documentation will be completed and will accompany all samples until they are delivered to the laboratory. Samples will be transported to the project laboratory in person, generally on the same day as samples are collected, or within 24 hours of sample collection.

All water samples are identified with unique Sample ID specific to the sampling location and date. Groundwater samples taken from wells are identified by their GWIC number followed by the sample collection date, written as a six-digit number. Surface water samples are identified by their Station ID followed by the sample collection date, written as a six-digit number (example P4_070319). Sample labels will be completed and affixed to the sample containers with Sample ID, preservation (if applicable), filtering, samplers initials, and the time and date of sample collection. Labels will be completed using a waterproof marker.

An example Sample ID name for a well is:

278755_070319

or

1055MillRd_070319

Where:

- 278755 is the GWIC number
- if GWIC number not assigned, an address will be used such as 1055 Mill Rd, and
- 070319 is the sample date, July 7, 2019 in a six-digit format

Field duplicate samples will be identified using the same convention, adding a 'D' at the end of the Sample ID. The identification of the sample will be noted on the groundwater sampling form. Field blanks samples, comprised of deionized water placed into a sample container and transported with the collected samples, will be identified as a unique monitoring well, adding a 'B' at the end of the Sample ID.

3.0 Quality Assurance

This section describes the quality assurance elements associated with the monitoring program, and presents details regarding the project organization, data quality indicators, data documentation, sample collection and laboratory analysis, data management, response actions and data validation.

3.1 Project Organization

Project organization for each Project Plan governed by this QAP is defined by individual project management staff at the WQPD. The typical project management structure and roles for project participants are listed in **Table 3-1**. The project will be managed as part of the regular workload at the Lewis & Clark County Water Quality Protection District. All project activities will be completed under the direct supervision of the Project Manager.

Table 3-1. Key Program Personnel

Position	Affiliation	Activities
Project Manager	WQPD	Oversight of project activities
Laboratory Manager	WQ Lab	Responsible for laboratory Quality Assurance Program
Staff	WQPD	Responsible for conducting field data collection and data entry

3.2 Analytical Methods

All methods for water quality analysis are derived from *Standard Methods for the Examination of Water and Wastewater, 21st Edition* (AWWA, 2005) and are performed by a state-certified laboratory using standard methods. The project laboratory is responsible for applying quality assurance to laboratory analyses following their EPA and DEQ approved Quality Assurance Program The laboratory will provide standard data qualifiers (**Table 3-2**), when appropriate, to reported sample results.

The analytical parameters, analytical methods and reporting limits for water quality samples are defined in individual Project Plans. Examples of commonly used analyte lists for WQPD groundwater and surface water sampling projects and activities are provided in Appendix B.

3.3 Data Quality Indicators and Criteria

This section describes for each data quality indicator (representativeness, comparability, completeness, sensitivity, precision and accuracy) how the sampling and analysis plan and study design aims to achieve data quality. Data quality indicator criteria are specified, where appropriate.

Precision represents the ability of a specific measurement system to obtain replicate measurements. The precision of laboratory analytical data will be evaluated using the relative percent difference (RPD) in duplicate analyses. The precision laboratory goals are 10% for analytical controls and 20% for method batch controls. The RPD is calculated as follows:

$$\text{RPD} = \frac{|\text{Original Result} - \text{Duplicate Result}|}{(\text{Original Result} + \text{Duplicate Result})/2} \times 100$$

Accuracy represents a measure of the reported value compared with the true value. The accuracy of field measurements will be evaluated with calibration records, used to evaluate drift or bias within the system. Laboratory accuracy will be evaluated using matrix spikes added to samples, and control samples run with each sample run. Laboratory guidelines for analytical controls are 10% of analyses, and 20% for method batch controls. Accuracy is determined by the percent recovery for each sample, determined as follows:

$$\text{Matrix Spike \% Recovery} = \frac{(\text{Spiked Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{Control Stnd \% Recovery} = \frac{(\text{Instrument Determined Concentration})}{\text{True Concentration}} \times 100$$

Representativeness refers to the extent to which measurements represent an environmental condition in time and space. This project follows a judgmental sampling design in which spatial and temporal considerations were used to help ensure representativeness. Study design, site selection, and proper field and sample management protocols helps ensure that samples and data are representative of environmental conditions. Complete field notes and field forms will document the representativeness of samples and field data.

Comparability is the degree to which different methods, data sets, and/or decisions agree or are similar. Comparability allows data users to determine the applicability of data to certain projects or decisions. For this study, comparability will be achieved by following consistent field sampling protocols, sampling at the consistent locations, and obtaining analytical data following standardized methods for chemical analyses of water.

Completeness is a measure, expressed as a percentage, of the amount of data *planned for collection* compared to the amount *actually collected*. Data may be rejected due to problems with field sampling protocols, or through the laboratory data validation procedure. The project goal is 90% completeness of the data set. If this number is not achieved, corrective actions may be employed including resampling specific locations, or re-analyzing samples in the laboratory.

3.4 Quality Control

Quality control comprises methods of verifying that the sampling and analysis program is adequately designed to characterize environmental conditions.

3.4.1 Field Quality Control

Field quality control for laboratory analyses will be evaluated using field blanks and duplicate samples. The field blank is a sample of filtered, deionized water treated as a water quality sample. Field duplicate samples are used to evaluate the precision of the laboratory analytical system, and how field sampling conditions, equipment and protocols may influence analytical precision. For each sampling events, field blanks and field duplicates will be collected at a 10% rate (i.e one field duplicate and one field blank for every 10 samples collected) with a minimum of one each per project sampling event.

3.4.2 Laboratory Quality Control

Laboratory quality control will be maintained by the analytical laboratory accordance with their Quality Assurance Manual. The analytical laboratories take responsibility for sample management and analysis with completion of chain-of-custody documentation upon receipt at the laboratory. Upon receipt, the laboratory inspects the samples, checks that samples have been properly cooled since collection, and verifies that sample labels and identification are consistent with the chain-of-custody. The samples are logged into the laboratory system for tracking and management to ensure that proper analytical methods are used within necessary holding times.

The analytical laboratory provides a quality assurance package with each set of analyses documenting their quality control procedures and results. The laboratory quality assurance program includes duplicate analyses, matrix spike samples, blank samples and reference samples. When analytical precision or accuracy goals are not met, the data is flagged with the appropriate identification (**Table 3-2**), and, depending on the analytical problem, the usability of data results is evaluated.

Table 3-2. Analytical Laboratory Data Qualifiers

Data Result Qualifier	Description
B	Field and/or trip blank detection
D	Increase in detection limit due to sample matrix interference
H	Exceedence of Holding Time
J	Estimated – analyte presence positively identified, concentration is approximate
R	Rejected – unusable data as quality assurance criterion were not met.
U	Not Detected

3.4.3 Instrument Calibration and Maintenance

A YSI Professional Plus multi-parameter meter is used for field parameter measurement is calibrated daily prior to use according to manufacturer's instructions. All calibration information is recorded in a logbook dedicated to the instrument. Calibration standards are obtained from commercial sources and restocked on a regular basis. Any significant maintenance or corrective action for the instrument are completed by the manufacturer, or a representative of the manufacturer.

The project laboratory is responsible for calibration, maintenance and corrective action for analytical instrumentation in accordance with their Quality Assurance Manual. This includes proper documentation of procedures and any problems which may impact the quality of the data results.

4.0 Data Management and Record Keeping

4.1 Data Management

All field and laboratory data collected by the WQPD under this QAP is managed in-house by the WQPD in spreadsheet format using Excel software. Laboratory analytical data is provided from the analytical laboratory in electronic format, accompanied by all relevant quality assurance data.

4.2 Records Management

All documents generated during the course of the project will be stored in dedicated project files. These documents include:

- Field notes and field forms
- Chain-of custody forms for analytical samples
- Laboratory data reports
- Project reports – status reports, final reports or required project reporting forms
- Data Validation reports
- Additional Project Management notes – records of phone calls, emails and other correspondence pertinent to the project

4.3 Data Validation

An evaluation of all data results is conducted to ensure that data is usable for intended purposes, and that completeness goals are met. Field notes, field measurements, and field forms are reviewed to

verify that proper protocols were followed during field sampling and data collection activities. Additionally, data is reviewed through the detailed examination of raw data to check for calculation and transformation errors, measurements within calibration range, and data entry errors. Various computer software programs may be used to assist in the data review process to help identify potentially erroneous data.

The project laboratory is responsible for validation of laboratory data, and for flagging data with qualifiers as needed. The data validation process includes compliance with holding times, and the results of quality control samples. The data validation process for the laboratory is included in their Quality Assurance Manual. WQPD reviews laboratory data validation results, and any issues requiring corrective actions are communicated to the project laboratory.

5.0 References

AWWA, 2005. Standard Methods for the Examination of Water and Wastewater, 21st Edition (Centennial Edition). American Public Health Association.

EPA, 2001. EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5. United States EPA Publication EPA/24O/B-01/003, 40 p.

Cunningham, W.L., and Schalk, C.W., comps., 2011, Groundwater technical procedures of the U.S. Geological Survey: U.S. Geological Survey Techniques and Methods 1–A1, 151 p.

Montana Department of Environmental Quality. 2012. Water Quality Planning Bureau Field Procedures Manual for Water Quality Assessment Monitoring Version 3.0. Helena, MT: Montana Dept. of Environmental Quality

Figure 1: Stream Monitoring Station

Appendix A

Field Forms

A1: Groundwater Field Sampling Form

Site/Well		**Date**
Location		Weather
Well Diameter	Water Level	
Casing Type	Total Depth	Temperature
Measuring Point	Water Column	
Completion Depth	Well Volume	
Sampling Device		
Purge Water Disposal Method		
Sampling Personnel		

Time	**Temp**	**Dissolved Oxygen**		**Specific Conductivity**	**Conductivity**	**pH**	**ORP**	
	°C	**% Sat**	**mg/L**	**uS/cm**	**µs/cm**	**SU**	**pH mV**	**ORP mV**
Total Purge Volume								

Sample ID		**Date/Time**
Sample Container	**Preservative**	**Analytes**

COMMENTS:

A2: Groundwater Level Monitoring Field Form

Route Order	GWIC ID	Name	Address	Date	Time	SWL	Field Comment

A3: Surface Water Discharge Field Form

Water Quality Protection District Discharge Measurement notes					
Site Name					
Site Number		Hydrographer		Air Temp	
Date		Weather		Water Temp	
Time start		Precip		Gage Ht start	
Time finish		Wtr Clarity		Gage Ht finish	
Notes/Control					
Remarks					

Distance	**Width**	**Depth**	**Velocity**	**Comment**

A4: Surface Water Field Parameter Form

Station:_____

Date: _____

Water Quality Field Measurements

meter: YSI ProPlus____ YSI 63____

Air Temp	(C/F)	
Water Temp	(C/F)	
DO saturation	(%)	
DO concentration	(mg/l)	
SPC	(uS/cm)	
C	(uS/cm)	
TDS	(mg/l)	
SAL	(ppt)	
pH	(su)	
Staff Gauge	(ft)	

Notes:

A5: Surface Water Sampling/Site Visit Form

Date:	**Time:**	**Team Member(s):**	**Station ID:**	**Visit #:**
Waterbody:		Site Description:		County:
HUC:	Latitude: __ __ . __ __ __ __	Longitude: __ __ __ . __ __ __ __	Lat/Long Verified? ☐ By:	
		Circle One - "Coordinates: Decimal Degrees/Degrees-Minutes-Seconds"		
Elevation (m):		GPS Datum: NAD 83		

Samples collected:	**Sample ID:**	**Sample Collection/Preservation Info**
Water ☐		Grab
Analysis requested:		
Total Persulfate Nitrogen		HNO3 H2SO4 HCL None
Total Phosphorus (P)		HNO3 H2SO4 HCL None
Nitrate-nitrite as N		HNO3 H2SO4 HCL None
Total Ammonia		HNO3 H2SO4 HCL None
Total hardness		HNO3 H2SO4 HCL None
Total recoverable Metals		HNO3 H2SO4 HCL None

Field Measurements:			**Field Assessments:**	**Current Weather (Circle one):**
Temperature: (Water/Air)	W °C °F	A °C °F	Photographs: Digitals ☐ Film ☐	Cloud Cover:
pH:			Channel Cross –Section ☐	<5% 5-25% 25-75% 75-100%
Specific conductance :(µS)			Habitat Assessment:	Precipitation:
Dissolved Oxygen:	mg/L	%Sat.	Reach Scale: ☐	None Light Mod. Heavy
Turbidity (Visual) Clear ☐ Slight ☐ Turbid ☐ Opaque ☐			Site Scale: ☐	Past Precipitation (last 24 hours)
Flow: (cfs)	Flow Method: Meter ☐ Float ☐ Gage ☐		Substrate; Pebble Count ☐	None Light Mod. Heavy
Flow Comments: Dry Bed ☐ No Measurable Flow ☐				
Site Visit Comments:				

Chemistry Lab information:			
Lab Samples Submitted to:	Account #:	Date Submitted:	Analytical
Invoice Address: Water Quality Protection District, 316 North Park Ave, Room 220, Helena, MT 59623			
Contact name & phone:			
Relinquished by & Date/Time:	Shipped by & Date/time:	Received By & Date/Time:	

Appendix B
Analytical Parameter Lists

B1: Groundwater Analyte Suite 1- Aquifer Characteristics

Analyte	Analytical Method	Reporting Limit	Units	Preservative
Non-Metals				
Alkalinity (total as CaCO3)	A2320-B	1	mg/L	cool ≤ 6°C
Bicarbonate as HCO3	A2320-B	1	mg/L	cool ≤ 6°C
Bromide	EPA 300.0	0.05	mg/L	cool ≤ 6°C
Carbonate as CO3	A2320-B	1	mg/L	cool ≤ 6°C
Chloride	EPA 300.0	1	mg/L	cool ≤ 6°C
Conductance, Specific @ 25C	EPA 120.1	1	uS/cm	cool ≤ 6°C
Fluoride	EPA 300.0	0.1	mg/L	cool ≤ 6°C
Hardness (total as CaCO3)	A2340-B	1	mg/L	cool ≤ 6°C
Nitrogen: Nitrate plus Nitrite as N	E353.2	0.01	mg/L	cool ≤6C, H_2SO_4 to pH<2
pH (lab)	EPA 150.2	0.1	s.u.	NA
Phosphorus, Total, low level	E365.1	0.005	mg/L	cool ≤6C, H_2SO_4 to pH<2
Sulfate	EPA 300.0	1	mg/L	cool ≤ 6°C
Total Dissolved Solids	A 2540 C	10	mg/L	cool ≤ 6°C
Metals (Total Recoverable or Dissolved)				
Arsenic	E200.8/A3114B	0.001	mg/L	cool ≤6C, HNO_3 to pH<2
Calcium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Iron	E200.7/E200.8	0.02	mg/L	cool ≤6C, HNO_3 to pH<2
Magnesium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Potassium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Sodium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Uranium	E200.7/E200.8	0.0003	mg/L	cool ≤6C, HNO_3 to pH<2

B2: Surface Water Analyte Suite 1– Stream Characteristics

Analyte	Analytical Method	Reporting Limit	Units	Preservative
Non-Metals				
Alkalinity (total as CaCO3)	A2320-B	1	mg/L	cool ≤ 6°C
Bicarbonate as HCO3	A2320-B	1	mg/L	cool ≤ 6°C
Carbonate as CO3	A2320-B	1	mg/L	cool ≤ 6°C
Chloride	EPA 300.0	1	mg/L	cool ≤ 6°C
Conductance, Specific @ 25C	EPA 120.1	1	uS/cm	cool ≤ 6°C
Fluoride	EPA 300.0	0.1	mg/L	cool ≤ 6°C
Hardness (total as CaCO3)	A2340-B	1	mg/L	cool ≤ 6°C
Nitrogen, Total (persulfate)	SM 4500-N C	0.04	mg/L	cool ≤ 6°C
Nitrogen: Ammonia as N	A 4500 NH_3 H	0.05	mg/L	cool ≤6C, H_2SO_4 to pH<2
Nitrogen: Nitrate plus Nitrite as N	E353.2	0.01	mg/L	cool ≤6C, H_2SO_4 to pH<2
pH (lab)	EPA 150.2	0.1	s.u.	NA
Phosphorus, Total, low level	E365.1	0.005	mg/L	cool ≤6C, H_2SO_4 to pH<2
Sulfate	EPA 300.0	1	mg/L	cool ≤ 6°C
Total Dissolved Solids	A 2540 C	10	mg/L	cool ≤ 6°C
Total Suspended Solids (TSS), low level	A2540D	1	mg/L	cool ≤ 6°C
Metals (Total Recoverable)				
Arsenic	E200.8/A3114B	0.001	mg/L	cool ≤6C, HNO_3 to pH<2
Cadmium	E200.7/E200.8	0.001	mg/L	cool ≤6C, HNO_3 to pH<2
Calcium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Copper	E200.7/E200.8	0.005	mg/L	cool ≤6C, HNO_3 to pH<2
Iron	E200.7/E200.8	0.02	mg/L	cool ≤6C, HNO_3 to pH<2
Lead	E200.7/E200.8	0.001	mg/L	cool ≤6C, HNO_3 to pH<2
Magnesium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Potassium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Sodium	E200.7/E200.8	1	mg/L	cool ≤6C, HNO_3 to pH<2
Uranium	E200.7/E200.8	0.0003	mg/L	cool ≤6C, HNO_3 to pH<2
Zinc	E200.7/E200.8	0.01	mg/L	cool ≤6C, HNO_3 to pH<2

Appendix C

Example Project Plan Format

C1: Example Project Plan

Project Plan

1.0 Project Introduction/Context/Background

2.0 Project Goals and Objectives

3.0 Project Area Overview & Map

4.0 Project Study Design
- Monitoring/Sampling Stations & Map
- Monitoring/Sampling Parameters
- Monitoring Schedule & Timeline
- Monitoring Budget

5.0 Project Team & Responsibilities
- Project Partners

6.0 Project Data Management and Reporting
- Data Management and Storage
- Project Reports and Deliverables

Lewis and Clark County
Water Quality Protection District

316 N. Park. Rm. 230
P.O. Box 1723
Helena, MT 59624
Ph: 406.447.8584
Fax: 406.447.8398

Susan Good Geise
316 N. Park
Helena, MT 59623
447-8304 (W)
E-mail: sgeise@lccountymt.gov

Representing the Board of County Commissioners

Jamie Schell, chair
P.O. Box 1610
East Helena, MT 59635
227-7044(H) 465-2921 (C)
E-mail: mayorschell@easthelenamt.us

Representing the East Helena City Council

Stan Frasier
PO Box 5841
Helena, MT 59604
442-2705 (H) 439-2705 (C)
E-mail: sfrasier@mt.net

Representing the L & C Conservation District

Ryan Leland
316 N. Park
Helena, MT 59623
447-8433 (W)
E-mail: rleland@helenamt.gov

Representing the Helena City Commission

Vacant

Representing the Helena Citizen's Council

Kammy Johnson
2030 Cromwell Dixon Ln
Ste F, PMB 202
Helena, MT 59602
799-3654 (W) 458-1956 (H) 439-0914 (C)
E-mail: kjohnsonmt@gmail.com

Representing the Board of Health

Catherine Scott
P.O Box 5631
Helena, MT 59604
458-4910 (H)
E-Mail: cs1028cs@gmail.com

Term ends 06/30/22 – General Public

Amanda Harrow
627 1st Street
Helena, MT 59601
(508) 577-4959 (C)
E-mail: lcwqpd.generalpublic1@gmail.com

Term ends 06/30/21 – General Public

Jeff Ryan, vice chair
6425 Jasper Road
Helena, MT 59602
(C) 202-4003
E-mail: jeff@rfryan.com

Term ends 06/30/20– General Public

Attendance Record for the
Lewis & Clark County Water Quality Protection District
FY 2020

	Jul	Aug	Sep	Oct	Nov/Dec	Jan	Feb	Mar	Apr	May	Jun
Frasier	*	X	T	X	O	*	O	*			
Geise	---	---	---	---	---	*	X	*			
Harrow	*	X	T	O	X	*	O	*			
Hunthausen	*	O	T	X	O	---	---	---	---	---	---
Johnson	*	X	T	X	X	*	X	*			
Leland	*	X	T	X	O	*	O	*			
Ryan	*	X	T	X	X	*	X	*			
Schell	*	X	T	X	X	*	X	*			
Scott	---	---	T	X	X	*	X	*			
Sloan	*	X	T	X	---	---	---	---	---	---	---

Legend:

X = Present

--- = Not a member of the board at that time.

* = No meeting held

O = Absent

/ = Work Session

T = Tour

Lewis and Clark County
Water Quality Protection District

316 N. Park. Rm. 230
P.O. Box 1723
Helena, MT 59624
Ph: 406.447.8351
Fax: 406.447.8398

All board meetings are held in room 226 of the City-County Building, 316 N. Park, Helena, Montana at 5:30 p.m. The meetings are generally completed by 7:30 p.m.

MEETING DATES FOR FISCAL YEAR 2020

July 23, 2019- Canceled

August 27, 2019

September 24, 2019

October 22, 2019

December 4, 2019

January 28, 2020-Canceled

February 25, 2020

March 24, 2020

April 28, 2020

May 26, 2020

June 23, 2020