

APPENDIX A
BFF GWIC LOGS

MONTANA WELL LOG REPORT

Other Options

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

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Site Name: BIGFORK WATER & SEWER DISTRICT * BFF-4
GWIC Id: 260891

Section 7: Well Test Data

Total Depth: 80
 Static Water Level: 18.07
 Water Temperature:

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 1: Well Owner(s)

- 1) BIGFORK WATER AND SEWER DISTRICT (WELL)
 108 HARBOR HEIGHTS BLVD
 BIGFORK MT 59911 [04/22/2011]
- 2) BIGFORK WATER AND SEWER DISTRICT (MAIL)
 P.O. BOX 1108
 BIGFORK MT 59911 [04/22/2011]
- 3) MONTANA BUREAU OF MINES (MAIL)
 1300 WEST PARK
 BUTTE MT. [04/21/2011]

Section 8: Remarks

Section 2: Location

Township	Range	Section	Quarter Sections	
27N	20W	18	SE¼	SE¼ NE¼
County		Geocode		
FLATHEAD				
Latitude	Longitude	Geomethod	Datum	
48.103531688888	-114.181999877778	SUR-GPS	NAD83	
Ground Surface Altitude	Ground Surface Method	Datum	Date	
2907.86	SUR-GPS	NAVD88	1/20/2011	
Measuring Point Altitude	MP Method	Datum	Date Applies	
2909.64	SUR-GPS	NAVD88	4/22/2011	
Addition	Block	Lot		

Section 9: Well Log

Geologic Source
 111ALVM - ALLUVIUM (HOLOCENE)

From	To	Description
0	1	SOIL AND SILTY LOAM
1	18	BROWN SANDY SILTY LOAM
18	39	BLACK WET SAND
39	80	GRAY SILTY SAND WITH WATER

Section 3: Proposed Use of Water

MONITORING (1)

Section 4: Type of Work

Drilling Method: ROTARY
 Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Thursday, April 21, 2011

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	80	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	75	6	0.25		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
75	80	4		.015	SCREEN-CONTINUOUS-PVC

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	30	BENTONITE	Y

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: BRAD FORMAN
Company: ALLWEST DRILLING INC
License No: MWC-339
Date Completed: 4/21/2011

MONTANA WELL LOG REPORT**Other Options**

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Site Name: BIGFORK WATER & SEWER DISTRICT * BFF-3
GWIC Id: 260889

Section 7: Well Test Data

Total Depth: 365
 Static Water Level: 17.36
 Water Temperature:

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks**Section 9: Well Log****Geologic Source**

112TILL - GLACIAL TILL

From	To	Description
0	20	DRY, POWDERY SILT. LIGHT BROWN TO RED BROWN. SANDY SILT, VERY FEW SMALL GRAVELS, PACKS IN HAND
20	36	SAND WITH CLAY. GRAY SAND WITH SANDY, PLASTICITY CLAY BALLS. FINE GRAINED GRAY, BROWN AND BLACK GRAINS.
36	40	CLAY WITH SAND AND SILT. MUDDY TEXTURE, SATURATED, WITH FINE GRAINED SAND GRAINS.
40	45	SILTY CLAY. STICKY, GRAY, WET CLAY.
45	56	CLAYEY SILTY SAND. FINE GRAINED, DAMP, GRAY SAND, PACKS IN HAND
56	76	SATURATED SAND. FINE GRAINED, SATURATED, SILTY SAND, VERY SOUPY, WITH TAN (CLAY?) STREAKS. A VERY FEW PLASTICITY CLAY BALLS IN CLEANOUT. VERY FAST RUN.
76	116	SILTY CLAYEY SAND. GRAY, SATURATED, SILTY SAND, VERY SOUPY WITH BLACK, FINE GRAINED, WOODY ORGANIC MATERIAL. WATER SEPARATES FROM SAND IN DISCHARGE. VERY FAST RUN, CASING DROPPING IN TO HOLE UNDER OWN WEIGHT
116	130	SAND WITH SILT AND CLAY. FINE GRAINED, SATURATED, LIGHT GRAY SAND WITH MORE SILT AND CLAY. THICKER CONSISTENCY THAN ABOVE.
130	136	SILTY SAND. MORE SILT AND MUCH MORE BLACK ORGANIC MATERIAL. FINE GRAINED MORE CONCENTRATED/CONSOLIDATED SAND. FINE GRAINED SEDIMENTS (SILT/CLAY) ABUNDANT IN CUTTINGS WATER. SEDIMENT IS STICKY AND TACKY.
136	156	SAND. FINE GRAINED, GRAY SAND WITH SOME SILT AND TAN STREAKS (CLAY?), SATURATED
156	166	SAND WITH CLAY. FINE GRAINED, LIGHT BROWN, TAN, GRAY, WITH SILT AND MORE CLAY. MORE TAN STREAKS (CLAY) AND THICKER CONSISTENCY, CLAY HOLDS WATER IN CUTTINGS.
166	176	CLAY WITH SILT AND SAND. FEWER CUTTINGS, SMOOTHER, LESS GRITTY TEXTURE, LIGHT BROWN. BECOMING LESS GRITTY AND MORE THICK AND VISCOUS WITH DEPTH.
176	216	CLAY. GRAY, SMOOTH TEXTURE, NO GRIT, FLOWS AS THICK LUMPS, CUTTING HOLDS WATER AND FORM SLOPES RATHER THAN RUN TO COLLECTION TRENCH.

Section 1: Well Owner(s)

- 1) MONTANA BUREAU OF MINES (MAIL)
1300 WEST PARK
BUTTE MT 59701 [04/21/2011]
- 2) BIGFORK WATER AND SEWER DISTRICT (WELL)
108 HARBOR HEIGHTS BLVD
BIGFORK MT 59911 [04/20/2011]
- 3) BIGFORK WATER AND SEWER DISTRICT (MAIL)
P.O. BOX 1108
BIGFORK MT 59911 [04/20/2011]

Section 2: Location

Township	Range	Section	Quarter Sections
27N	20W	18	SE¼ SE¼ NE¼
County		Geocode	
FLATHEAD			
Latitude	Longitude	Geomethod	Datum
48.103523344444	-114.18207275	SUR-GPS	NAD83
Ground Surface Altitude	Ground Surface Method	Datum	Date
2907.7	SUR-GPS	NAVD88	1/20/2011
Measuring Point Altitude	MP Method	Datum	Date Applies
2909.36	SUR-GPS	NAVD88	4/22/2011 9:00:00 AM
Addition	Block	Lot	

Section 3: Proposed Use of Water

MONITORING (1)

Section 4: Type of Work

Drilling Method: ROTARY
 Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Thursday, April 21, 2011

Section 6: Well Construction Details**Borehole dimensions**

From	To	Diameter
0	365	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	355	6	0.25		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
355	365	5		.015	SCREEN-CONTINUOUS-PVC

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	30	BENTONITE	Y
344	354	BENTONITE	

		LIGHT BROWN WITH YELLOW GRADING TO YELLOW AT THE END OF THE INTERVAL.
216	256	CLAY. THICK, VISCOUS CLAY WITH DENSE, PLASTIC CLAY BALLS. GRAY WITH RED AND PINK STREAKS AND SEGMENTS. FEW RETURNS CUTTINGS, GEL LIKE CONSISTENCY, THICK AND VISCOUS CUTTINGS ARE HARD TO LIFT FROM WELL.
256	296	CLAY, SILTY CLAY. LIGHT BROWN TAN, THICK, VISCOUS, WITH PLASTIC CLAY BALLS IN CUTTINGS. VERY SMOOTH TEXTURE, NO GRIT, THICK HARD TO LIFT FROM WELL. CONTAINS MORE WATER THAN IN LAST RUN.

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: BRAD FORMAN
Company: ALLWEST DRILLING INC
License No: MWC-339
Date Completed: 4/21/2011

Site Name: BIGFORK WATER & SEWER DISTRICT		
GWIC Id: 260889		
Additional Lithology Records		
From	To	Description
296	310	CLAY. YELLOW TAN WITH A GREENISH TINT, THICK, VERY STICKY, WITH PLASTIC CLAY BALLS. CUTTINGS ARE VERY SMOOTH, CREAMY TEXTURE, SEMI-FLUID, SURFACE SHEARS WHEN FLOWING.
310	316	CLAY, PLASTIC, DENSE
316	336	CLAY. GREEN YELLOW, GREEN TAN, THICK FLUID WITH PLASTIC CLAY BALLS. TACKY WITH FINE GRAINED, SILT, GRIT, MODERATELY FLUID
336	366	CLAY. YELLOW, TAN YELLOW, MODERATELY FLUID WITH NUMEROUS PLASTIC CLAY BALLS IN CUTTINGS

MONTANA WELL LOG REPORT**Other Options**

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

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Site Name: BIGFORK WATER & SEWER DISTRICT * BFF-2
GWIC Id: 260888

Section 7: Well Test Data

Total Depth: 672
 Static Water Level: 10
 Water Temperature:

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks**Section 9: Well Log****Geologic Source**

112ALVM - ALLUVIUM (PLEISTOCENE)

From	To	Description
0	14	DRY, CLAYEY SILT. LIGHT BROWN. CLAY FORMS SMALL PLASTIC BALLS IN CUTTINGS
14	25	SAND WITH SILT, BROWN, DRY TO DAMP TO WET
25	56	SATURATED SAND WITH SILT AS ABOVE, WET. FINE GRAINED TO MEDIUM GRAINED SAND, WELL SORTED, BROWN TO GRAY COLOR.
56	156	SAND WITH SILT, DARK GRAY, SOUPY, SATURATED SAND, MEDIUM LIGHT GRAY. BLACK FLECKS OF ORGANIC MATERIAL, WOODY STEM PIECES. QUICKSAND CONSISTENCY. SAND GRAINS ARE DARK RED, WHITE AND BLACK. ORGANIC MATERIAL IS THE SAME SIZE AS SAND GRAINS. GRAY TO GRAY BROWN WATER WITH SILTY, GRITTY FEEL. LIGHT TAN (SILT/CLAY?) STREAKS IN CUTTINGS. LESS SILT GRADING TO MORE CLAY IN WATER WITH DEPTH, LESS GRITTY FEEL, BECOMING SMOOTHER TEXTURED.
156	176	SAND WITH STICKY CLAY. SATURATED MEDIUM LIGHT GRAY, FINE GRAINED SAND AS ABOVE WITH TAN STREAKS AND A FEW SMALL CLAY BALLS IN CUTTINGS. CLAY IS GRITTY (SILTY) PLASTIC AND MEDIUM LIGHT GRAY. BLACK WOODY FRAGMENTS.
176	196	SANDY SILT WITH STICKY CLAY. LIGHT MEDIUM GRAY TO LIGHT GRAY BROWN WITH FINE GRAINED SAND. GRITTY TEXTURE, THICKER CONSISTENCY. NO FREE WATER, ALL WATER REMAINS IN SILT CUTTINGS. A FEW SMALL PLASTIC CLAY BALLS.
196	200	SANDY SILT WITH CLAY AS ABOVE, BUT MORE FLUID. LIGHT MEDIUM GRAY. GRADES TO MORE CLAY DOWNWARD. VERY FEW CUTTINGS IN RETURN (CLAY CONTENT). CASING DROPS UNDER OWN WEIGHT THROUGH FORMATION.
200	212	STICKY CLAY WITH SILT, LIGHT MEDIUM GRAY
212	236	SANDY SILT WITH CLAY. FINE GRAINED-VERY FINED GRAINED, GRITTY TEXTURE, THICK, VISCOUS CUTTINGS, HOLD WATER.
236	260	STICKY CLAY, THICK VISCOUS CUTTINGS, HARD TO LIFT FROM HOLE. LIGHT GRAY WITH TAN LIGHT BROWN TINT, THICK CLAY WITH NUMEROUS PLASTIC FRAGMENTS IN CUTTINGS. CUTTINGS ARE THICK AND HOLD WATER, DO NOT FLOW IN DISCHARGE. THIN GELATIN LIKE TEXTURE. THICK AND STICKY WHEN SHOVELED, SHOWS SHEARING ON SURFACE WHEN IT DOES FLOW.

Section 1: Well Owner(s)

1) BIGFORK WATER AND SEWER DISTRICT (WELL)
 108 HARBOR HEIGHTS BLVD
 BIGFORK MT 59911 [04/13/2011]
 2) BIGFORK WATER AND SEWER DISTRICT (MAIL)
 P.O. BOX 1108
 BIGFORK MT 59911 [04/13/2011]
 3) MONTANA BUREAU OF MINES (MAIL)
 1300 WEST PARK
 BUTTE MT 59701 [04/04/2011]

Section 2: Location

Township	Range	Section	Quarter Sections
27N	20W	18	SE¼ SE¼ NE¼
County		Geocode	
FLATHEAD			
Latitude	Longitude	Geomethod	Datum
48.103514786111	-114.182152530556	SUR-GPS	NAD83
Ground Surface Altitude	Ground Surface Method	Datum	Date
2907.01	SUR-GPS	NAVD88	1/20/2011
Measuring Point Altitude	MP Method	Datum	Date Applies
2908.76	SUR-GPS	NAVD88	4/13/2011 9:13:00 AM
Addition	Block	Lot	

Section 3: Proposed Use of Water

MONITORING (1)

Section 4: Type of Work

Drilling Method: ROTARY
 Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Monday, April 4, 2011

Section 6: Well Construction Details**Borehole dimensions**

From	To	Diameter
0	378	8
378	680	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	378	8	0.25		WELDED	A53B STEEL
360	642	6	0.25		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
620	640	6			PERFORATED CASING
642	672	5		.020	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont.

			Fed?
0	30	BENTONITE	Y
368	378	BENTONITE	

260	276	SILTY CLAY, THINNER CONSISTENCY THAN ABOVE, MORE FLUID, TAN TO TAN LIGHT GRAY. SMOOTH, CREAMY TEXTURE, FLOWS IN DISCHARGE TRENCH. STILL HAS NUMEROUS PLASTIC CLAY BALLS AND STICKY TEXTURE.
276	286	PLASTIC CLAY, TAN, THICK WITH PLASTIC CLAY BALLS/FRAGMENTS. FEW RETURN CUTTINGS, NO RETURN CUTTINGS LAST 12 FEET-15 FEET. FLUSHING HOLE AT END OF RUN PRODUCED THICK, RED AND TAN CLAY WITH MANY PLASTICY FRAGMENTS.
286	396	SILTY CLAY. DRILLS EASIER THAN CLAY ABOVE. TAN YELLOW, THICK FLUID CUTTINGS WITH VERY SMOOTH, CREAMY TEXTURE. NO GRITTY FEEL. SOME THICK PLASTICY CLAY BALLS, MORE NUMEROUS TOWARD BOTTOM. LOW DENSITY, LIGHT WEIGHT MATERIAL. DRILLER THINKS THIS COULD BE A "DRY" INTERVAL (LOW WATER CONTENT?). TOOK A LARGE VOLUME OF FLUSH WATER TO GET CUTTINGS IN RETURN. CUTTINGS ARE THICK AND DO NOT FLOW, CUTTINGS HOLD WATER. DRIES HARD TO PACK ON SURFACE.
396	402	PLASTIC CLAY, TAN WITH PLASTIC CLAY BALLS AND SOME SMALL GRAVELS.
402	416	SAND AND GRAVEL, MEDIUM FINE GRAINED, WITH A FEW PEBBLES AND PEBBLE FRAGMENTS. GRINDING ON A BIT AND MORE RETURN WATER. LIGHT BROWN TAN, SILTY WATER. PEBBLES ARE SUBROUNDED WITH SQUARED OFF FACES (TILL-SOURCED ALLUVIUM?)

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

<p>Name: BRAD FORMAN Company: ALLWEST DRILLING INC License No: MWC-339 Date Completed: 4/4/2011</p>
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Site Name: BIGFORK WATER & SEWER DISTRICT		
GWIC Id: 260888		
Additional Lithology Records		
From	To	Description
416	445	GRAVEL WITH SAND AND PEBBLES. MEDIUM FINE GRAINED GRAVEL AND PEBBLE CHIPS. GRAINS ARE DARK RED, GREEN, SOME TAN, AND A FEW LIGHT GRAY. SOME COARSE GRAINED GRAVEL, SUBROUND-ANGULAR WITH FINE GRAINED, BROWN AND TAN SAND GRAINS. WATER IS SILTY, TAN. INCREASING SAND CONTENT DOWNWARD.
445	476	SAND AND GRAVEL, MORE SAND THAN ABOVE.
476	480	SAND AND GRAVEL GRADING TO GRAVEL WITH SAND AND A FEW PEBBLES. DECREASING SAND CONTENT
480	496	SAND WITH GRAVEL. MEDIUM FINE GRAINED, BROWN SAND WITH GRAVEL AND MEDIUM COARSE GRAINED, ROUNDED PEBBLES AND TAN, SILTY WATER. ROUGH DRILLING.
496	506	GRAVEL. MEDIUM FINE GRAINED GRAVEL AND SOME SAND AND TAN SILT. BOUNCING DRILL RIG, ROUGH DRILLING, MOSTLY GRAVEL IN RETURN.
506	526	GRAVEL WITH SAND AND PEBBLES. MORE SAND AND MORE PEBBLES THAN ABOVE. TAN SILT TO BROWN AT THE END. BROWN AND BROWN TAN SILTY WATER. FINE GRAINED SAND BROWN WITH TAN, GREEN, RED, AND WHITE GRAINS. PEBBLES ROUNDED AND SUBROUNDED.
526	536	GRAVEL WITH SAND AND MORE TAN SILT
536	545	GRAVEL, MEDIUM FINE GRAINED, AND CHIPS; TAN, SILTY WATER. GRAVEL, ROUGH DRILLING.
545	556	SAND WITH SOME GRAVELS, BROWN, LIGHT BROWN SILTY WATER. SAND AND GRAVEL. SILT IS THICK AND GRITTY IN WATER.
556	570	SAND WITH MEDIUM COARSE GRAINED GRAVEL AND COARSE GRAINED PEBBLES, MORE GRAVELS THAN ABOVE. WATER AND SILT COLOR ALTERNATE BETWEEN BROWN AND TAN
570	580	SAND WITH SOME GRAVEL, MUCH LESS GRAVEL THAN ABOVE, TAN SILTY WATER.
580	585	GRAVEL, COARSE GRAINED-MEDIUM GRAINED WITH SOME SAND.
585	608	SAND WITH GRAVEL. MEDIUM GRAINED-MEDIUM FINE GRAINED GRAVEL AND FINE GRAINED-MEDIUM FINE GRAINED SAND WITH BROWN TO BROWN GRAY SILT WITH BLACK GRAINS SUSPENDED WITH FINES IN WATER. BROWN SILTY SANDY WATER
608	616	SAND WITH GRAVEL AND A FEW PEBBLES, LIGHT BROWN TO YELLOW BROWN. OLIVE GREEN AND TAN GRAVELS MORE PROMINENT. GRAVELS ARE SUBROUND-SUBANGULAR (TRIANGULAR SHAPE IN CROSS SECTION). DRILL FAST AND EASY
616	630	SAND AND GRAVEL WITH A FEW COARSE PEBBLES. MEDIUM COARSE GRAINED-MEDIUM GRAINED GRAVEL. LIGHT BROWN AND TAN LIGHT BROWN SILT
630	642	SAND AND GRAVEL WITH LIGHT BROWN SILT GRADING TO COARSE GRAINED GRAVEL WITH SOME SAND
642	648	COARSE GRAINED GRAVEL WITH SOME SAND
648	656	SAND AND GRAVEL. MEDIUM GRAINED AND MEDIUM FINE GRAINED SAND. LIGHT BROWN SILT, GRITTY IN WATER. GENERAL OBSERVATION THROUGH LAST SEVERAL INTERVALS: GRAVEL AND PEBBLES ARE ROUNDED AND SMOOTH BUT MOST HAVE 4 TO 5 SIDES WITH ROUNDED EDGES BETWEEN SURFACES. ALLUVIALLY DEPOSITED TILL-SOURCED MATERIAL?
656	670	SAND AND GRAVEL WITH A FEW PEBBLES. SAND IS MORE COARSE THAN ABOVE AND GRAVELS ARE SMALLER, MEDIUM GRAINED-MEDIUM FINE GRAINED, THAN IN MOST OF THE WELL. FEWER GRAVELS AND MORE SAND TOWARD BOTTOM.
670	676	SAND WITH SOME GRAVEL. MORE SAND AND FEWER GRAVELS TO BOTTOM

MONTANA WELL LOG REPORT

Other Options

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Site Name: BIGFORK WATER & SEWER DISTRICT * BFF-1
GWIC Id: 260892

Section 7: Well Test Data

Total Depth: 717
 Static Water Level: 10
 Water Temperature:

Section 1: Well Owner(s)

- 1) BIGFORK WATER AND SEWER DISTRICT (WELL)
 108 HARBOR HEIGHTS BLVD
 BIGFORK MT 59911 [04/21/2011]
- 2) BIGFORK WATER AND SEWER DISTRICT (MAIL)
 P.O. BOX 1108
 BIGFORK MT 59911 [04/21/2011]
- 3) MONTANA BUREAU OF MINES (MAIL)
 1300 WEST PARK
 BUTTE MT 59701 [04/06/2011]

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 2: Location

Township	Range	Section	Quarter Sections	
27N	20W	18	SE¼ SE¼ NE¼	
County			Geocode	
FLATHEAD				
Latitude	Longitude	Geomethod	Datum	
48.1035369	-114.181934402778	SUR-GPS	NAD83	
Ground Surface Altitude	Ground Surface Method	Datum	Date	
2907.64	SUR-GPS	NAVD88	4/21/2011	
Measuring Point Altitude	MP Method	Datum	Date Applies	
2910.24	SUR-GPS	NAVD88	2/17/2022	
Addition	Block	Lot		

Section 8: Remarks

GPM IS UNKNOWN UNTIL TEST PUMPING IS COMPLETE. LITHOLOGY CHANGED BY MBMG HYDROGEOLOGIST

Section 9: Well Log

Geologic Source

112ALVM - ALLUVIUM (PLEISTOCENE)

From	To	Description
0	16	BROWN, SOFT, LOOSE SILT
16	76	GRAY BROWN, MEDIUM FINE GRAINED SATURATED SAND, WITH DARK RED AND WHITE GRAINS, WITH SOME SILT AND SOME WOODY FRAGMENTS, DAMP. SAND IS GRAY WHEN WET, DRILLERS CALL THIS "BLACK SAND". WATER EASILY DRAINS FROM CUTTINGS A FEW COARSE SAND GRAINS BUT MEDIUM FINE GRAINED OVERALL. A FEW (RARE) WOODY FRAGMENTS, THIN BLACK ELONGATE, LIKE THIN WOODY PLANT STEMS. WOODY MATERIAL BLACK, ANGULAR, FINE GRAINED SIMILAR TO SAND SIZE.
76	116	GRAY SATURATED SAND WITH SILT. SAND GRAINS ARE GRAY WITH DARK RED, TAN, AND BLACK GRAINS. SLIGHT TAN COLOR, VERY FINE GRAINED WITH MORE SILTY CLAYEY TEXTURE THAN ABOVE. SILT TEXTURE WITH SOME CLAY HOLDS WATER IN CUTTINGS.
116	156	FINE GRAINED SILTY SAND, GRAY, VERY SATURATED (SOUPY). SOME SILT, VERY GRITTY TEXTURE. TAN STREAKS IN WATER. NUMEROUS WOODY FRAGMENTS
156	196	FINE GRAINED GRITTY SAND WITH STICKY SILT, GRAY TO GRAY TAN, SATURATED. OCCASIONAL GRAY SILTY CLAY BALLS. GRADING TO MORE SILTY, LESS SANDY TOWARDS BOTTOM.
196	216	STICKY SILT WITH FINE SANDY GRIT. CUTTINGS ARE THINK, SATURATED, GRAY TO GRAY TAN. CUTTINGS HOLD WATER.
216	236	STICKY PLASTIC CLAY, GRAY GRITTY WITH SILT, A FEW SMALL GRAY CLAY BALLS 1-5 CM. SATURATED CUTTINGS HOLD WATER. THICK, PASTY CONSISTENCY, FLOWS THICK.
236	256	GRAY TO GRAY BROWN, MOSTLY RED BROWN AT END, SMOOTH SILT CLAY. SATURATED, THICK, SOFT, FLUID. NO GRITTY TEXTURE, NOT PLASTIC.
256	275	PLASTIC, TAN CLAY, SMOOTH, FLUID TEXTURE WITH SMALL, GRAY, PLASTIC CLAY BALLS 1-5 CM. SOME TAN GRAY INTERVALS, VERY FLUID.
275	276	STICKY CLAY, BROWN- LIGHT GRAY PLASTIC CLAY BALLS 5-10 CM DIAMETER ABOUT 5 PERCENT, IN SMOOTH, TAN, FLUID CLAY
276	296	STICKY, PLASTIC CLAY BALLS IN THICK, FLUID TAN CLAY. WATER/FLUID IS HEAVIER, MORE DENSE, SLICK

Section 3: Proposed Use of Water

IRRIGATION (1)

Section 4: Type of Work

Drilling Method: ROTARY
 Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Tuesday, April 5, 2011

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	500	8
500	720	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	498	8	0.25		WELDED	A53B STEEL
360	717	6	0.25		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
640	670	6	800	1/4X2	HOLTE PERFORATOR SLOTS
713	717	6	25	1/4X4	TORCH OR PLASMA CUTS

Annular Space (Seal/Grout/Packer)

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From	To	Description	Cont. Fed?
0	30	BENTONITE	Y
480	500	BENTONITE	

		TO TOUCH.
296	316	STICKY, TAN CLAY, THICK, FLUID, SMOOTH TEXTURE, DOES NOT FLOW, PASTY WITH SOME CLAY BALLS UP TO 1 INCH DIAMETER.
316	336	PLASTIC, YELLOW TAN CLAY VERY SMOOTH FLUID TEXTURE WITH DENSE, TAN, STIFF, PLASTIC CLAY BALLS.
336	391	PLASTIC YELLOW CLAY WITH GREENISH TINT WITH FEW GRAVELS AND VERY LITTLE WATER. DENSE, STIFF CLAY BALLS ARE STICKY, GRAY AND GRAY BROWN, PLASTIC, SMOOTH. CLAY BALLS ARE BROWN GRAY, GRAY, AND GRAY BROWN. THICK, VISCIOS CUTTINGS, DO NOT FLOW. FEW CUTTINGS IN RETURN.
391	396	COARSE AND MEDIUM GRAINED, ROUNDED PEBBLES IN GRAVEL WITH WATER. PEBBLES ARE ROUND, GREEN, RED, GRAY BELT ROCKS ORIGIN. SMALLER GRAVELS ARE MORE ANGULAR WITH SMOOTH SIDES. GRAVELS ARE COMPOSED OF CHERT, RED, GREEN, AND GRAY BELT ORIGIN GRAINS.

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

<p>Name: BRAD FORMAN Company: ALLWEST DRILLING INC License No: WWC-571 Date Completed: 4/5/2011</p>
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Site Name: BIGFORK WATER & SEWER DISTRICT		
GWIC Id: 260892		
Additional Lithology Records		
From	To	Description
396	406	CLEAN GRAVEL, GOOD WATER, WITH ROUNDED PEBBLES, COARSE TO FINE GRAVEL, VERY COARSE GRAINED SAND. GRAVEL AND PEBBLES ARE MORE ANGULAR BUT WITH ROUND EDGES
406	416	REDDISH YELLOW WATER. GRAVEL AS ABOVE GRADING THROUGH INTERVAL TO BLACK, GRAY AND BROWN, VERY FINE GRAINED SAND WITH THIN MUDDY, SILTY WATER. WATER CONTAINS LIGHT BROWN TAN SILT.
416	436	GRAVEL WITH PEBBLES, FEWER PEBBLES TOWARD BOTTOM. BLACK, BROWN, AND GRAY, VERY FINE GRAINED SAND WITH TAN, SILTY WATER.
436	456	YELLOW TAN SILT IN GRAVEL WITH SOME PEBBLES AND SOME SILT. HIGH ROTATION PRESSURE ON CASING, DRILLING IS TIGHT
456	496	GRAVEL WITH PEBBLES AND COBBLES. YELLOW SILTY WATER WITH GRAVEL. HEAVY SILT CLAY LOAD IN WATER. SOME VERY FINE, BROWN SAND AND YELLOW SILT.
496	534	SAME AS ABOVE. GRAVEL, GRINDING A BIT. MUDDY BROWN WATER WITH MEDIUM FINE GRAINED GRAVEL, COARSE GRAINED SAND, AND PEBBLES. PEBBLES ARE ROUNDED, SMOOTH, RED AND BROWN/TAN. SAND GRAINS ARE BROWN AND BLACK, COARSE GRAINED. MORE ANGULAR, MEDIUM FINE GRAINED GRAVEL AND PEBBLE WITH DEPTH, FEWER PEBBLES. PEBBLES ARE ANGULAR, BROKEN WITH SOME ROUNDED EDGES. WATER.
534	545	GRAVEL WITH SMALL ROUNDED PEBBLES, SOME BROWN, MEDIUM FINE GRAINED SAND. SMOOTHER DRILLING, LESS GRINDING, LOTS OF BROWN, SILTY WATER.
545	547	SAND LAYER. MEDIUM FINE GRAINED BROWN SAND, WELL SORTED
547	565	GRAVEL WITH PEBBLES AND MEDIUM FINE GRAINED SAND AND BROWN, MUDDY WATER, PEBBLES ARE ANGULAR, SUBROUND, MEDIUM FINE GRAINED. SOME WHITE (QUARTZITE) PEBBLES, MOSTLY TAN AND RED PEBBLES.
565	576	MEDIUM GRAINED-MEDIUM FINE GRAINED GRAVEL, FEW COARSE GRAINED PEBBLES, VERY LITTLE SAND, SILTY, BROWN WATER. DRILLING SMOOTHER AND FASTER
576	594	BROWN, SILTY WATER IN GRAVEL, SOME PEBBLES AND FINE GRAINED BROWN SAND WITH BLACK GRAINS. INCREASING SAND CONTENT WITH DEPTH. MOSTLY GRAVEL AT START.
594	596	YELLOW BROWN SILTY WATER IN MEDIUM GRAIN, BROWN SAND WITH GRAVEL AND PEBBLES
596	636	SAND WITH GRAVEL. LIGHT BROWN TO BROWN TAN, SILTY WATER IN MEDIUM GRAIN BROWN SAND WITH MEDIUM FINE GRAINED-MEDIUM GRAINED, POORLY SORTED GRAVEL.
636	640	SAND WITH GRAVEL AND SOME PEBBLES. BROWN WATER IN FG.MFG SAND WITH MG GRAVEL AND VERY FEW PEBBLES. FINES SETTLE QUICKLY FROM WATER.
640	656	DRILLING HARDER. SAND AND GRAVEL AND PEBBLES. SAND TO GRAVEL ABOUT 50/50 MIX.
656	676	GRAVEL WITH SOME SAND. MEDIUM GRAINED-MEDIUM FINE GRAINED GRAVEL, PEA GRAVEL, SOME SAND. MINOR SILT, GRAVEL HAS SOME WHITE, QUARTZITE GRAINS. FINE GRAINED SAND, MORE SAND CONTENT TOWARDS BOTTOM OF INTERVAL. SILT AND FINES SETTLE FROM WATER. WATER IS MEDIUM BROWN COLOR.
676	678	GRAVEL WITH PEBBLES, ROUNDED GRAINS
678	682	DARK BROWN BLACK GRAVEL WITH PEBBLES. HARD SLOW DRILLING
682	686	SAND AND GRAVEL, MEDIUM BROWN-LIGHT BROWN. FINE SETTLE FROM WATER, CLEAN WATER. HARD SLOW DRILLING
686	698	COARSE SAND WITH GRAVEL. COARSE GRAINED-MEDIUM FINE GRAINED SAND WITH MEDIUM FINE GRAINED-MEDIUM GRAINED GRAVEL. MOSTLY SAND, FEW PEBBLES. LARGE PERCENT OF FINES. FINES SETTLE FROM WATER, CLEAN WATER. ROUGH DRILLING (HARD). SAND CONTENT INCREASING WITH DEPTH. SAND MAY HEAVE IF SCREENED IN THIS INTERVAL.
698	716	GRAVEL WITH SAND. MEDIUM FINE GRAINED GRAVEL WITH PEBBLES/COBBLE CHIPS, SOME SAND (LOW PERCENTAGE). GRAVELS ARE RED AND LIGHT BROWN, WITH SOME WHITE GRAINS. THE FEW PEBBLES PRESENT ARE ROUNDED. ROUGH/HARD DRILLING.

MONTANA WELL LOG REPORT

Other Options

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

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Site Name: BIG FORK WATER AND SEWER DISTRICT * BFF#5 **Section 7: Well Test Data**
GWIC Id: 317644

Section 1: Well Owner(s)

1) BIG FORK WATER AND SEWER DISTRICT (MAIL)
 108 HARBOR HEIGHTS BLV
 BIG FORK MONTANA 59911 [10/15/2021]

Total Depth: 1600
 Static Water Level: 15
 Water Temperature:

Air Test *

5 gpm with drill stem set at 500 feet for 1 hours.
 Time of recovery 1 hours.
 Recovery water level 15 feet.
 Pumping water level feet.

Section 2: Location

Township	Range	Section	Quarter Sections
27N	20W	18	SE¼ NE¼
County		Geocode	

FLATHEAD

Latitude	Longitude	Geomethod	Datum
48.103806	-114.182175	NAV-GPS	NAD83
Ground Surface Altitude	Ground Surface Method	Datum	Date
2908	DEM	NAVD88	10/20/2021
Measuring Point Altitude	MP Method	Datum	Date Applies
2911	DEM	NAVD88	10/20/2021
Addition	Block	Lot	

* During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.

Section 8: Remarks

Section 9: Well Log

Geologic Source

120SDMS - SEDIMENTS (TERTIARY)

From	To	Description
0	1	TOPSOIL - SILT LOAM
1	11	LIGHT BROWN TO TAN SOFT LOOSE SILT
11	30	FINE REDDISH BROWN SAND
30	35	FINE TO MEDIUM GRAY SAND
35	78	FINE TO MEDIUM GRAY SAND WITH SOME FINE GRAVEL, SOME SHELL FRAGMENTS (MUSSELS?), AND SOME PLANT FRAGMENTS
78	125	GRAY SILTY SAND WITH SOME WOOD FRAGMENTS AND FEW SHELLS
125	219	GRAY FINE SAND TO SILT WITH OCCASIONAL CLAY LAYERS
219	402	GRAY CLAY; FEW RETURNS; SILT AND FINER MOSTLY LOST IN THE DRILLING MUD; PLASTIC CLAY IN CLUMPS ON THE SCREEN
402	408	COURSE SAND AND GRAVEL; LITHIC FRAGMENTS OF ARGILLITE (BELT)
408	415	FINE TO MEDIUM GRAVEL WITH SOME FINE TO COURSE SAND
415	440	FINE TO MEDIUM GRAVEL WITH LITTLE SAND
440	485	GRAVEL WITH PEBBLES, COBBLES, AND SOME SAND
485	495	MEDIUM GRAVEL
495	505	COURSE GRAVEL
505	540	GRAVEL WITH PEBBLES, COBBLES, AND SOME SAND

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Section 3: Proposed Use of Water

MONITORING (1)

Section 4: Type of Work

Drilling Method: ROTARY
 Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Friday, October 15, 2021

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	380	16
380	1600	9.5

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
2	380	12	0.25		WELDED	A53B STEEL
2	540	10	0.25		WELDED	A53B STEEL
2	1540	6	0.188		THREADED	A53A STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
1540	1560	5		.020	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	340	CEMENT	Y
1520	1600	SILICA SAND	Y

Name: CHAD DANIELSON
Company: RM DRILLING & WELL SERVICE INC.
License No: WWC-114
Date Completed: 10/15/2021

Site Name: BIG FORK WATER AND SEWER DISTRICT		
GWIC Id: 317644		
Additional Lithology Records		
From	To	Description
540	580	GRAVEL WITH SOME SAND
580	620	GRAVEL WITH SOME SAND AND FEW COBBLES
620	640	GRAVEL WITH SOME SAND
640	680	FINE GRAVEL AND MEDIUM TO COURSE SAND
680	760	FINE TO MEDIUM GRAVEL WITH SOME SAND
760	780	FINE TO MEDIUM GRAVEL WITH LITTLE SAND
780	940	FINE TO MEDIUM GRAVEL WITH SOME MEDIUM TO COURSE SAND
940	960	MEDIUM GRAVEL WITH SOME FINE GRAVEL AND VERY LITTLE SAND
960	975	FINE GRAVEL WITH SOME MEDIUM GRAVEL AND SAND
975	983	CLAY? SMOOTH DRILLING WITH NO RETURNS
983	1003	SAND WITH LITTLE GRAVEL
1003	1025	FINE GRAVEL WITH SOME SAND
1025	1085	MEDIUM GRAVEL WITH SOME SAND
1085	1095	FINE GRAVEL, AND SAND
1095	1200	FINE TO MEDIUM GRAVEL WITH SOME SAND
1200	1380	GRAY SAND WITH SOME PLANT FRAGMENTS; FEW RETURNS
1380	1473	GRAY SAND WITH FEW PLANT FRAGMENTS; FEW RETURNS
1473	1600	GRAY SAND WITH SOME PLANT FRAGMENTS; FEW RETURNS