

COLLINS PRODUCTION WELL EXPLORATORY TEST WELL DRILLING AND TESTING

CITY OF PORTSMOUTH, NEW HAMPSHIRE

March 19, 2020
33.0083068.01



PREPARED FOR:
Al Pratt
City of Portsmouth, New Hampshire

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March 19, 2020
Project No. 33.0083068.01

Mr. Al Pratt
Department of Public Works
City of Portsmouth, New Hampshire
680 Peverly Hill Road
Portsmouth, NH 03801

RE: Summary Report regarding Exploratory Test Well Drilling and Testing near the Collins Production Well

Dear Al:

Emery & Garrett Groundwater Investigations (EGGI), a Division of GZA, has completed a preliminary hydrogeologic investigation near the Collins Production Well in Portsmouth, New Hampshire, subject to the limitations in **Appendix A**. The purpose of the investigation was to identify the most promising location to drill and develop a Replacement Production Well. The Collins Production Well has declined in production in recent years and can no longer withdraw groundwater at its design capacity of 650,000 gallons per day (gpd) or 450 gallons per minute (gpm). The existing Collins Well is somewhat limited in its drawdown capacity, so this investigation was focused on identifying the most promising area near the existing Collins Well where favorable transmissive geologic deposits exist, and greater saturated thickness of these deposits occur. EGGI has now completed the following:

- Installation of six exploratory test wells (Wells CSG2, CSG3, CSG4, CSG6, CSG7, and CSG8; **Figure 1** and **Table 1**).
- Development of all six exploratory test wells and preliminary yield testing of Wells CSG3, CSG4, CSG7, and CSG8.
- Sampling and analysis of groundwater from four test Wells (CSG3, CSG4, CSG7, and CSG8 (**Table 2**)).
- Groundwater level monitoring in Wells CSG3, CSG4, CSG7, and CSG8 to evaluate interference effects induced by pumping the existing Collins Well.

1.0 EXPLORATORY TEST WELL INSTALLATION

Exploratory Test Wells CSG2, CSG3, CSG4, and CSG6 were installed in August 2019, and Wells CSG7 and CSG8 were installed in January 2020 using a track-mounted drill rig with four-inch-diameter drive casing (**Appendix B**). The exploratory test well locations were selected based on the results of surficial geologic mapping, geophysical surveys, and the required setbacks from a Production Well to property boundaries and surface water (400 and 50 feet, respectively) (**Figure 1**).

Total depths of the boreholes ranged from 35.5 feet to 85 feet below ground level (**Table 1**). Three-inch-diameter PVC wells with 20-slot (0.020-inch openings) PVC screen were constructed in five of the borings: Wells CSG3, CSG4, CSG6, CSG7, and CSG8. Two-inch-diameter PVC with 10-slot (0.010-inch openings) was used to construct Well CSG2 because it was only to be used for water level monitoring. The wells were all constructed with between ten and twenty feet of slotted screen (**Table 1**).

2.0 DEVELOPMENT AND PRELIMINARY YIELD TESTING

Shortly after each well was installed, they were developed using a pump-and-surge technique where a tight-fitting surge block is reciprocated in the well screen while groundwater is removed from the well. This technique removes fine-grained material within and surrounding the well screen which serves to enhance the hydraulic communication between the well and the aquifer. During well development, it was found that Well CSG6 was screened in relatively low permeability material and would not be productive enough to justify the expense of preliminary testing.

Preliminary yield testing of Wells CSG3, CSG4, CSG7, and CSG8 was conducted by withdrawing groundwater with a submersible pump while water levels were monitored, allowing calculation of the specific capacity by dividing the pumping rate in gpm by the feet of pumping-induced drawdown (**Figure 1**). The specific capacity provides a measure of pumping capacity so that the relative potential yield of exploratory test wells can be compared. Both Wells CSG3 and CSG7 had exceptionally high specific capacity values at 273 and 184 gallons per minute per foot of drawdown (gpm/ft), respectively (**Table 1**). These values might be somewhat influenced by water level changes induced by the pumping/recovery of the Collins Well, but regardless these values are indicative of very highly transmissive aquifer materials. Well CSG4 also had a favorable specific capacity value of 54.3 gpm/ft.

3.0 SAMPLING AND ANALYSIS OF GROUNDWATER QUALITY

At the conclusion of the preliminary yield testing on Wells CSG3, CSG4, CSG7, and CSG8, groundwater samples were collected and submitted to National Testing Laboratories of Cleveland, Ohio, to evaluate general groundwater quality (**Figure 1**, **Table 2**, and **Appendix D**). The groundwater withdrawn from the aquifer near the Collins Well was generally of very high quality with no violations of Primary (health-based) Drinking Water Standards. All four exploratory test wells report relatively high hardness values (200 to 230 milligrams per liter (mg/l)), presumably due to the chemical makeup of the underlying bedrock (Kittery Formation – a calcareous metasandstone). The only Secondary (aesthetic/taste-based) Drinking Water Standard that was exceeded was that for manganese (0.05 mg/l) in Wells CSG4 and CSG7 (0.374 and 0.155 mg/l, respectively).

4.0 GROUNDWATER LEVEL MONITORING

Following preliminary yield testing and sampling, automated water level recorders were installed in Wells CSG3, CSG4, CSG7, and CSG8 for a period of several weeks to record pumping interferences with the existing Collins Production Well (**Figure 1** and **Appendix D**). Each of the plots in **Appendix D** shows three weeks of water level data.

Water level variations caused by the Collins Well in CSG3 were up to 0.6 feet during October 2019. Similar variations were recorded at CSG7 (0.4 feet) and CSG8 (0.9 feet) in February 2020. The monitoring of water levels in CSG4 during October 2019 shows no water level variations attributable to the Collins Production Well. This suggests that the development of additional yield capacity from the local aquifer at this location may be possible.

5.0 RECOMMENDATIONS

Based on all the work completed to date, the most favorable location for constructing and developing a replacement well for the Collins Production Well is in the immediate vicinity of Well CSG7. This Well is highly favorable because:

- It has a very high specific capacity, estimated to be 184 gpm/ft or higher (**Table 1**). The initial specific capacity of the Collins Well after its construction was 63 gpm/ft and under long-term operating conditions it varied from 7.9 to 45 gpm/ft (**Tata & Howard, 2010¹**).
- It is 392 feet from the closest property boundary as measured by the City. Therefore, the Well is just short of the 400-foot Sanitary Protective Radius (SPA) requirement. A waiver for the 8-10 feet can likely be obtained. A replacement Production Well could also be sited with a full 400-foot setback from property boundaries, but that might require minor filling of the adjacent wetland.
- Production Wells need to be sited 50 feet from areas with standing surface water for 30 days or more per year. The wetland adjacent to CSG7 is not characterized by standing water for long periods of time, so a Replacement Well at this location meets the requirement for a 50-foot setback from surface water.
- Well CSG7 has significantly more available drawdown (approximately 36 feet) than the existing Collins Well (approximately 28 feet). Construction of a Replacement Well near Well CSG7 may allow for a shorter screen to be installed than the exploratory test well, so even more drawdown may be available.

The only disadvantage of this proposed location is the detection of dissolved manganese at a level exceeding the Secondary Drinking Water Limit (**Table 2**). However, Well CSG7 was only pumped for two hours before the sample was collected, so the manganese may represent a very localized area of elevated manganese. A larger Production Well constructed in the same location will draw groundwater from a much larger area and provide a more representative manganese concentration under actual operating conditions. **Tata & Howard (2010)** report that between 1988 (Collins Well installation) and 2010, the highest manganese concentration measured was 0.08 mg/l. It is suspected that a Replacement Collins Well would ultimately have a similar manganese concentration as the existing Collins Well.

It's EGGI's professional opinion that the City should proceed with the development of a Replacement Well at the Well CSG-7 location. Final cost estimates to complete this work will be provided upon request.

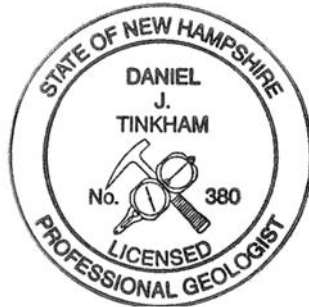
¹ Tata & Howard, Inc., Draft Letter Report, Collins Well and Pump Station Evaluation, July 7, 2010.

Respectfully submitted,

EMERY & GARRETT GROUNDWATER INVESTIGATIONS, A DIVISION OF GZA



Daniel J. Tinkham, PG
Project Manager
Senior Hydrogeologic Consultant



James M. Emery, PG
Principal/District Office Manager
Senior Hydrogeologist



DJT/JME

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Attachments:

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|------------|--|
| Table 1 | Exploratory Test Well Information |
| Table 2 | Results of Laboratory Analyses from Water Quality Samples Collected |
| Figure 1 | Exploratory Test Well Location Proximal to the Collins Production Well |
| Appendix A | Limitations |
| Appendix B | Hydrogeologic Logs |
| Appendix C | Water Quality Results |
| Appendix D | Groundwater Level Plots |



Tables

TABLE 1
Exploratory Test Well Information
Collins Well Field Assessment Project
City of Portsmouth, New Hampshire

	Approximate Coordinates of Site (NAD 83 NH State Plane)		Elevation of Measurement Point (feet, msl)	Depth to Rock or Refusal (feet)	Bedrock Elevation (feet, msl)	Total Depth of Well (feet)	Screened Interval/ Slot Size (feet / inches)	Pumping Rate During Testing (gpm)	Specific Capacity During Testing (gpm/ft)
	Northing	Easting							
Exploratory Sand and Gravel Test Wells									
PRD-CSG2	204,683	1,219,101	47.10	32.5	12.60	32	22' - 32' / 0.010"	nt	nt
PRD-CSG3	204,927	1,218,844	64.70	Not Intercepted	Unknown	78.5	58.5' - 78.5' / 0.020"	43.6	273*
PRD-CSG4	205,404	1,219,158	29.33	Not Intercepted	Unknown	52.5	32.5' - 52.5' / 0.020"	44.0	54.3
PRD-CSG6	204,762	1,218,911	48.56	52.5	-5.94	52.5	42.5' - 52.5' / 0.020"	nt	nt
PRD-CSG7	205,019	1,218,870	32.34	74	-44	60.5	40.5' - 60.5' / 0.020"	49.7	184*
PRD-CSG8	205,057	1,218,730	30.49	45	-17	38	28' - 38' / 0.020"	20.0	34.5*

msl- mean sea level

nt = not tested; test wells were too low yielding to warrant further testing.

* = Reported specific capacity values may be influenced by pumping/recovery of the Collins Production Wells.

TABLE 2
Results of Laboratory Analyses from Water Quality Samples Collected
Collins Well Field Assessment Project
City of Portsmouth, New Hampshire

Well	Lab	Iron (mg/l)	Manganese (mg/l)	pH	Arsenic (mg/l)	Alkalinity (mg/l)	Chloride (mg/l)	Turbidity (ntu)	Hardness (mg/l)	Total Dissolved				
										Solids (mg/l)	Sulfate (mg/l)	Nitrate (mg/l)	SOCs (mg/l)	VOCs (mg/l)
	MCL	0.30	0.05	6.5-8.5			250	1		500	250	10		
PRD-CSG3	NTL	0.024	0.022	7.4	BDL	290	76.0	0.1	230	430	17.0	BDL	BDL	BDL
PRD-CSG4	NTL	BDL	0.374	7.5	BDL	120	100.0	0.1	200	340	16.0	0.9	BDL	BDL
PRD-CSG7	NTL	BDL	0.155	7.5	BDL	170	96.0	BDL	200	360	13.0	BDL	BDL	BDL
PRD-CSG8	NTL	BDL	0.021	7.5	BDL	180	120.0	BDL	230	410	17.0	BDL	BDL	BDL

BDL = parameter below detection limit

LAB CODE: NTL = National Testing Laboratories, Ltd

Values in bold meet or exceed Drinking Water Standard (MCL)



Figure

FIGURE 1

Exploratory Test Well Locations
Proximal to the Collins Production Well

City of Portsmouth, New Hampshire
Groundwater Exploration Program



Legend

- PRD-CSG7 Exploratory Test Well Site
- Collins Production Well
- 400-foot Buffer around Test Well CSG7
- Lot Owned by City of Portsmouth
- Tax Map Parcels
- Railroad Corridor



Scale is 1:2,400
1 inch = 200 feet

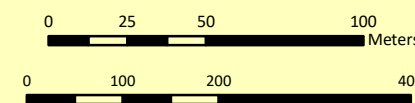


FIGURE 1

Emery & Garrett
Groundwater Investigations, A Division of GZA



Appendix A – Limitations



USE OF REPORT

1. Emery & Garrett Groundwater Investigations (EGGI), a Division of GZA GeoEnvironmental, Inc. (GZA) (hereafter referenced as GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

STANDARD OF CARE

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Proposal for Services and/or Report and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. Conditions other than described in this report may be found at the subject location(s).
3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made. Specifically, GZA does not and cannot represent that the Site contains no hazardous material, oil, or other latent condition beyond that observed by GZA during its study. Additionally, GZA makes no warranty that any response action or recommended action will achieve all of its objectives or that the findings of this study will be upheld by a local, state or federal agency.
4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

SUBSURFACE CONDITIONS

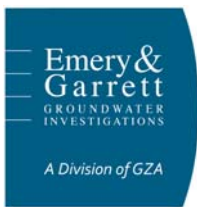
5. The nature and extent of well yield performance associated with this testing process may not become evident until further pumping of the well. If variations or other latent conditions then become evident, it may be necessary to reevaluate the conclusions and recommendations of this report.
6. Water level readings have been made, as described in this Report, in the production well at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The observed water table may be other than indicated in the Report.

COMPLIANCE WITH CODES AND REGULATIONS

7. We used reasonable care in identifying and interpreting applicable codes and regulations necessary to execute our scope of work. These codes and regulations are subject to various, and possibly contradictory, interpretations. Interpretations and compliance with codes and regulations by other parties is beyond our control.

SCREENING AND ANALYTICAL TESTING

8. GZA collected environmental samples at the locations identified in the Report. These samples were analyzed for the specific parameters identified in the report. Additional constituents, for which analyses were not conducted, may be



present in soil, groundwater, surface water, sediment and/or air. Future Site activities and uses may result in a requirement for additional testing.

9. Our interpretation of field screening and laboratory data is presented in the Report. Unless otherwise noted, we relied upon the laboratory's QA/QC program to validate these data.
10. Variations in the types and concentrations of contaminants observed at a given location or time may occur due to release mechanisms, changes in flow paths, and/or the influence of various physical, chemical, biological or radiological processes. Subsequently observed concentrations may be other than indicated in the Report.

INTERPRETATION OF DATA

11. Our opinions are based on available information as described in the Report, and on our professional judgment. Additional observations made over time, and/or space, may not support the opinions provided in the Report.

ADDITIONAL INFORMATION

12. In the event that the Client or others authorized to use this report obtain additional information on environmental or hazardous waste issues at the Site not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the conclusions stated in this report.



Appendix B – Hydrogeologic Logs

HYDROGEOLOGIC LOG FOR EXPLORATORY TEST WELL PRD-CSG2

Collins Well Field Assessment Project City of Portsmouth, New Hampshire

Collins Well Field Assessment Project

Driller: S.W. Cole Engineering, Inc.

Geologist: Ryan Chase (August 9), Michael O'Brien (August 12)

Dates Drilled: August 9 & 12, 2019

Drill Method: Drive and Wash Casing Advancement

Total Depth of Borehole: 35.5'

Depth to Bedrock: 32.5'

Static Water Level: 19.21' (9/11/19)

Screen Interval (Slot Size): 22' - 32' (0.010" slotted)

DEPTH (feet)	WELL CONSTRUCTION	DRILL LOG	SAMPLE DESCRIPTION	**Penetration Blows (Recovery)
+2	Locking, protective monument			
0			0' - 31.5': Brown, well-sorted fine to medium sand, trace silt, trace pebbles.	
2	0'-2': Natural Fill			
4	and/or #2 Sand			
6	2'-6': Bentonite			
8	2-inch PVC casing			
10	2.5' a.g.* to 22' b.g.*		10'-12': Split-spoon: Brown, well-sorted, fine to medium sand, trace silt, trace pebbles.	18,31,9,8 (Unknown)
12				
14				
16				
18	19.21' Water Level			
20			20'-22': Split-spoon: Brown, well-sorted, fine to medium sand, trace silt.	5,7,7,8 (Unknown)
22	6'-35.5': Natural Fill			
24	and/or #2 Sand			
26	22'-32': 2-inch PVC			
28	0.010" slotted screen			
30			30'-32': Split-spoon: Brown, compact, well-sorted fine to medium sand, 2" of till/rock fragments in the tip of the spoon.	9,14,29,39 (13")
32	32': Bottom of well		31.5' - 32.5': Compact, poorly-sorted, till.	
34	35.5': Bottom of boring		32.5' - 35.5': Competent bedrock.	
36				
38			35.5': Bottom of boring.	

*a.g. - Above Ground Surface; b.g. - Below Ground Surface.

** Penetration blows with a 140-pound hammer falling 30 inches (per 6 inches over a 2-foot interval).

GEOLOGIC LOG LEGEND

- Generally, well-sorted, fine to coarse sand, trace silt.
- Till; compact, poorly-sorted clay to pebbles.
- Bedrock - Partially weathered to competent rock.

PERCENTAGES USED IN SAMPLE DESCRIPTIONS

Trace = 0-10% Little = 10-20%
Some = 20-35% And = 35-50%

HYDROGEOLOGIC LOG FOR EXPLORATORY TEST WELL PRD-CSG3

Collins Well Field Assessment Project City of Portsmouth, New Hampshire

Collins Well Field Assessment Project

Driller: S.W. Cole Engineering, Inc.

Geologist: Ryan Chase

Date Drilled: August 8-9, 2019

Drill Method: Drive and Wash Casing Advancement

Total Depth of Borehole: 85'

Depth to Bedrock: not intercepted

Static Water Level: 41.15' (9/4/19)

Screen Interval (Slot Size): 58.5' - 78.5' (0.020" slotted)

DEPTH (feet)	WELL CONSTRUCTION	DRILL LOG	SAMPLE DESCRIPTION	**Penetration Blows (Recovery)
+2	Locking, protective monument			
0			0' - 29': Poorly-sorted fine sand to pebbles, trace silt.	
2	0'-7': Natural Fill			
4				
6				
8	7'-18': Bentonite			
10			10'-12': Split-spoon: Brown, poorly-sorted, fine sand to pebbles, trace silt.	13,22,13,11 (Unknown)
12				
14				
16				
18				
20			20'-22': Split-spoon: Brown, poorly-sorted, fine sand to pebbles, trace silt.	12,11,19,15 (Unknown)
22	18'-85': Natural Fill			
24				
26	3-inch PVC casing			
28	2' a.g.* to 58.5' b.g.*		29' - 33': Well-sorted medium sand.	
30			30'-32': Split-spoon: Brown, well-sorted, medium sand.	15,14,15,19 (Unknown)
32			33' - 50': Poorly-sorted fine sand to pebbles, trace silt.	
34			35'-37': Split-spoon: Brown, poorly-sorted, fine sand to pebbles, trace silt.	24,20,22,26 (Unknown)
36				
38				
40	41.15' Water Level		40'-42': Split-spoon: Brown to gray, poorly-sorted, silt to pebbles.	7,7,9,16 (Unknown)
42				
44				
46				
48			50' - 73': Poorly-sorted silt to pebbles.	
50			50'-51'3": Split-spoon: Brown to gray, poorly-sorted, silt to pebbles.	20,37,50/3"*** (Unknown)
52				
54				
56				
58				
60			60'-62': Split-spoon: Brown to gray, poorly-sorted, silt to pebbles.	25,23,20,24 (Unknown)
62	58.5'-78.5': 3" PVC			
64	0.020" slotted			
66	screen		65'-67': Split-spoon: Gray-brown, poorly-sorted, silt to pebbles.	25,12,10,18 (Unknown)
68				
70			70'-72': Split-spoon: Gray-brown, poorly-sorted, silt to pebbles.	39,19,11,14 (Unknown)
72				
74			73' - 85': Well-sorted medium sand.	
76			75'-77': Split-spoon: Gray, well-sorted, fine to medium sand.	13,22,22,30 (Unknown)
78				
80	78.5': Bottom of well			
82	85': Bottom of			
84	boring		85': Bottom of boring.	
86				

HYDROGEOLOGIC LOG FOR EXPLORATORY TEST WELL PRD-CSG3

Collins Well Field Assessment Project

City of Portsmouth, New Hampshire

Collins Well Field Assessment Project

Driller: S.W. Cole Engineering, Inc.

Geologist: Ryan Chase

Date Drilled: August 8-9, 2019

Drill Method: Drive and Wash Casing Advancement

Total Depth of Borehole: 85'

Depth to Bedrock: not intercepted

Static Water Level: 41.15' (9/4/19)

Screen Interval (Slot Size): 58.5' - 78.5' (0.020" slotted)


DEPTH (feet)	WELL CONSTRUCTION	DRILL LOG	SAMPLE DESCRIPTION	**Penetration Blows (Recovery)
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
*a.g. - Above Ground Surface; b.g. - Below Ground Surface.

** Penetration blows with a 140-pound hammer falling 30 inches (per 6 inches over a 2-foot interval).

*** Inflated blow counts, soil stuck in rods.

GEOLOGIC LOG LEGEND

 Generally, poorly-sorted (well-graded), fine to coarse sands and gravels.

 Generally, well-sorted, fine to coarse sand, trace silt.

**PERCENTAGES USED IN
SAMPLE DESCRIPTIONS**

Trace = 0-10% Little = 10-20%
Some = 20-35% And = 35-50%

HYDROGEOLOGIC LOG FOR EXPLORATORY TEST WELL PRD-CSG4

Collins Well Field Assessment Project

City of Portsmouth, New Hampshire

Collins Well Field Assessment Project

Driller: S.W. Cole Engineering, Inc.

Geologist: Michael O'Brien

Date Drilled: August 13, 2019







Drill Method: Drive and Wash Casing Advancement

Total Depth of Borehole: 62'

Depth to Bedrock: not intercepted

Static Water Level: 5.34' (9/4/19)

Screen Interval (Slot Size): 32.5' - 52.5' (0.020" slotted)

DEPTH (feet)	WELL CONSTRUCTION	DRILL LOG	SAMPLE DESCRIPTION	**Penetration Blows (Recovery)
+2	Locking, protective monument			
0	0'-1': Natural Fill		0' - 7.5': Sand and gravel backfill, some cobbles.	
2	1'-5': Bentonite			
4	5.34' Water Level		7.5' - 23': Gray clay.	
6				
8				
10				
12				
14				
16				
18				
20				
22	5'-62': Natural Fill		23' - 50': Well-sorted, Medium to very coarse sand, little pebbles.	
24				
26	3-inch PVC casing			
28	2.5' a.g.* to 32.5' b.g.*			
30			30'-32': Split-spoon: Brown, well-sorted, fine to very coarse, little subrounded pebbles.	13,13,14,20 (12")
32				
34				
36				
38				
40	32.5'-52.5': 3-inch PVC 0.020" slotted screen		40'-42': Split-spoon: Brown, well-sorted, fine to very coarse sand, little subrounded pebbles.	12,14,14,28 (11")
42				
44				
46				
48				
50			50'-52': Split-spoon: Very fine to fine sand with large subangular pebbles.	18,20,10,14 (21")
52	52.5': Bottom of well		50' - 60': Fine to very coarse sand, trace pebbles.	
54				
56				
58			60' - 62': Very fine to fine sand.	
60	62': Bottom of boring		60'-62': Split-spoon: Very fine gray sand.	4,7,8,10 (12")
62			62': Bottom of boring.	
64				

*a.g. - Above Ground Surface; b.g. - Below Ground Surface.

** Penetration blows with a 140-pound hammer falling 30 inches (per 6 inches over a 2-foot interval).

HYDROGEOLOGIC LOG FOR EXPLORATORY TEST WELL PRD-CSG4

Collins Well Field Assessment Project

City of Portsmouth, New Hampshire

Collins Well Field Assessment Project

Driller: S.W. Cole Engineering, Inc.

Geologist: Michael O'Brien

Date Drilled: August 13, 2019

Drill Method: Drive and Wash Casing Advancement

Total Depth of Borehole: 62'

Depth to Bedrock: not intercepted

Static Water Level: 5.34' (9/4/19)

Screen Interval (Slot Size): 32.5' - 52.5' (0.020" slotted)

DEPTH (feet)	WELL CONSTRUCTION	DRILL LOG	SAMPLE DESCRIPTION	**Penetration Blows (Recovery)
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GEOLOGIC LOG LEGEND

- Generally, poorly-sorted (well-graded), fine to coarse sands and gravels.
- Clay
- Generally, well-sorted, fine to coarse sands; variable pebbles.
- Generally, well-sorted, fine to coarse sand, trace silt.
- Interbedded very fine to medium sands, trace coarse sand and silt.

**PERCENTAGES USED IN
SAMPLE DESCRIPTIONS**

Trace = 0-10% Little = 10-20%
Some = 20-35% And = 35-50%

HYDROGEOLOGIC LOG FOR EXPLORATORY TEST WELL PRD-CSG6

Collins Well Field Assessment Project City of Portsmouth, New Hampshire

Collins Well Field Assessment Project

Driller: S.W. Cole Engineering, Inc.

Geologist: Michael O'Brien

Date Drilled: August 12, 2019

Drill Method: Drive and Wash Casing Advancement

Total Depth of Borehole: 54.5'

Depth to Bedrock: 52.5'

Static Water Level: 24.50' (8/14/19)

Screen Interval (Slot Size): 42.5' - 52.5' (0.020" slotted)

DEPTH (feet)	WELL CONSTRUCTION	DRILL LOG	SAMPLE DESCRIPTION	**Penetration Blows (Recovery)
+2	Locking, protective monument			
0			0' - 20': Poorly-sorted, medium to coarse sand and gravel, some cobbles.	
2	0'-1': Bentonite			
4				
6				
8				
10	1'-54.5': Natural Fill		10'-12': Split-spoon: Medium to coarse sand and gravel.	50, refusal (10")
12				
14				
16				
18				
20			20'-22': Split-spoon: Fine to coarse sand, little silt.	12,14,12,14 (13")
22	24.50' Water Level		20' - 25': Well-sorted, fine to coarse sand, little silt.	
24				
26	3-inch PVC casing		25' - 43': Well-sorted, very fine to medium sand, trace silt.	
28	2.5' a.g.* to 42.5' b.g.*			
30			30'-32': Split-spoon: Well-sorted, silt to fine sand.	10,15,14,16 (19")
32				
34				
36				
38				
40	42.5'-52.5': 3-inch PVC		40'-42': Split-spoon: Well-sorted, silt to very fine sand, with trace thin clay layers.	8,14,15,17 (17")
42	0.020" slotted screen			
44			43' - 52': Fine to very coarse sand.	
46				
48				
50	52.5': Bottom of well		50'-52': Split-spoon: No return.	18,18,30,25 (0")
52			52' - 52.5': Till.	
54	54.5': Bottom of boring		52.5' - 54.5': Bedrock.	
56			54.5': Bottom of boring.	
58				

*a.g. - Above Ground Surface; b.g. - Below Ground Surface.

** Penetration blows with a 140-pound hammer falling 30 inches (per 6 inches over a 2-foot interval).

GEOLOGIC LOG LEGEND

- Generally, poorly-sorted (well-graded), fine to coarse sands and gravels.
- Generally, well-sorted, fine to coarse sand, trace silt.
- Interbedded very fine to medium sands, trace coarse sand and silt.
- Till; compact, poorly-sorted clay to pebbles.
- Bedrock - Partially to unweathered rock.

**PERCENTAGES USED IN
SAMPLE DESCRIPTIONS**

Trace = 0-10% Little = 10-20%
Some = 20-35% And = 35-50%

HYDROGEOLOGIC LOG FOR EXPLORATORY TEST WELL PRD-CSG7

Collins Well Field Assessment Project

City of Portsmouth, New Hampshire

Collins Well Field Assessment Project

Driller: S.W. Cole Engineering, Inc.

Geologist: Dan Tinkham & Megan Murphy

Date Drilled: January 13, 2020

Drill Method: Drive and Wash Casing Advancement

Total Depth of Borehole: 74'

Depth to Bedrock: not intercepted

Static Water Level: ~4' (01/13/20)

Screen Interval (Slot Size): 40.5' - 60.5' (0.020" slotted)

DEPTH (feet)	WELL CONSTRUCTION	DRILL LOG	SAMPLE DESCRIPTION	**Penetration Blows (Recovery)
+2.5	Locking, protective monument			
0			0' - 16': Poorly-sorted silt to pebbles.	
2	0'-2': Natural Fill			
4	2'-4': Bentonite			
6				
8	~ 4' Water Level			
10			10'-12': Split-spoon: Brown, poorly-sorted, silt to pebbles.	10, 11, 18, 21 (12")
12			Difficulty drilling from 12'-16'	
14				
16			16' - 23': Well-sorted medium sand.	
18			Auger to 20' - Heaving sands up into rods back to 14' - Switch to D&W	
20			20'-22': Split-spoon: Rusty-brown, well-sorted, fine to medium sand,	12, 11, 11, 17 (10")
22	4'-74': Natural Fill		trace silt.	
24			23' - 60': Poorly-sorted fine sand to pebbles, trace silt.	21, 20, 22, 32 (6")
26	3-inch PVC casing		24'-26': Split-spoon: Gray, poorly-sorted, silt to pebbles.	
28	2.5'a.g.* to 40.5'b.g.*			
30			30'-32': Split-spoon: WASH - All pebbles.	7, 5, 7, 9 (0")
32				
34			35'-37': Split-spoon: Brown, poorly-sorted, silt to pebbles.	8, 9, 10, 10 (3")
36				
38			39'-41': Split-spoon: (6") Brown, moderately-sorted, v. fine sand to granulers.	9, 10, 9, 11 (11")
40			(5") Tan, poorly-sorted, silt to pebbles.	
42				
44				
46			45'-47': Split-spoon: WASH - Granulers to pebbles.	9, 11, 24, 28 (0")
48	40.5'-60.5': 3" PVC			
50	0.020" slotted		50'-52": Split-spoon: (6") Brown, moderately-sorted, fine sand to granulers,	15, 8, 10, 16 (11")
52	screen		trace silt.	
54			(5") Brown, poorly-sorted, v. fine sand to pebbles, trace silt.	
56			55'-57': Split-spoon: (7") Brown, moderately-sorted, fine sand to pebbles.	17, 15, 28, 38 (19")
58			(8") Tan, well-sorted, v. fine to fine sand, laminated.	
60			(4") Brown, poorly-sorted, medium sand to pebbles.	
62	60.5': Bottom of well		60' - 71': Well-sorted medium sand.	
64			60'-62': Split-spoon: (8") Brown well-sorted, fine to medium sand.	6, 11, 13, 21 (16")
66			(8") Gray, well-sorted, fine to medium sand.	
68				
70				
72			71' - 74': Till (based on drilling observations).	
74	74': Bottom of boring		74': Bottom of boring - Refusal on Bedrock.	
76				

HYDROGEOLOGIC LOG FOR EXPLORATORY TEST WELL PRD-CSG7

Collins Well Field Assessment Project

City of Portsmouth, New Hampshire

Collins Well Field Assessment Project

Driller: S.W. Cole Engineering, Inc.

Geologist: Dan Tinkham & Megan Murphy

Date Drilled: January 13, 2020

Drill Method: Drive and Wash Casing Advancement

Total Depth of Borehole: 74'

Depth to Bedrock: not intercepted

Static Water Level: ~4' (01/13/20)


Screen Interval (Slot Size): 40.5' - 60.5' (0.020" slotted)


DEPTH (feet)	WELL CONSTRUCTION	DRILL LOG	SAMPLE DESCRIPTION	**Penetration Blows (Recovery)
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*a.g. - Above Ground Surface; b.g. - Below Ground Surface.

** Penetration blows with a 140-pound hammer falling 30 inches (per 6 inches over a 2-foot interval).

GEOLOGIC LOG LEGEND

 Generally, poorly-sorted (well-graded), fine to coarse sands and gravels.

 Generally, well-sorted, fine to coarse sand, trace silt.

 Till; compact, poorly-sorted clay to pebbles.

**PERCENTAGES USED IN
SAMPLE DESCRIPTIONS**

Trace = 0-10% Little = 10-20%
Some = 20-35% And = 35-50%

HYDROGEOLOGIC LOG FOR EXPLORATORY TEST WELL PRD-CSG8

Collins Well Field Assessment Project

City of Portsmouth, New Hampshire

Collins Well Field Assessment Project

Driller: S.W. Cole Engineering, Inc.

Geologist: Dan Tinkham & Megan Murphy

Date Drilled: January 14, 2020

Drill Method: Drive and Wash Casing Advancement

Total Depth of Borehole: 45'

Depth to Refusal: 45'

Static Water Level: ~4' (01/14/20)

Screen Interval (Slot Size): 28' - 38' (0.020" slotted)

DEPTH (feet)	WELL CONSTRUCTION	DRILL LOG	SAMPLE DESCRIPTION	**Penetration Blows (Recovery)
+2.5	Locking, protective monument			
0	0'-3': Natural Fill		0' - 45': Poorly-sorted silt to pebbles.	
2				
4	~4' Water Level			
6				
8	3'-5': Bentonite		~8': (Visual description of cuttings) Gray clay encountered at approximately 8' layers continued to approximately 20'.	
10				
12				
14			Difficulty drilling from 10'-20' - dark gray cuttings observed.	
16	5-46': Natural Fill			
18				
20			20'-22': Split-spoon: Brown, poorly-sorted, silt to pebbles.	7, 5, 8, 9 (5")
22				
24				
26	3-inch PVC casing			
28	2.5' a.g.* to 28' b.g.*			
30			30'-32': Split-spoon: Gray-brown, poorly-sorted, silt to pebbles.	10, 15, 15, 15 (8")
32	28'-38': 3" PVC		Difficulty drilling from 32'-35'.	
34	0.020" slotted		35'-37': Split-spoon: Tan, poorly-sorted, silt to pebbles, large weathered clast.	19, 26, 28, 23 (12")
36	screen		Lost almost all water between 35' to 40'.	
38				
40	38': Bottom of well		40'-42': Split-spoon: Tan-gray, poorly-sorted, silt to pebbles.	9, 10, 9, 11 (11")
42			Lost almost all water between 40' to 45'.	
44	45': Bottom of boring		Casing refusal at 43'.	
46			Roller bit refusal at 45'.	
			45': Bottom of boring - Refusal	

HYDROGEOLOGIC LOG FOR EXPLORATORY TEST WELL PRD-CSG8

Collins Well Field Assessment Project

City of Portsmouth, New Hampshire

Collins Well Field Assessment Project

Driller: S.W. Cole Engineering, Inc.

Geologist: Dan Tinkham & Megan Murphy

Date Drilled: January 14, 2020

Drill Method: Drive and Wash Casing Advancement

Total Depth of Borehole: 45'

Depth to Refusal: 45'

Static Water Level: ~4' (01/14/20)

Screen Interval (Slot Size): 28' - 38' (0.020" slotted)

DEPTH (feet)	WELL CONSTRUCTION	DRILL LOG	SAMPLE DESCRIPTION	**Penetration Blows (Recovery)
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*a.g. - Above Ground Surface; b.g. - Below Ground Surface.

** Penetration blows with a 140-pound hammer falling 30 inches (per 6 inches over a 2-foot interval).

GEOLOGIC LOG LEGEND



Generally, poorly-sorted (well-graded), fine to coarse sands and gravels.

**PERCENTAGES USED IN
SAMPLE DESCRIPTIONS**

Trace = 0-10% Little = 10-20%
Some = 20-35% And = 35-50%



Appendix C – Water Quality Results

Informational Water Quality Report

Watercheck w/PO



6571 Wilson Mills Rd
Cleveland, Ohio 44143
1-800-458-3330

Client:

Ordered By:
Emery & Garrett Groundwater Investigations, LLC 56 Main Street Meredith, NH 03253 ATTN: Emery & Garrett Groundwater Inc.

Sample Number: 903544

Location: PRD-CSG3

Type of Water: Well Water

Collection Date and Time: 9/4/2019 11:00 AM

Received Date and Time: 9/6/2019 10:55 AM

Date Completed: 9/20/2019

Metals Filtered

Definition and Legend

This informational water quality report compares the actual test result to national standards as defined in the EPA's Primary and Secondary Drinking Water Regulations.

Primary Standards: Are expressed as the maximum contaminant level (MCL) which is the highest level of contaminant that is allowed in drinking water. MCLs are enforceable standards.

Secondary standards: Are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. Individual states may choose to adopt them as enforceable standards.


Action levels: Are defined in treatment techniques which are required processes intended to reduce the level of a contaminant in drinking water.

mg/L (ppm): Unless otherwise indicated, results and standards are expressed as an amount in milligrams per liter or parts per million.


Minimum Detection Level (MDL): The lowest level that the laboratory can detect a contaminant.

ND: The contaminant was not detected above the minimum detection level.


NA: The contaminant was not analyzed.

 The contaminant was not detected in the sample above the minimum detection level.

 The contaminant was detected at or above the minimum detection level, but not above the referenced standard.

 The contaminant was detected above the standard, which is not an EPA enforceable MCL.

 The contaminant was detected above the EPA enforceable MCL.

 These results may be invalid.

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
Microbiologicals					
	Total Coliform by P/A	No bacteria sample was submitted.			
Inorganic Analytes - Metals					
✓	Aluminum	ND	mg/L	0.2	EPA Secondary 0.1
✓	Arsenic	ND	mg/L	0.010	EPA Primary 0.005
✓	Barium	ND	mg/L	2	EPA Primary 0.30
✓	Cadmium	ND	mg/L	0.005	EPA Primary 0.002
●	Calcium	67.3	mg/L	--	2.0
✓	Chromium	ND	mg/L	0.1	EPA Primary 0.010
●	Copper	0.005	mg/L	1.3	EPA Action Level 0.004
●	Iron	0.024	mg/L	0.3	EPA Secondary 0.020
✓	Lead	ND	mg/L	0.015	EPA Action Level 0.002
●	Lithium	0.005	mg/L	--	0.001
●	Magnesium	14.54	mg/L	--	0.10
●	Manganese	0.022	mg/L	0.05	EPA Secondary 0.004
✓	Mercury	ND	mg/L	0.002	EPA Primary 0.001
✓	Nickel	ND	mg/L	--	0.020
●	Potassium	4.4	mg/L	--	1.0
✓	Selenium	ND	mg/L	0.05	EPA Primary 0.020
●	Silica	10.9	mg/L	--	0.1
✓	Silver	ND	mg/L	0.100	EPA Secondary 0.002
●	Sodium	63	mg/L	--	1
●	Strontium	0.321	mg/L	--	0.001
●	Uranium	0.004	mg/L	0.030	EPA Primary 0.001
●	Zinc	0.074	mg/L	5	EPA Secondary 0.004
Physical Factors					
●	Alkalinity (Total as CaCO3)	290	mg/L	--	20
▲	Hardness	230	mg/L	100	NTL Internal 10

Status	Contaminant	Results	Units	National Standards	Min. Detection Level	
✓	pH	7.4	pH Units	6.5 to 8.5	EPA Secondary	
●	Total Dissolved Solids	430	mg/L	500	EPA Secondary	20
●	Turbidity	0.1	NTU	1.0	EPA Action Level	0.1
Inorganic Analytes - Other						
✓	Bromide	ND	mg/L	--		0.5
●	Chloride	76.0	mg/L	250	EPA Secondary	5.0
✓	Fluoride	ND	mg/L	4.0	EPA Primary	0.5
✓	Nitrate as N	ND	mg/L	10	EPA Primary	0.5
✓	Nitrite as N	ND	mg/L	1	EPA Primary	0.5
✓	Ortho Phosphate	ND	mg/L	--		2.0
●	Sulfate	17.0	mg/L	250	EPA Secondary	5.0
Organic Analytes - Trihalomethanes						
✓	Bromodichloromethane	ND	mg/L	--		0.002
✓	Bromoform	ND	mg/L	--		0.004
✓	Chloroform	ND	mg/L	--		0.002
✓	Dibromochloromethane	ND	mg/L	--		0.004
✓	Total THMs	ND	mg/L	0.080	EPA Primary	0.002
Organic Analytes - Volatiles						
✓	1,1,1,2-Tetrachloroethane	ND	mg/L	--		0.002
✓	1,1,1-Trichloroethane	ND	mg/L	0.2	EPA Primary	0.001
✓	1,1,2,2-Tetrachloroethane	ND	mg/L	--		0.002
✓	1,1,2-Trichloroethane	ND	mg/L	0.005	EPA Primary	0.002
✓	1,1-Dichloroethane	ND	mg/L	--		0.002
✓	1,1-Dichloroethene	ND	mg/L	0.007	EPA Primary	0.001
✓	1,1-Dichloropropene	ND	mg/L	--		0.002
✓	1,2,3-Trichlorobenzene	ND	mg/L	--		0.002
✓	1,2,3-Trichloropropane	ND	mg/L	--		0.002
✓	1,2,4-Trichlorobenzene	ND	mg/L	0.07	EPA Primary	0.002

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
✓	1,2-Dichlorobenzene	ND	mg/L	0.6 EPA Primary	0.001
✓	1,2-Dichloroethane	ND	mg/L	0.005 EPA Primary	0.001
✓	1,2-Dichloropropane	ND	mg/L	0.005 EPA Primary	0.002
✓	1,3-Dichlorobenzene	ND	mg/L	--	0.001
✓	1,3-Dichloropropane	ND	mg/L	--	0.002
✓	1,4-Dichlorobenzene	ND	mg/L	0.075 EPA Primary	0.001
✓	2,2-Dichloropropane	ND	mg/L	--	0.002
✓	2-Chlorotoluene	ND	mg/L	--	0.001
✓	4-Chlorotoluene	ND	mg/L	--	0.001
✓	Acetone	ND	mg/L	--	0.01
✓	Benzene	ND	mg/L	0.005 EPA Primary	0.001
✓	Bromobenzene	ND	mg/L	--	0.002
✓	Bromomethane	ND	mg/L	--	0.002
✓	Carbon Tetrachloride	ND	mg/L	0.005 EPA Primary	0.001
✓	Chlorobenzene	ND	mg/L	0.1 EPA Primary	0.001
✓	Chloroethane	ND	mg/L	--	0.002
✓	Chloromethane	ND	mg/L	--	0.002
✓	cis-1,2-Dichloroethene	ND	mg/L	0.07 EPA Primary	0.002
✓	cis-1,3-Dichloropropene	ND	mg/L	--	0.002
✓	DBCP	ND	mg/L	--	0.001
✓	Dibromomethane	ND	mg/L	--	0.002
✓	Dichlorodifluoromethane	ND	mg/L	--	0.002
✓	Dichloromethane	ND	mg/L	0.005 EPA Primary	0.002
✓	EDB	ND	mg/L	--	0.001
✓	Ethylbenzene	ND	mg/L	0.7 EPA Primary	0.001
✓	Methyl Tert Butyl Ether	ND	mg/L	--	0.004
✓	Methyl-Ethyl Ketone	ND	mg/L	--	0.01
✓	Styrene	ND	mg/L	0.1 EPA Primary	0.001

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
✓	Tetrachloroethene	ND	mg/L	0.005	EPA Primary 0.002
✓	Tetrahydrofuran	ND	mg/L	--	0.01
✓	Toluene	ND	mg/L	1	EPA Primary 0.001
✓	trans-1,2-Dichloroethene	ND	mg/L	0.1	EPA Primary 0.002
✓	trans-1,3-Dichloropropene	ND	mg/L	--	0.002
✓	Trichloroethene	ND	mg/L	0.005	EPA Primary 0.001
✓	Trichlorofluoromethane	ND	mg/L	--	0.002
✓	Vinyl Chloride	ND	mg/L	0.002	EPA Primary 0.001
✓	Xylenes (Total)	ND	mg/L	10	EPA Primary 0.001
Organic Analytes - Others					
✓	2,4-D	ND	mg/L	0.07	EPA Primary 0.010
✓	Alachlor	ND	mg/L	0.002	EPA Primary 0.001
✓	Aldrin	ND	mg/L	--	0.002
✓	Atrazine	ND	mg/L	0.003	EPA Primary 0.002
✓	Chlordane	ND	mg/L	0.002	EPA Primary 0.001
✓	Dichloran	ND	mg/L	--	0.002
✓	Dieldrin	ND	mg/L	--	0.001
✓	Endrin	ND	mg/L	0.002	EPA Primary 0.0001
✓	Heptachlor	ND	mg/L	0.0004	EPA Primary 0.0004
✓	Heptachlor Epoxide	ND	mg/L	0.0002	EPA Primary 0.0001
✓	Hexachlorobenzene	ND	mg/L	0.001	EPA Primary 0.0005
✓	Hexachlorocyclopentadiene	ND	mg/L	0.05	EPA Primary 0.001
✓	Lindane	ND	mg/L	0.0002	EPA Primary 0.0002
✓	Methoxychlor	ND	mg/L	0.04	EPA Primary 0.002
✓	Pentachloronitrobenzene	ND	mg/L	--	0.002
✓	Silvex 2,4,5-TP	ND	mg/L	0.05	EPA Primary 0.005
✓	Simazine	ND	mg/L	0.004	EPA Primary 0.002
✓	Total PCBs	ND	mg/L	0.0005	EPA Primary 0.0005

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
✓	Toxaphene	ND	mg/L	0.003 EPA Primary	0.001
✓	Trifluralin	ND	mg/L	--	0.002

We certify that the analyses performed for this report are accurate, and that the laboratory tests were conducted by methods approved by the U.S. Environmental Protection Agency or variations of these EPA methods.

These test results are intended to be used for informational purposes only and may not be used for regulatory compliance.

National Testing Laboratories, Ltd.

NATIONAL TESTING LABORATORIES, LTD

Informational Water Quality Report

Watercheck w/PO



6571 Wilson Mills Rd
Cleveland, Ohio 44143
1-800-458-3330

Client:

Ordered By:
Emery & Garrett Groundwater Investigations, LLC 56 Main Street Meredith, NH 03253 ATTN: Emery & Garrett Groundwater Inc.

Sample Number: 903543

Location: PRD-CSG4

Type of Water: Well Water

Collection Date and Time: 9/4/2019 3:15 PM

Received Date and Time: 9/6/2019 10:55 AM

Date Completed: 9/20/2019

Metals Filtered

Definition and Legend

This informational water quality report compares the actual test result to national standards as defined in the EPA's Primary and Secondary Drinking Water Regulations.

Primary Standards: Are expressed as the maximum contaminant level (MCL) which is the highest level of contaminant that is allowed in drinking water. MCLs are enforceable standards.

Secondary standards: Are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. Individual states may choose to adopt them as enforceable standards.


Action levels: Are defined in treatment techniques which are required processes intended to reduce the level of a contaminant in drinking water.

mg/L (ppm): Unless otherwise indicated, results and standards are expressed as an amount in milligrams per liter or parts per million.


Minimum Detection Level (MDL): The lowest level that the laboratory can detect a contaminant.

ND: The contaminant was not detected above the minimum detection level.


NA: The contaminant was not analyzed.

 The contaminant was not detected in the sample above the minimum detection level.

 The contaminant was detected at or above the minimum detection level, but not above the referenced standard.

 The contaminant was detected above the standard, which is not an EPA enforceable MCL.

 The contaminant was detected above the EPA enforceable MCL.

 These results may be invalid.

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
Microbiologicals					
	Total Coliform by P/A	No bacteria sample was submitted.			
Inorganic Analytes - Metals					
✓	Aluminum	ND	mg/L	0.2	EPA Secondary 0.1
✓	Arsenic	ND	mg/L	0.010	EPA Primary 0.005
✓	Barium	ND	mg/L	2	EPA Primary 0.30
✓	Cadmium	ND	mg/L	0.005	EPA Primary 0.002
●	Calcium	64.9	mg/L	--	2.0
✓	Chromium	ND	mg/L	0.1	EPA Primary 0.010
✓	Copper	ND	mg/L	1.3	EPA Action Level 0.004
✓	Iron	ND	mg/L	0.3	EPA Secondary 0.020
✓	Lead	ND	mg/L	0.015	EPA Action Level 0.002
●	Lithium	0.004	mg/L	--	0.001
●	Magnesium	9.52	mg/L	--	0.10
▲	Manganese	0.374	mg/L	0.05	EPA Secondary 0.004
✓	Mercury	ND	mg/L	0.002	EPA Primary 0.001
✓	Nickel	ND	mg/L	--	0.020
●	Potassium	3.3	mg/L	--	1.0
✓	Selenium	ND	mg/L	0.05	EPA Primary 0.020
●	Silica	10.7	mg/L	--	0.1
✓	Silver	ND	mg/L	0.100	EPA Secondary 0.002
●	Sodium	57	mg/L	--	1
●	Strontium	0.231	mg/L	--	0.001
✓	Uranium	ND	mg/L	0.030	EPA Primary 0.001
●	Zinc	0.037	mg/L	5	EPA Secondary 0.004
Physical Factors					
●	Alkalinity (Total as CaCO3)	120	mg/L	--	20
▲	Hardness	200	mg/L	100	NTL Internal 10

Status	Contaminant	Results	Units	National Standards	Min. Detection Level	
✓	pH	7.5	pH Units	6.5 to 8.5	EPA Secondary	
●	Total Dissolved Solids	340	mg/L	500	EPA Secondary	20
●	Turbidity	0.1	NTU	1.0	EPA Action Level	0.1
Inorganic Analytes - Other						
✓	Bromide	ND	mg/L	--		0.5
●	Chloride	100.0	mg/L	250	EPA Secondary	5.0
✓	Fluoride	ND	mg/L	4.0	EPA Primary	0.5
●	Nitrate as N	0.9	mg/L	10	EPA Primary	0.5
✓	Nitrite as N	ND	mg/L	1	EPA Primary	0.5
✓	Ortho Phosphate	ND	mg/L	--		2.0
●	Sulfate	16.0	mg/L	250	EPA Secondary	5.0
Organic Analytes - Trihalomethanes						
✓	Bromodichloromethane	ND	mg/L	--		0.002
✓	Bromoform	ND	mg/L	--		0.004
✓	Chloroform	ND	mg/L	--		0.002
✓	Dibromochloromethane	ND	mg/L	--		0.004
✓	Total THMs	ND	mg/L	0.080	EPA Primary	0.002
Organic Analytes - Volatiles						
✓	1,1,1,2-Tetrachloroethane	ND	mg/L	--		0.002
✓	1,1,1-Trichloroethane	ND	mg/L	0.2	EPA Primary	0.001
✓	1,1,2,2-Tetrachloroethane	ND	mg/L	--		0.002
✓	1,1,2-Trichloroethane	ND	mg/L	0.005	EPA Primary	0.002
✓	1,1-Dichloroethane	ND	mg/L	--		0.002
✓	1,1-Dichloroethene	ND	mg/L	0.007	EPA Primary	0.001
✓	1,1-Dichloropropene	ND	mg/L	--		0.002
✓	1,2,3-Trichlorobenzene	ND	mg/L	--		0.002
✓	1,2,3-Trichloropropane	ND	mg/L	--		0.002
✓	1,2,4-Trichlorobenzene	ND	mg/L	0.07	EPA Primary	0.002

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
✓	1,2-Dichlorobenzene	ND	mg/L	0.6 EPA Primary	0.001
✓	1,2-Dichloroethane	ND	mg/L	0.005 EPA Primary	0.001
✓	1,2-Dichloropropane	ND	mg/L	0.005 EPA Primary	0.002
✓	1,3-Dichlorobenzene	ND	mg/L	--	0.001
✓	1,3-Dichloropropane	ND	mg/L	--	0.002
✓	1,4-Dichlorobenzene	ND	mg/L	0.075 EPA Primary	0.001
✓	2,2-Dichloropropane	ND	mg/L	--	0.002
✓	2-Chlorotoluene	ND	mg/L	--	0.001
✓	4-Chlorotoluene	ND	mg/L	--	0.001
✓	Acetone	ND	mg/L	--	0.01
✓	Benzene	ND	mg/L	0.005 EPA Primary	0.001
✓	Bromobenzene	ND	mg/L	--	0.002
✓	Bromomethane	ND	mg/L	--	0.002
✓	Carbon Tetrachloride	ND	mg/L	0.005 EPA Primary	0.001
✓	Chlorobenzene	ND	mg/L	0.1 EPA Primary	0.001
✓	Chloroethane	ND	mg/L	--	0.002
✓	Chloromethane	ND	mg/L	--	0.002
✓	cis-1,2-Dichloroethene	ND	mg/L	0.07 EPA Primary	0.002
✓	cis-1,3-Dichloropropene	ND	mg/L	--	0.002
✓	DBCP	ND	mg/L	--	0.001
✓	Dibromomethane	ND	mg/L	--	0.002
✓	Dichlorodifluoromethane	ND	mg/L	--	0.002
✓	Dichloromethane	ND	mg/L	0.005 EPA Primary	0.002
✓	EDB	ND	mg/L	--	0.001
✓	Ethylbenzene	ND	mg/L	0.7 EPA Primary	0.001
✓	Methyl Tert Butyl Ether	ND	mg/L	--	0.004
✓	Methyl-Ethyl Ketone	ND	mg/L	--	0.01
✓	Styrene	ND	mg/L	0.1 EPA Primary	0.001

Status	Contaminant	Results	Units	National Standards		Min. Detection Level
✓	Tetrachloroethene	ND	mg/L	0.005	EPA Primary	0.002
✓	Tetrahydrofuran	ND	mg/L	--		0.01
✓	Toluene	ND	mg/L	1	EPA Primary	0.001
✓	trans-1,2-Dichloroethene	ND	mg/L	0.1	EPA Primary	0.002
✓	trans-1,3-Dichloropropene	ND	mg/L	--		0.002
✓	Trichloroethene	ND	mg/L	0.005	EPA Primary	0.001
✓	Trichlorofluoromethane	ND	mg/L	--		0.002
✓	Vinyl Chloride	ND	mg/L	0.002	EPA Primary	0.001
✓	Xylenes (Total)	ND	mg/L	10	EPA Primary	0.001
Organic Analytes - Others						
✓	2,4-D	ND	mg/L	0.07	EPA Primary	0.010
✓	Alachlor	ND	mg/L	0.002	EPA Primary	0.001
✓	Aldrin	ND	mg/L	--		0.002
✓	Atrazine	ND	mg/L	0.003	EPA Primary	0.002
✓	Chlordane	ND	mg/L	0.002	EPA Primary	0.001
✓	Dichloran	ND	mg/L	--		0.002
✓	Dieldrin	ND	mg/L	--		0.001
✓	Endrin	ND	mg/L	0.002	EPA Primary	0.0001
✓	Heptachlor	ND	mg/L	0.0004	EPA Primary	0.0004
✓	Heptachlor Epoxide	ND	mg/L	0.0002	EPA Primary	0.0001
✓	Hexachlorobenzene	ND	mg/L	0.001	EPA Primary	0.0005
✓	Hexachlorocyclopentadiene	ND	mg/L	0.05	EPA Primary	0.001
✓	Lindane	ND	mg/L	0.0002	EPA Primary	0.0002
✓	Methoxychlor	ND	mg/L	0.04	EPA Primary	0.002
✓	Pentachloronitrobenzene	ND	mg/L	--		0.002
✓	Silvex 2,4,5-TP	ND	mg/L	0.05	EPA Primary	0.005
✓	Simazine	ND	mg/L	0.004	EPA Primary	0.002
✓	Total PCBs	ND	mg/L	0.0005	EPA Primary	0.0005

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
✓	Toxaphene	ND	mg/L	0.003 EPA Primary	0.001
✓	Trifluralin	ND	mg/L	--	0.002

We certify that the analyses performed for this report are accurate, and that the laboratory tests were conducted by methods approved by the U.S. Environmental Protection Agency or variations of these EPA methods.

These test results are intended to be used for informational purposes only and may not be used for regulatory compliance.

National Testing Laboratories, Ltd.

NATIONAL TESTING LABORATORIES, LTD

Informational Water Quality Report

Watercheck w/PO



6571 Wilson Mills Rd
Cleveland, Ohio 44143
1-800-458-3330

Client:

Ordered By:
Emery & Garrett Groundwater Investigations, LLC 56 Main Street Meredith, NH 03253 ATTN: Emery & Garrett Groundwater Inc.

Sample Number: 907732

Location: PRD-CSG7

Type of Water: Well Water

Collection Date and Time: 1/23/2020 3:40 PM

Received Date and Time: 1/27/2020 10:30 AM

Date Completed: 2/7/2020

Metals filtered

Definition and Legend

This informational water quality report compares the actual test result to national standards as defined in the EPA's Primary and Secondary Drinking Water Regulations.

Primary Standards: Are expressed as the maximum contaminant level (MCL) which is the highest level of contaminant that is allowed in drinking water. MCLs are enforceable standards.

Secondary standards: Are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. Individual states may choose to adopt them as enforceable standards.


Action levels: Are defined in treatment techniques which are required processes intended to reduce the level of a contaminant in drinking water.


mg/L (ppm): Unless otherwise indicated, results and standards are expressed as an amount in milligrams per liter or parts per million.


Minimum Detection Level (MDL): The lowest level that the laboratory can detect a contaminant.

ND: The contaminant was not detected above the minimum detection level.


NA: The contaminant was not analyzed.

 The contaminant was not detected in the sample above the minimum detection level.

 The contaminant was detected at or above the minimum detection level, but not above the referenced standard.

 The contaminant was detected above the standard, which is not an EPA enforceable MCL.

 The contaminant was detected above the EPA enforceable MCL.

 These results may be invalid.

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
Microbiologicals					
	Total Coliform by P/A	No bacteria sample was submitted.			
Inorganic Analytes - Metals					
✓	Aluminum	ND	mg/L	0.2	EPA Secondary 0.1
✓	Arsenic	ND	mg/L	0.010	EPA Primary 0.005
✓	Barium	ND	mg/L	2	EPA Primary 0.30
✓	Cadmium	ND	mg/L	0.005	EPA Primary 0.002
●	Calcium	61.7	mg/L	--	2.0
✓	Chromium	ND	mg/L	0.1	EPA Primary 0.010
✓	Copper	ND	mg/L	1.3	EPA Action Level 0.004
✓	Iron	ND	mg/L	0.3	EPA Secondary 0.020
✓	Lead	ND	mg/L	0.015	EPA Action Level 0.002
●	Lithium	0.004	mg/L	--	0.001
●	Magnesium	10.80	mg/L	--	0.10
▲	Manganese	0.155	mg/L	0.05	EPA Secondary 0.004
✓	Mercury	ND	mg/L	0.002	EPA Primary 0.001
✓	Nickel	ND	mg/L	--	0.020
●	Potassium	4.2	mg/L	--	1.0
✓	Selenium	ND	mg/L	0.05	EPA Primary 0.020
●	Silica	12.0	mg/L	--	0.1
✓	Silver	ND	mg/L	0.100	EPA Secondary 0.002
●	Sodium	55	mg/L	--	1
●	Strontium	0.254	mg/L	--	0.001
●	Uranium	0.002	mg/L	0.030	EPA Primary 0.001
●	Zinc	0.056	mg/L	5	EPA Secondary 0.004
Physical Factors					
●	Alkalinity (Total as CaCO3)	170	mg/L	--	20
▲	Hardness	200	mg/L	100	NTL Internal 10

Status	Contaminant	Results	Units	National Standards	Min. Detection Level	
✓	pH	7.5	pH Units	6.5 to 8.5	EPA Secondary	
●	Total Dissolved Solids	360	mg/L	500	EPA Secondary	20
✓	Turbidity	ND	NTU	1.0	EPA Action Level	0.1
Inorganic Analytes - Other						
✓	Bromide	ND	mg/L	--		0.5
●	Chloride	96.0	mg/L	250	EPA Secondary	5.0
✓	Fluoride	ND	mg/L	4.0	EPA Primary	0.5
✓	Nitrate as N	ND	mg/L	10	EPA Primary	0.5
✓	Nitrite as N	ND	mg/L	1	EPA Primary	0.5
✓	Ortho Phosphate	ND	mg/L	--		2.0
●	Sulfate	13.0	mg/L	250	EPA Secondary	5.0
Organic Analytes - Trihalomethanes						
✓	Bromodichloromethane	ND	mg/L	--		0.002
✓	Bromoform	ND	mg/L	--		0.004
✓	Chloroform	ND	mg/L	--		0.002
✓	Dibromochloromethane	ND	mg/L	--		0.004
✓	Total THMs	ND	mg/L	0.080	EPA Primary	0.002
Organic Analytes - Volatiles						
✓	1,1,1,2-Tetrachloroethane	ND	mg/L	--		0.002
✓	1,1,1-Trichloroethane	ND	mg/L	0.2	EPA Primary	0.001
✓	1,1,2,2-Tetrachloroethane	ND	mg/L	--		0.002
✓	1,1,2-Trichloroethane	ND	mg/L	0.005	EPA Primary	0.002
✓	1,1-Dichloroethane	ND	mg/L	--		0.002
✓	1,1-Dichloroethene	ND	mg/L	0.007	EPA Primary	0.001
✓	1,1-Dichloropropene	ND	mg/L	--		0.002
✓	1,2,3-Trichlorobenzene	ND	mg/L	--		0.002
✓	1,2,3-Trichloropropane	ND	mg/L	--		0.002
✓	1,2,4-Trichlorobenzene	ND	mg/L	0.07	EPA Primary	0.002

Status	Contaminant	Results	Units	National Standards		Min. Detection Level
✓	1,2-Dichlorobenzene	ND	mg/L	0.6	EPA Primary	0.001
✓	1,2-Dichloroethane	ND	mg/L	0.005	EPA Primary	0.001
✓	1,2-Dichloropropane	ND	mg/L	0.005	EPA Primary	0.002
✓	1,3-Dichlorobenzene	ND	mg/L	--		0.001
✓	1,3-Dichloropropane	ND	mg/L	--		0.002
✓	1,4-Dichlorobenzene	ND	mg/L	0.075	EPA Primary	0.001
✓	2,2-Dichloropropane	ND	mg/L	--		0.002
✓	2-Chlorotoluene	ND	mg/L	--		0.001
✓	4-Chlorotoluene	ND	mg/L	--		0.001
✓	Acetone	ND	mg/L	--		0.01
✓	Benzene	ND	mg/L	0.005	EPA Primary	0.001
✓	Bromobenzene	ND	mg/L	--		0.002
✓	Bromomethane	ND	mg/L	--		0.002
✓	Carbon Tetrachloride	ND	mg/L	0.005	EPA Primary	0.001
✓	Chlorobenzene	ND	mg/L	0.1	EPA Primary	0.001
✓	Chloroethane	ND	mg/L	--		0.002
✓	Chloromethane	ND	mg/L	--		0.002
✓	cis-1,2-Dichloroethene	ND	mg/L	0.07	EPA Primary	0.002
✓	cis-1,3-Dichloropropene	ND	mg/L	--		0.002
✓	DBCP	ND	mg/L	--		0.001
✓	Dibromomethane	ND	mg/L	--		0.002
✓	Dichlorodifluoromethane	ND	mg/L	--		0.002
✓	Dichloromethane	ND	mg/L	0.005	EPA Primary	0.002
✓	EDB	ND	mg/L	--		0.001
✓	Ethylbenzene	ND	mg/L	0.7	EPA Primary	0.001
✓	Methyl Tert Butyl Ether	ND	mg/L	--		0.004
✓	Methyl-Ethyl Ketone	ND	mg/L	--		0.01
✓	Styrene	ND	mg/L	0.1	EPA Primary	0.001

Status	Contaminant	Results	Units	National Standards	Min. Detection Level	
✓	Tetrachloroethene	ND	mg/L	0.005	EPA Primary	0.002
✓	Tetrahydrofuran	ND	mg/L	--		0.01
✓	Toluene	ND	mg/L	1	EPA Primary	0.001
✓	trans-1,2-Dichloroethene	ND	mg/L	0.1	EPA Primary	0.002
✓	trans-1,3-Dichloropropene	ND	mg/L	--		0.002
✓	Trichloroethene	ND	mg/L	0.005	EPA Primary	0.001
✓	Trichlorofluoromethane	ND	mg/L	--		0.002
✓	Vinyl Chloride	ND	mg/L	0.002	EPA Primary	0.001
✓	Xylenes (Total)	ND	mg/L	10	EPA Primary	0.001
Organic Analytes - Others						
✓	2,4-D	ND	mg/L	0.07	EPA Primary	0.010
✓	Alachlor	ND	mg/L	0.002	EPA Primary	0.001
✓	Aldrin	ND	mg/L	--		0.002
✓	Atrazine	ND	mg/L	0.003	EPA Primary	0.002
✓	Chlordane	ND	mg/L	0.002	EPA Primary	0.001
✓	Dichloran	ND	mg/L	--		0.002
✓	Dieldrin	ND	mg/L	--		0.001
✓	Endrin	ND	mg/L	0.002	EPA Primary	0.0001
✓	Heptachlor	ND	mg/L	0.0004	EPA Primary	0.0004
✓	Heptachlor Epoxide	ND	mg/L	0.0002	EPA Primary	0.0001
✓	Hexachlorobenzene	ND	mg/L	0.001	EPA Primary	0.0005
✓	Hexachlorocyclopentadiene	ND	mg/L	0.05	EPA Primary	0.001
✓	Lindane	ND	mg/L	0.0002	EPA Primary	0.0002
✓	Methoxychlor	ND	mg/L	0.04	EPA Primary	0.002
✓	Pentachloronitrobenzene	ND	mg/L	--		0.002
✓	Silvex 2,4,5-TP	ND	mg/L	0.05	EPA Primary	0.005
✓	Simazine	ND	mg/L	0.004	EPA Primary	0.002
✓	Total PCBs	ND	mg/L	0.0005	EPA Primary	0.0005

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
✓	Toxaphene	ND	mg/L	0.003 EPA Primary	0.001
✓	Trifluralin	ND	mg/L	--	0.002

We certify that the analyses performed for this report are accurate, and that the laboratory tests were conducted by methods approved by the U.S. Environmental Protection Agency or variations of these EPA methods.

These test results are intended to be used for informational purposes only and may not be used for regulatory compliance.

National Testing Laboratories, Ltd.

NATIONAL TESTING LABORATORIES, LTD

Informational Water Quality Report

Watercheck w/PO



6571 Wilson Mills Rd
Cleveland, Ohio 44143
1-800-458-3330

Client:

Ordered By:
Emery & Garrett Groundwater Investigations, LLC 56 Main Street Meredith, NH 03253 ATTN: Emery & Garrett Groundwater Inc.

Sample Number: 907731

Location: PRD-CSG8

Type of Water: Well Water

Collection Date and Time: 1/23/2020 4:40 PM

Received Date and Time: 1/27/2020 10:30 AM

Date Completed: 2/7/2020

Metals Filtered

Definition and Legend

This informational water quality report compares the actual test result to national standards as defined in the EPA's Primary and Secondary Drinking Water Regulations.

Primary Standards: Are expressed as the maximum contaminant level (MCL) which is the highest level of contaminant that is allowed in drinking water. MCLs are enforceable standards.

Secondary standards: Are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. Individual states may choose to adopt them as enforceable standards.


Action levels: Are defined in treatment techniques which are required processes intended to reduce the level of a contaminant in drinking water.

mg/L (ppm): Unless otherwise indicated, results and standards are expressed as an amount in milligrams per liter or parts per million.


Minimum Detection Level (MDL): The lowest level that the laboratory can detect a contaminant.

ND: The contaminant was not detected above the minimum detection level.


NA: The contaminant was not analyzed.

 The contaminant was not detected in the sample above the minimum detection level.

 The contaminant was detected at or above the minimum detection level, but not above the referenced standard.

 The contaminant was detected above the standard, which is not an EPA enforceable MCL.

 The contaminant was detected above the EPA enforceable MCL.

 These results may be invalid.

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
Microbiologicals					
	Total Coliform by P/A	No bacteria sample was submitted.			
Inorganic Analytes - Metals					
✓	Aluminum	ND	mg/L	0.2	EPA Secondary 0.1
✓	Arsenic	ND	mg/L	0.010	EPA Primary 0.005
✓	Barium	ND	mg/L	2	EPA Primary 0.30
✓	Cadmium	ND	mg/L	0.005	EPA Primary 0.002
●	Calcium	67.9	mg/L	--	2.0
✓	Chromium	ND	mg/L	0.1	EPA Primary 0.010
✓	Copper	ND	mg/L	1.3	EPA Action Level 0.004
✓	Iron	ND	mg/L	0.3	EPA Secondary 0.020
✓	Lead	ND	mg/L	0.015	EPA Action Level 0.002
●	Lithium	0.005	mg/L	--	0.001
●	Magnesium	13.63	mg/L	--	0.10
●	Manganese	0.021	mg/L	0.05	EPA Secondary 0.004
✓	Mercury	ND	mg/L	0.002	EPA Primary 0.001
✓	Nickel	ND	mg/L	--	0.020
●	Potassium	4.3	mg/L	--	1.0
✓	Selenium	ND	mg/L	0.05	EPA Primary 0.020
●	Silica	13.3	mg/L	--	0.1
✓	Silver	ND	mg/L	0.100	EPA Secondary 0.002
●	Sodium	64	mg/L	--	1
●	Strontium	0.277	mg/L	--	0.001
●	Uranium	0.003	mg/L	0.030	EPA Primary 0.001
●	Zinc	0.046	mg/L	5	EPA Secondary 0.004
Physical Factors					
●	Alkalinity (Total as CaCO3)	180	mg/L	--	20
▲	Hardness	230	mg/L	100	NTL Internal 10

Status	Contaminant	Results	Units	National Standards	Min. Detection Level	
✓	pH	7.5	pH Units	6.5 to 8.5	EPA Secondary	
●	Total Dissolved Solids	410	mg/L	500	EPA Secondary	20
✓	Turbidity	ND	NTU	1.0	EPA Action Level	0.1
Inorganic Analytes - Other						
✓	Bromide	ND	mg/L	--		0.5
●	Chloride	120.0	mg/L	250	EPA Secondary	5.0
✓	Fluoride	ND	mg/L	4.0	EPA Primary	0.5
✓	Nitrate as N	ND	mg/L	10	EPA Primary	0.5
✓	Nitrite as N	ND	mg/L	1	EPA Primary	0.5
✓	Ortho Phosphate	ND	mg/L	--		2.0
●	Sulfate	17.0	mg/L	250	EPA Secondary	5.0
Organic Analytes - Trihalomethanes						
✓	Bromodichloromethane	ND	mg/L	--		0.002
✓	Bromoform	ND	mg/L	--		0.004
✓	Chloroform	ND	mg/L	--		0.002
✓	Dibromochloromethane	ND	mg/L	--		0.004
✓	Total THMs	ND	mg/L	0.080	EPA Primary	0.002
Organic Analytes - Volatiles						
✓	1,1,1,2-Tetrachloroethane	ND	mg/L	--		0.002
✓	1,1,1-Trichloroethane	ND	mg/L	0.2	EPA Primary	0.001
✓	1,1,2,2-Tetrachloroethane	ND	mg/L	--		0.002
✓	1,1,2-Trichloroethane	ND	mg/L	0.005	EPA Primary	0.002
✓	1,1-Dichloroethane	ND	mg/L	--		0.002
✓	1,1-Dichloroethene	ND	mg/L	0.007	EPA Primary	0.001
✓	1,1-Dichloropropene	ND	mg/L	--		0.002
✓	1,2,3-Trichlorobenzene	ND	mg/L	--		0.002
✓	1,2,3-Trichloropropane	ND	mg/L	--		0.002
✓	1,2,4-Trichlorobenzene	ND	mg/L	0.07	EPA Primary	0.002

Status	Contaminant	Results	Units	National Standards		Min. Detection Level
✓	1,2-Dichlorobenzene	ND	mg/L	0.6	EPA Primary	0.001
✓	1,2-Dichloroethane	ND	mg/L	0.005	EPA Primary	0.001
✓	1,2-Dichloropropane	ND	mg/L	0.005	EPA Primary	0.002
✓	1,3-Dichlorobenzene	ND	mg/L	--		0.001
✓	1,3-Dichloropropane	ND	mg/L	--		0.002
✓	1,4-Dichlorobenzene	ND	mg/L	0.075	EPA Primary	0.001
✓	2,2-Dichloropropane	ND	mg/L	--		0.002
✓	2-Chlorotoluene	ND	mg/L	--		0.001
✓	4-Chlorotoluene	ND	mg/L	--		0.001
✓	Acetone	ND	mg/L	--		0.01
✓	Benzene	ND	mg/L	0.005	EPA Primary	0.001
✓	Bromobenzene	ND	mg/L	--		0.002
✓	Bromomethane	ND	mg/L	--		0.002
✓	Carbon Tetrachloride	ND	mg/L	0.005	EPA Primary	0.001
✓	Chlorobenzene	ND	mg/L	0.1	EPA Primary	0.001
✓	Chloroethane	ND	mg/L	--		0.002
✓	Chloromethane	ND	mg/L	--		0.002
✓	cis-1,2-Dichloroethene	ND	mg/L	0.07	EPA Primary	0.002
✓	cis-1,3-Dichloropropene	ND	mg/L	--		0.002
✓	DBCP	ND	mg/L	--		0.001
✓	Dibromomethane	ND	mg/L	--		0.002
✓	Dichlorodifluoromethane	ND	mg/L	--		0.002
✓	Dichloromethane	ND	mg/L	0.005	EPA Primary	0.002
✓	EDB	ND	mg/L	--		0.001
✓	Ethylbenzene	ND	mg/L	0.7	EPA Primary	0.001
✓	Methyl Tert Butyl Ether	ND	mg/L	--		0.004
✓	Methyl-Ethyl Ketone	ND	mg/L	--		0.01
✓	Styrene	ND	mg/L	0.1	EPA Primary	0.001

Status	Contaminant	Results	Units	National Standards	Min. Detection Level
✓	Tetrachloroethene	ND	mg/L	0.005 EPA Primary	0.002
✓	Tetrahydrofuran	ND	mg/L	--	0.01
✓	Toluene	ND	mg/L	1 EPA Primary	0.001
✓	trans-1,2-Dichloroethene	ND	mg/L	0.1 EPA Primary	0.002
✓	trans-1,3-Dichloropropene	ND	mg/L	--	0.002
✓	Trichloroethene	ND	mg/L	0.005 EPA Primary	0.001
✓	Trichlorofluoromethane	ND	mg/L	--	0.002
✓	Vinyl Chloride	ND	mg/L	0.002 EPA Primary	0.001
✓	Xylenes (Total)	ND	mg/L	10 EPA Primary	0.001
Organic Analytes - Others					
✓	2,4-D	ND	mg/L	0.07 EPA Primary	0.010
✓	Alachlor	ND	mg/L	0.002 EPA Primary	0.001
✓	Aldrin	ND	mg/L	--	0.002
✓	Atrazine	ND	mg/L	0.003 EPA Primary	0.002
✓	Chlordane	ND	mg/L	0.002 EPA Primary	0.001
✓	Dichloran	ND	mg/L	--	0.002
✓	Dieldrin	ND	mg/L	--	0.001
✓	Endrin	ND	mg/L	0.002 EPA Primary	0.0001
✓	Heptachlor	ND	mg/L	0.0004 EPA Primary	0.0004
✓	Heptachlor Epoxide	ND	mg/L	0.0002 EPA Primary	0.0001
✓	Hexachlorobenzene	ND	mg/L	0.001 EPA Primary	0.0005
✓	Hexachlorocyclopentadiene	ND	mg/L	0.05 EPA Primary	0.001
✓	Lindane	ND	mg/L	0.0002 EPA Primary	0.0002
✓	Methoxychlor	ND	mg/L	0.04 EPA Primary	0.002
✓	Pentachloronitrobenzene	ND	mg/L	--	0.002
✓	Silvex 2,4,5-TP	ND	mg/L	0.05 EPA Primary	0.005
✓	Simazine	ND	mg/L	0.004 EPA Primary	0.002
✓	Total PCBs	ND	mg/L	0.0005 EPA Primary	0.0005

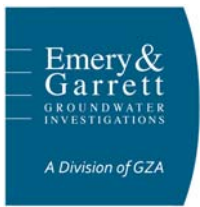
Status	Contaminant	Results	Units	National Standards	Min. Detection Level
✓	Toxaphene	ND	mg/L	0.003 EPA Primary	0.001
✓	Trifluralin	ND	mg/L	--	0.002

We certify that the analyses performed for this report are accurate, and that the laboratory tests were conducted by methods approved by the U.S. Environmental Protection Agency or variations of these EPA methods.

These test results are intended to be used for informational purposes only and may not be used for regulatory compliance.

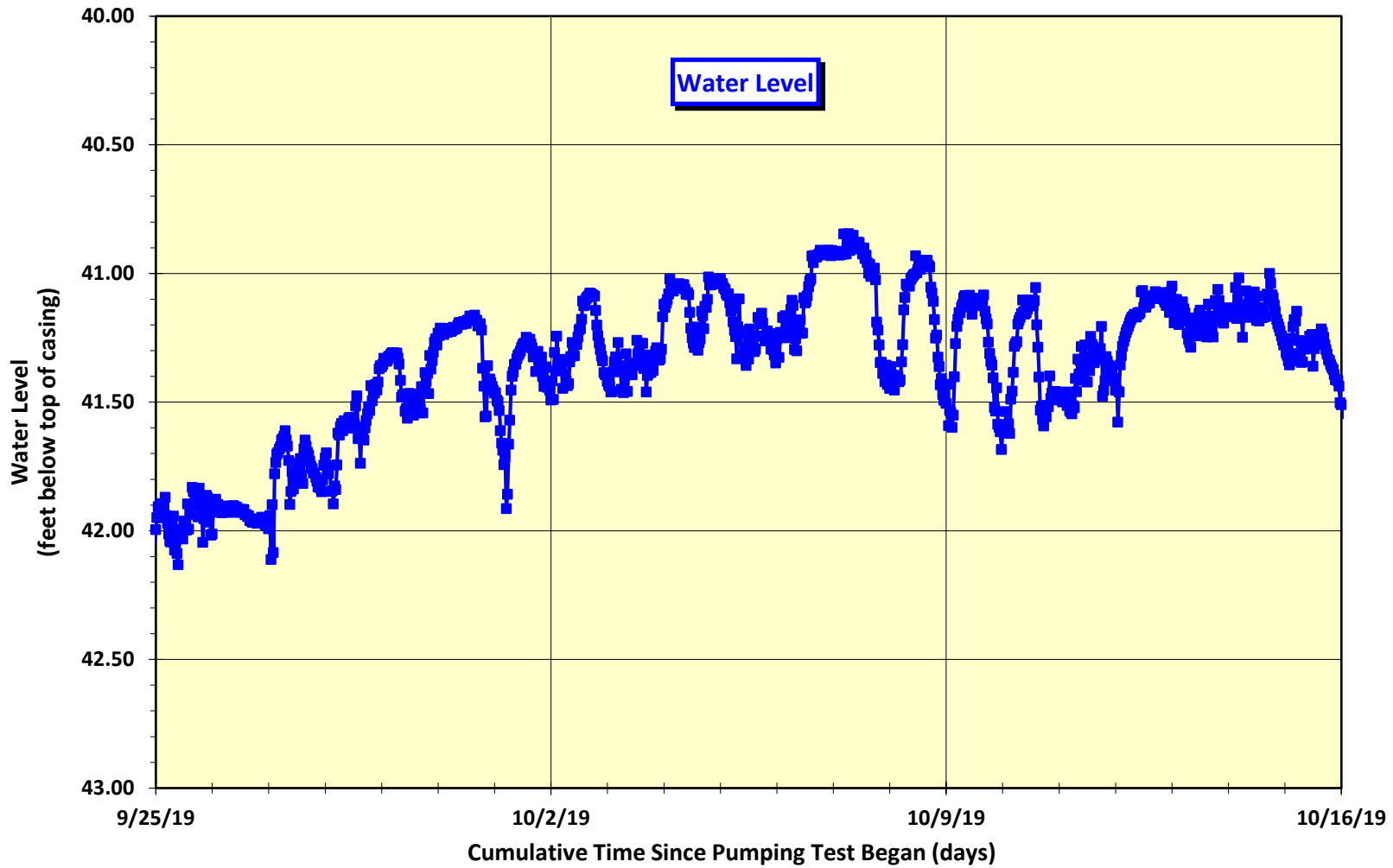
National Testing Laboratories, Ltd.

NATIONAL TESTING LABORATORIES, LTD



Appendix D – Groundwater Level Plots

Exploration Well PRD-CSG3

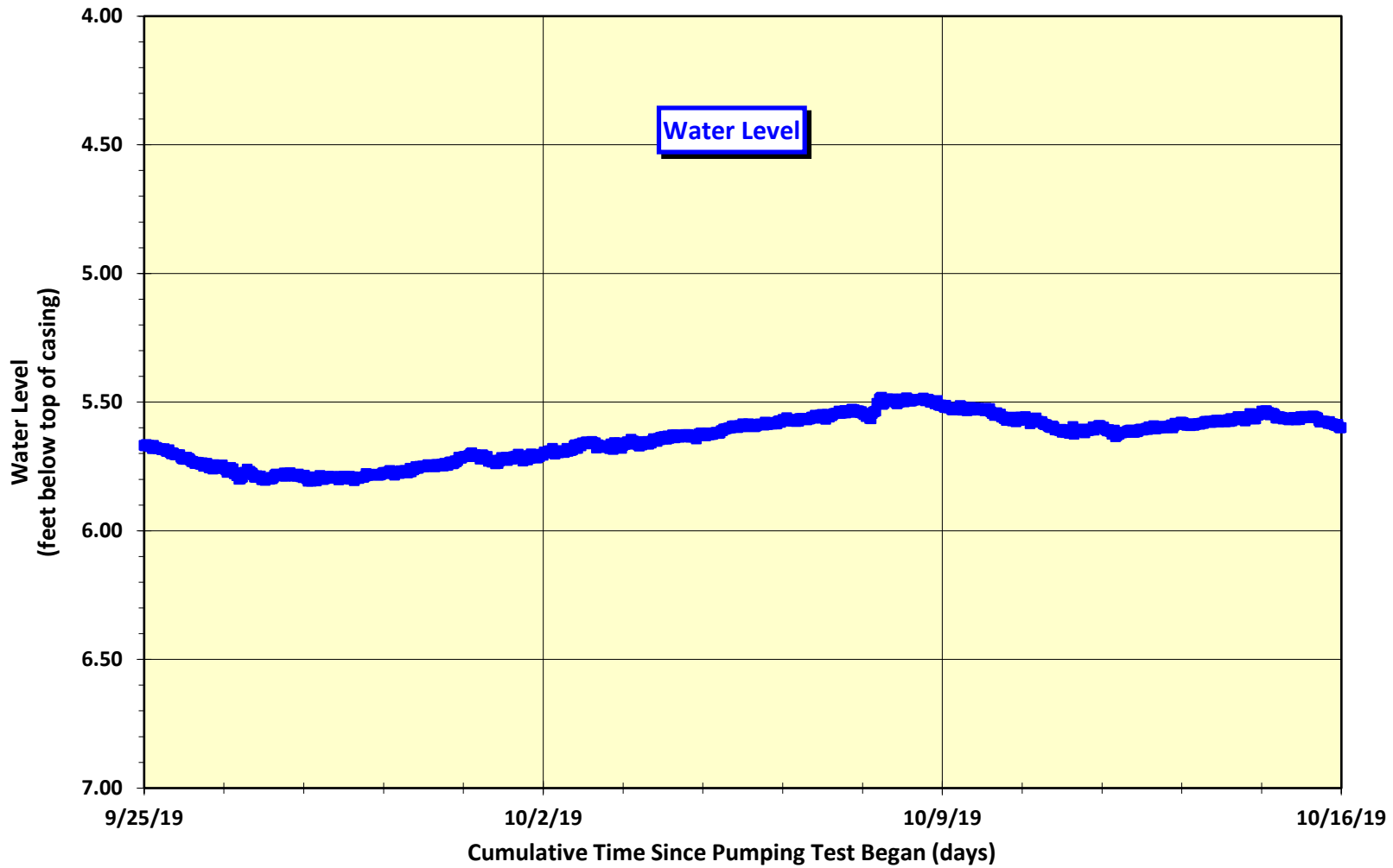


Plot of Water Level versus Time for September 25 to October 16, 2019

Collins Well Field Assessment Project

Portsmouth, New Hampshire

Exploration Well PRD-CSG4

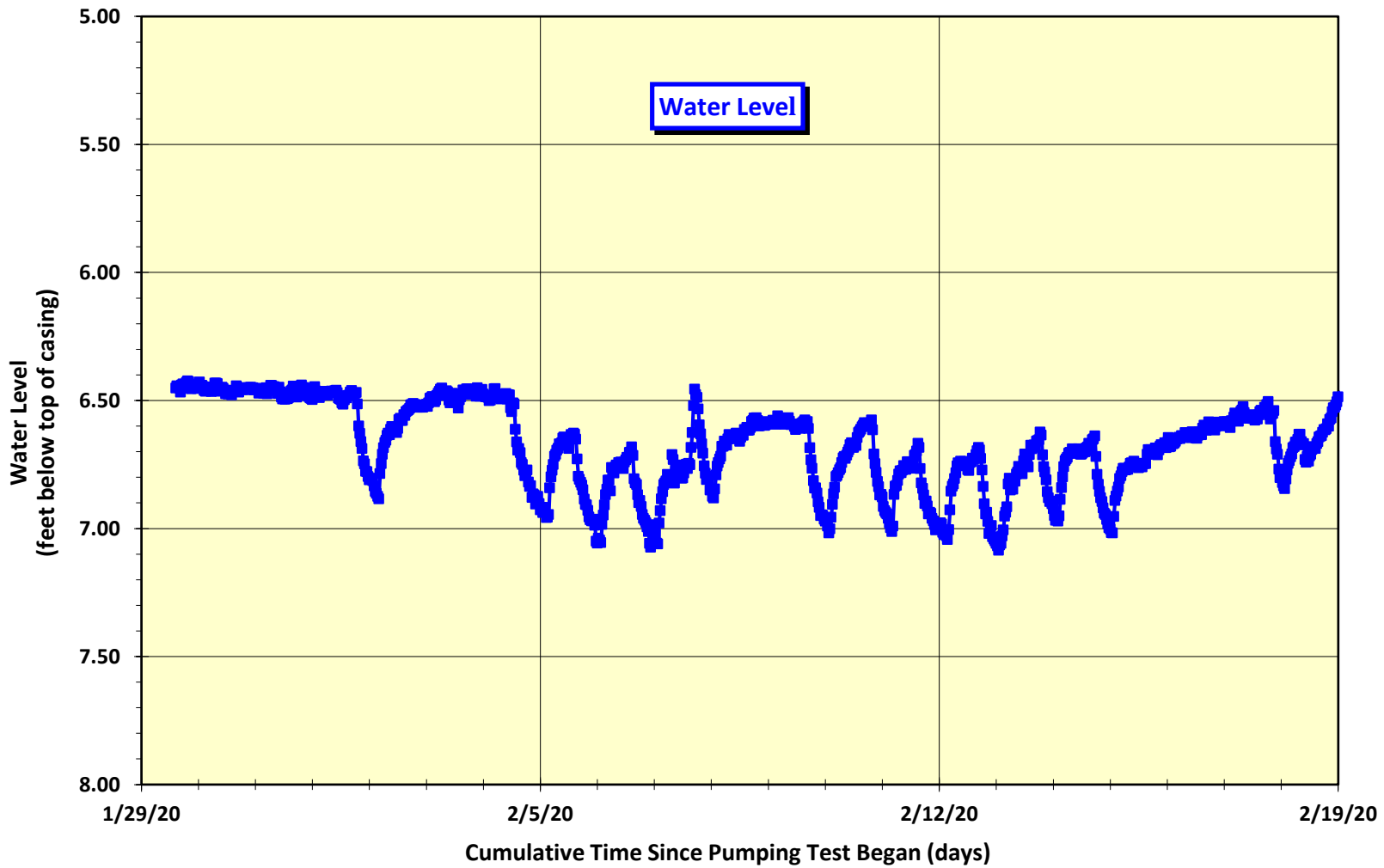


Plot of Water Level versus Time for September 25 to October 16, 2019

Collins Well Field Assessment Project

Portsmouth, New Hampshire

Exploration Well PRD-CSG7

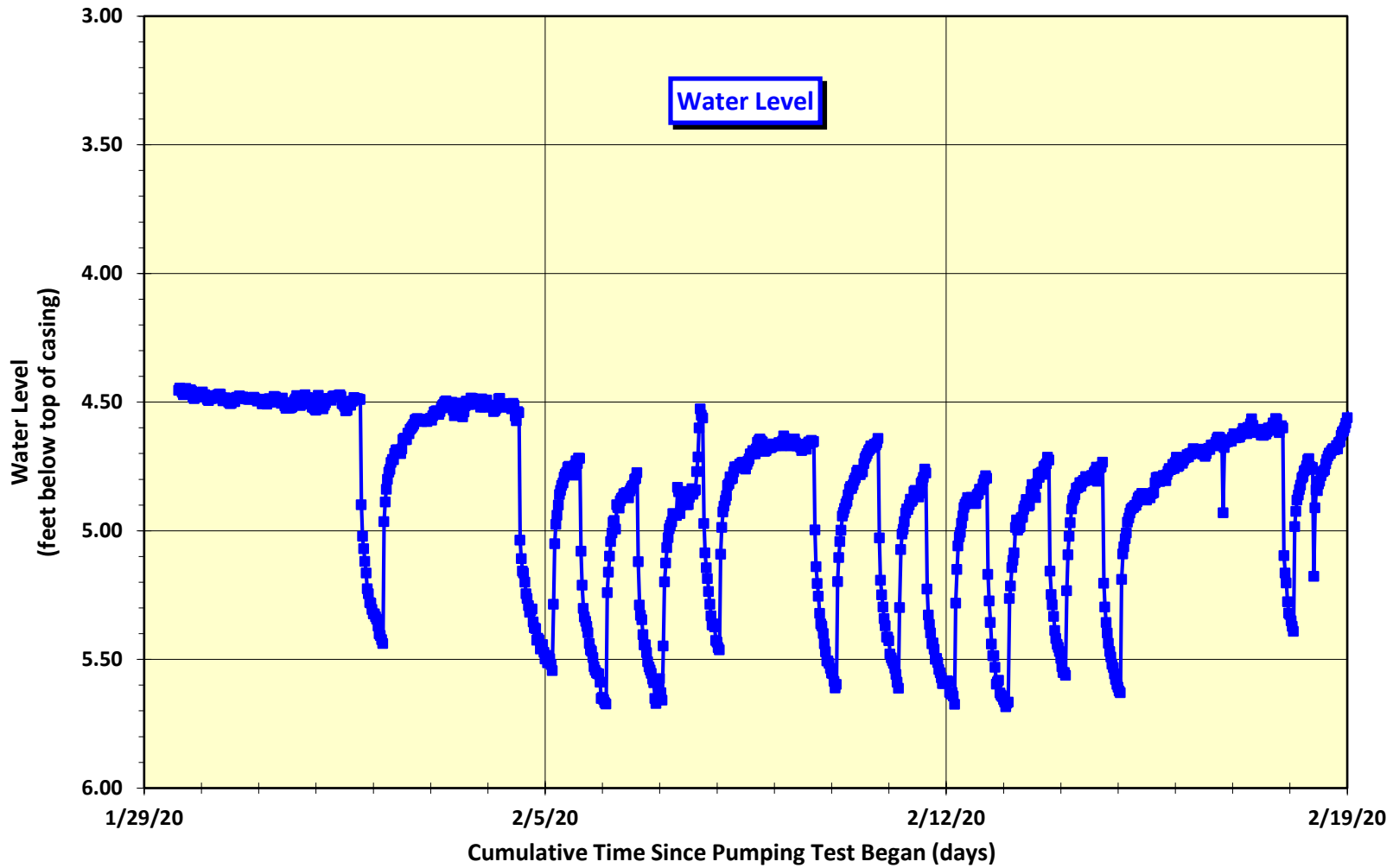


Plot of Water Level versus Time for January 29 to February 19, 2020

Collins Well Field Assessment Project

Portsmouth, New Hampshire

Exploration Well PRD-CSG8



Plot of Water Level versus Time for January 29 to February 19, 2020

Collins Well Field Assessment Project

Portsmouth, New Hampshire



Emery & Garrett Groundwater Investigations
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