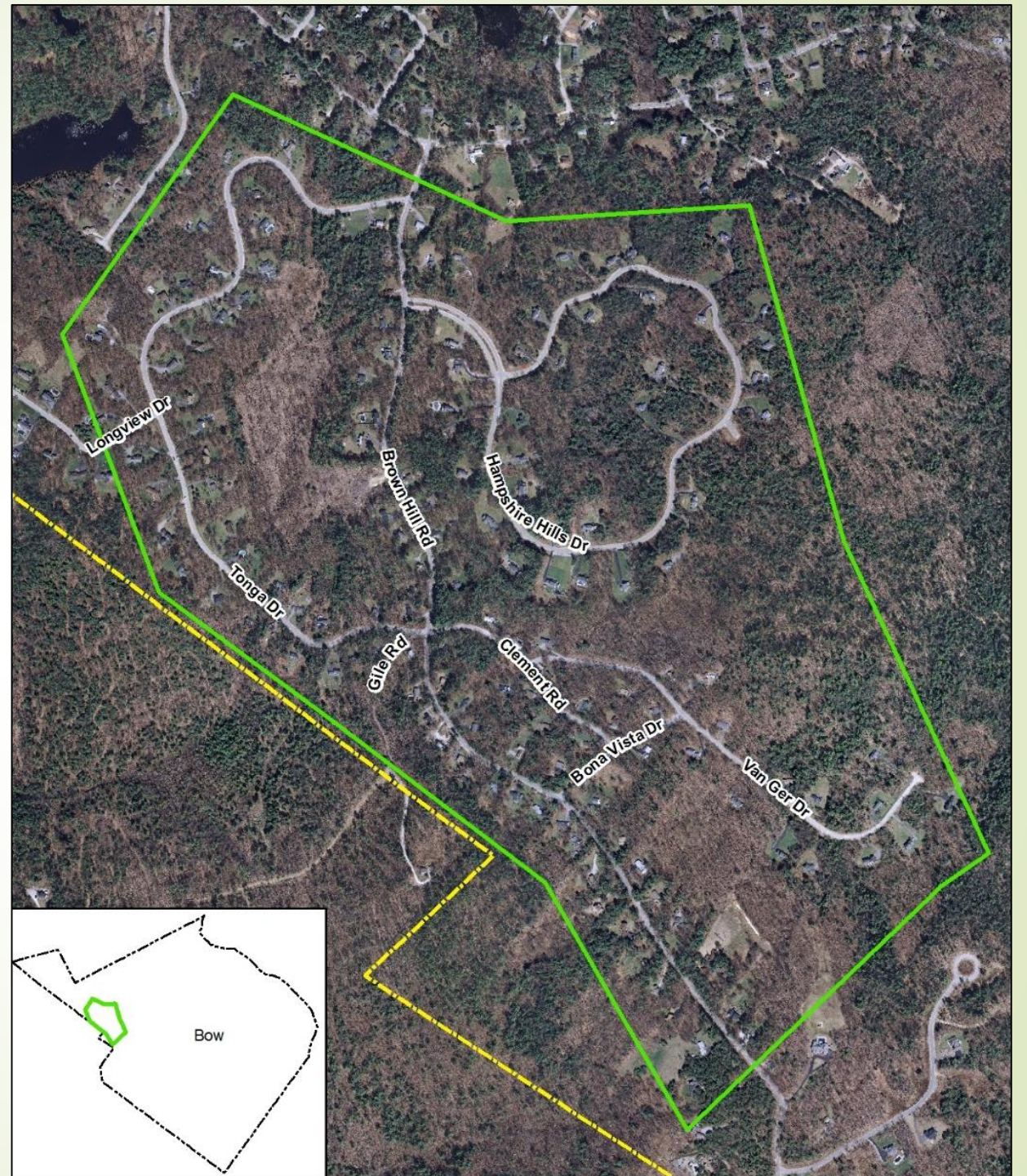


Brown Hill Rd Area Water Quality Study

June 8, 2016

Old Town Hall, Bow NH

**Bow Drinking Water
Protection Committee**



Bow Drinking Water Protection Committee

Bowdrinkingwater@gmail.com

Cynthia Klevens, Chair

Dick Kraybill, Sandy Crystall, Wendy Waskin, Blake Hooper,
Matt Taylor (Bow Community Development Director),
Noel Gourley (Bow Department of Public Works)



Acknowledgements

- Brown Hill Rd Area residents participating in this study
- NHDES Professional Geologist and Brown Hill Resident, Brandon Kernen
- US EPA Chelmsford Massachusetts Laboratory
- Former Community Development Director, Bill Klubben and Assistant Planner, Bryan Westover
- Bow DPW, Noel Gourley and Tim Sweeney
- Bow Town Manager and Select Board

Study Objectives

- Update and expand previous studies on private well information in the Brown Hill Road area.
- Perform private well sampling focusing on parameters associated with salt and corrosion.
- Compare results with historical data and evaluate data trends with respect to the different parameters sampled.
- Formulate conclusions and recommendations for the Town and residents.

Project Tasks and Timeline

- Jul 2013 – Resident complaints to Select Board
- Sep 2013 to Apr 2014 - Project Planning
- **Jun 2014 – Homeowner Surveys**
- Jul to Sep 2014 Field Sampling and Lab Analyses
- **Dec 2014 – Lab Reports sent to Homeowners**
- Jan to Sep 2015 – Analysis of Results
- Oct to Mar 2016 – Report Preparation
- Apr 2016 – Presentation to Select Board
- **Jun 2016 – Presentation to Residents**
- Jul 2016 – Final Report

Field Efforts

- 158 homes surveyed
- 79 respondents and well samples
- 36 parameters analyzed
- \$300 - \$400 value lab analyses per sample
(Provided by US EPA)



Locations of Private Wells Sampled

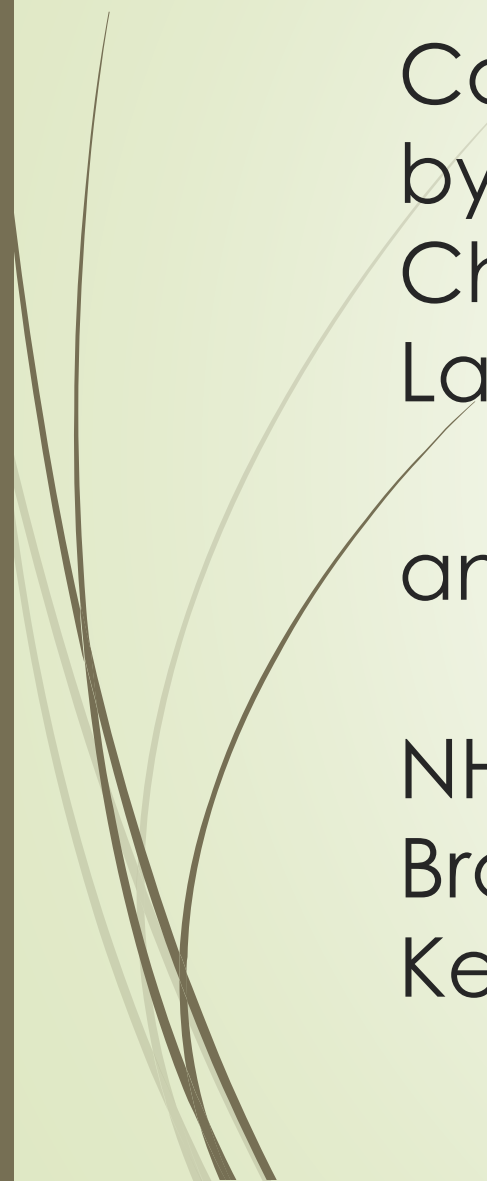
- Private wells sampled
- Study area
- - - Town boundary



0 0.125 0.25 0.5
Miles

Brown Hill Road Area Well Water Quality Study
Drinking Water Protection Committee
Bow, New Hampshire 2016





Collaboration
by USEPA
Chelmsford
Laboratories

and

NHDES
Brandon
Kernen, P.G.

TABLE 2-1
ANALYTICAL PARAMETERS
Laboratory Tests

Aluminum	Lithium
Ammonium	Magnesium
Antimony	Manganese
Arsenic	Molybdenum
Barium	Nickel
Beryllium	Nitrate as Nitrogen
Bromide	Nitrite as Nitrogen
Cadmium	Potassium
Calcium	Selenium
Chloride	Silver
Chromium	Sodium
Cobalt	Sulfate
Copper	Thallium
Fluoride	Uranium
Hardness	Vanadium
Iron	Zinc
Lead	

Field Tests

pH
Specific Conductance
Temperature

Well Water Testing Summary

12/15/2014

Date Sampled 7/28/2014

Analyzed by US Environmental Protection Agency

Chelmsford, Massachusetts

Sampler: Bow Drinking Water Protection Committee

Bow, New Hampshire 03304

PULL DOWN MENU IN CELL A2 TO CHANGE ADDRESS

- The concentration of the contaminant is less than half of the health based drinking water limit.
- The concentration of the contaminant was detected in the sample at a level that is more than half of the health based drinking water limit, but is below the limit.
- The concentration of the contaminant was detected in the sample above the health based drinking water limit.

- The concentration of the contaminant was detected below the aesthetic based drinking water limit.
- The concentration of the contaminant was detected above the aesthetic based drinking water limit.

µg/L = micrograms per liter = parts-per-billion (ppb)

mg/L = milligrams per liter = parts-per-million (ppm)

Health Status	Aesthetic Status	Chemical	Result	Units	Health Limit*	Aesthetic Limit*
		Aluminum	12	µg/L		500
		Ammonium	Not Detected	mg/L		
		Antimony	0.67	µg/L	6	
		Arsenic	1.6	µg/L	10	
		Barium	16	µg/L	2000	
		Beryllium	0.32	µg/L	4	
		Bromide	0.26	mg/L		
		Cadmium	0.76	µg/L	5	
		Calcium	24	mg/L		
		Chloride	400	mg/L		250
		Chromium	0.8	µg/L	100	
		Cobalt	Not Detected	µg/L		
		Copper	2900	µg/L		1000
		Fluoride	Not Detected	mg/L	4	2
		Hardness by Ion Chromatography	89	mg CaCO3/L		
		Iron	520	µg/L		300
		Lead	5200	µg/L	15	
		Lithium	Not Detected	mg/L		
		Magnesium	7	mg/L		
		Manganese	34	µg/L		50
		Molybdenum	Not Detected	µg/L		
		Nickel	7	µg/L		
		Nitrate as Nitrogen	0.97	mg/L	10	
		Nitrite as Nitrogen	Not Detected	mg/L	1	
		Potassium	2.6	mg/L		
		Selenium	Not Detected	µg/L	50	
		Silver	Not Detected	µg/L		
		Sodium	220	mg/L		
		Sulfate	19	mg/L		250
		Thallium	Not Detected	µg/L	2	
		Uranium	10	µg/L	30	
		Vanadium	Not Detected	µg/L		
		Zinc	360	µg/L		5000

Field measurements made by the Bow Drinking Water Protection Committee at the time of sampling:

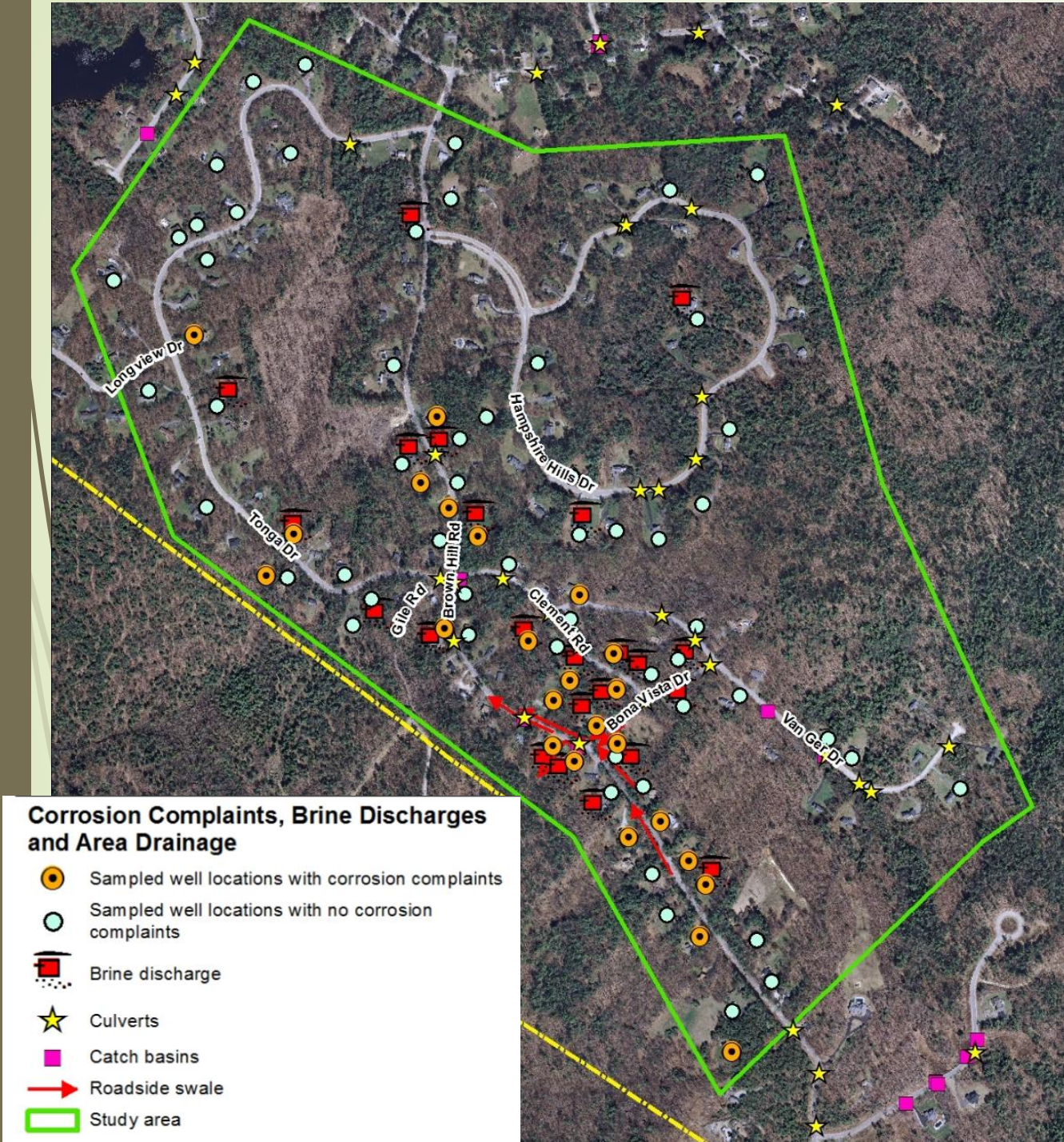
pH	5.26	
Conductivity	1358	Microsiemens Per Centimeter (µS/cm)
Temperature	18.4	Degrees Celsius (C)

Note: * If the value is left blank, no limit has been established by Federal or State agencies

Status	Status	Chemical	Result	Units	Limit*	Limit*
		Aluminum	12	µg/L		500
		Ammonium	Not Detected	mg/L		
		Antimony	0.67	µg/L	6	
		Arsenic	1.6	µg/L	10	
		Barium	16	µg/L	2000	
		Beryllium	0.32	µg/L	4	
		Bromide	0.26	mg/L		
		Cadmium	0.76	µg/L	5	
		Calcium	24	mg/L		
		Chloride	400	mg/L		250
		Chromium	0.8	µg/L	100	
		Cobalt	Not Detected	µg/L		
		Copper	2900	µg/L		1000
		Fluoride	Not Detected	mg/L	4	2
		Hardness by Ion Chromatography	89	mg CaCO3/L		
		Iron	520	µg/L		300
		Lead	5200	µg/L	15	
		Lithium	Not Detected	mg/L		
		Magnesium	7	mg/L		
		Manganese	34	µg/L		50

Corrosion Complaints

- 30% (24 of 79) report issues with corrosion
- Both pH and salt contribute to water corrosivity
- Salt sources = road salt drainage and softener brine
- Low pH = acid rain infiltration older wells

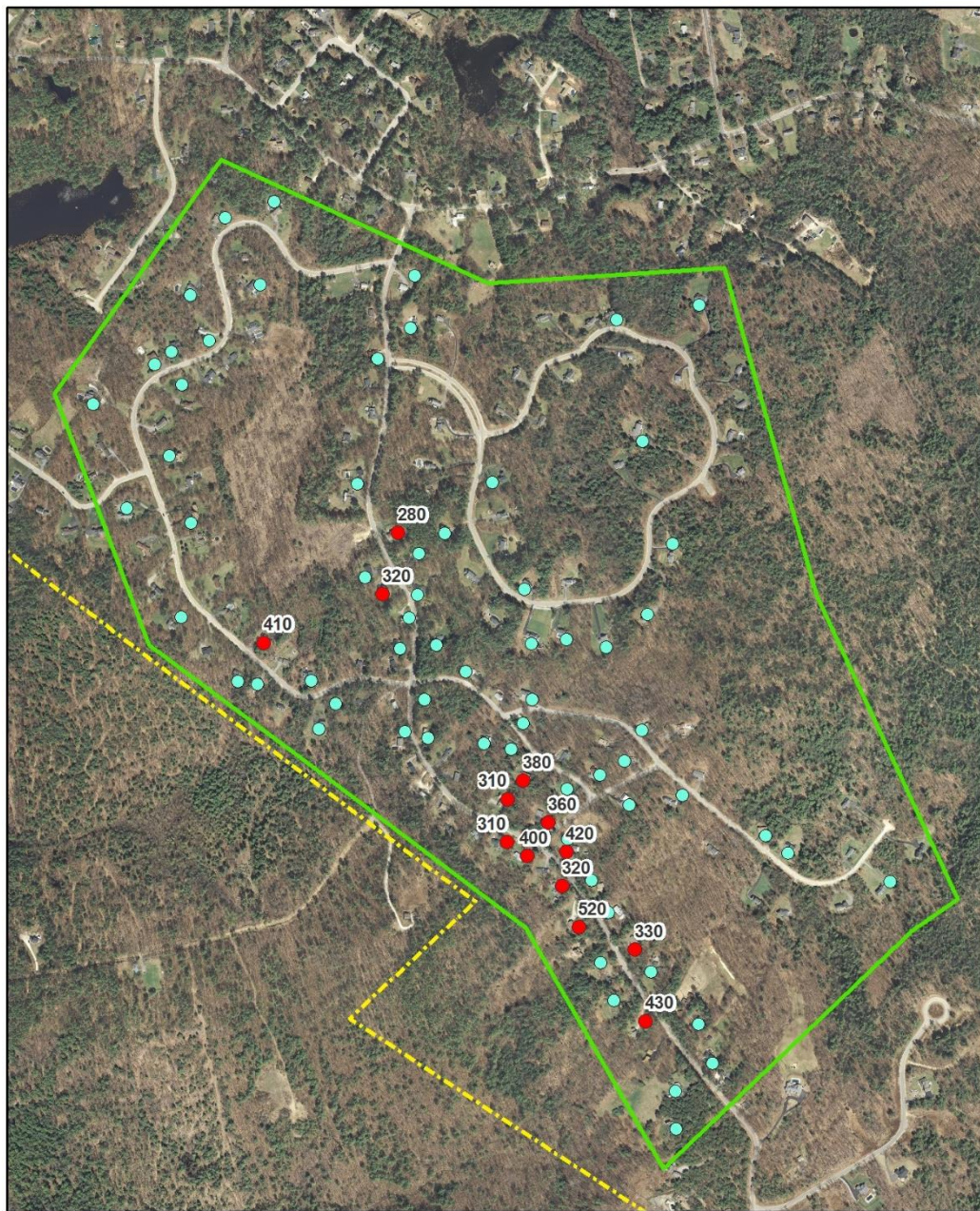


Chloride Levels

66 Blue < 250 mg/L

13 Red \geq 250 mg/L

- 12 of 13 report corrosion
- 6 of 13 have softeners

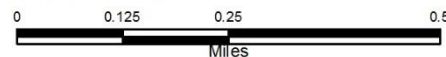


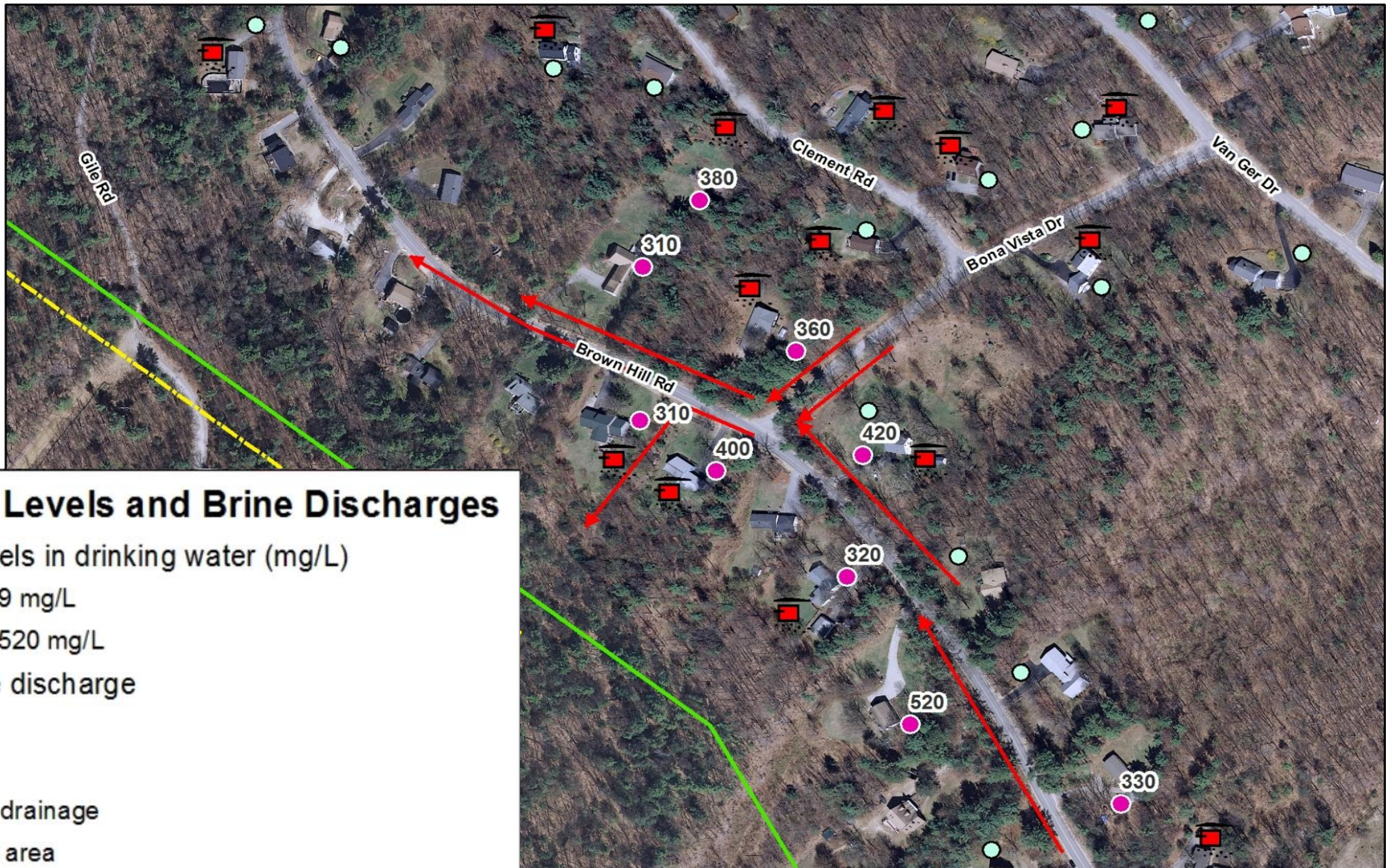
Chloride Levels in Wells Sampled

- 1 - 249 mg/L
- 250 - 520 mg/L
- Study area



Brown Hill Road Area Well Water Quality Study
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Bow, New Hampshire 2016





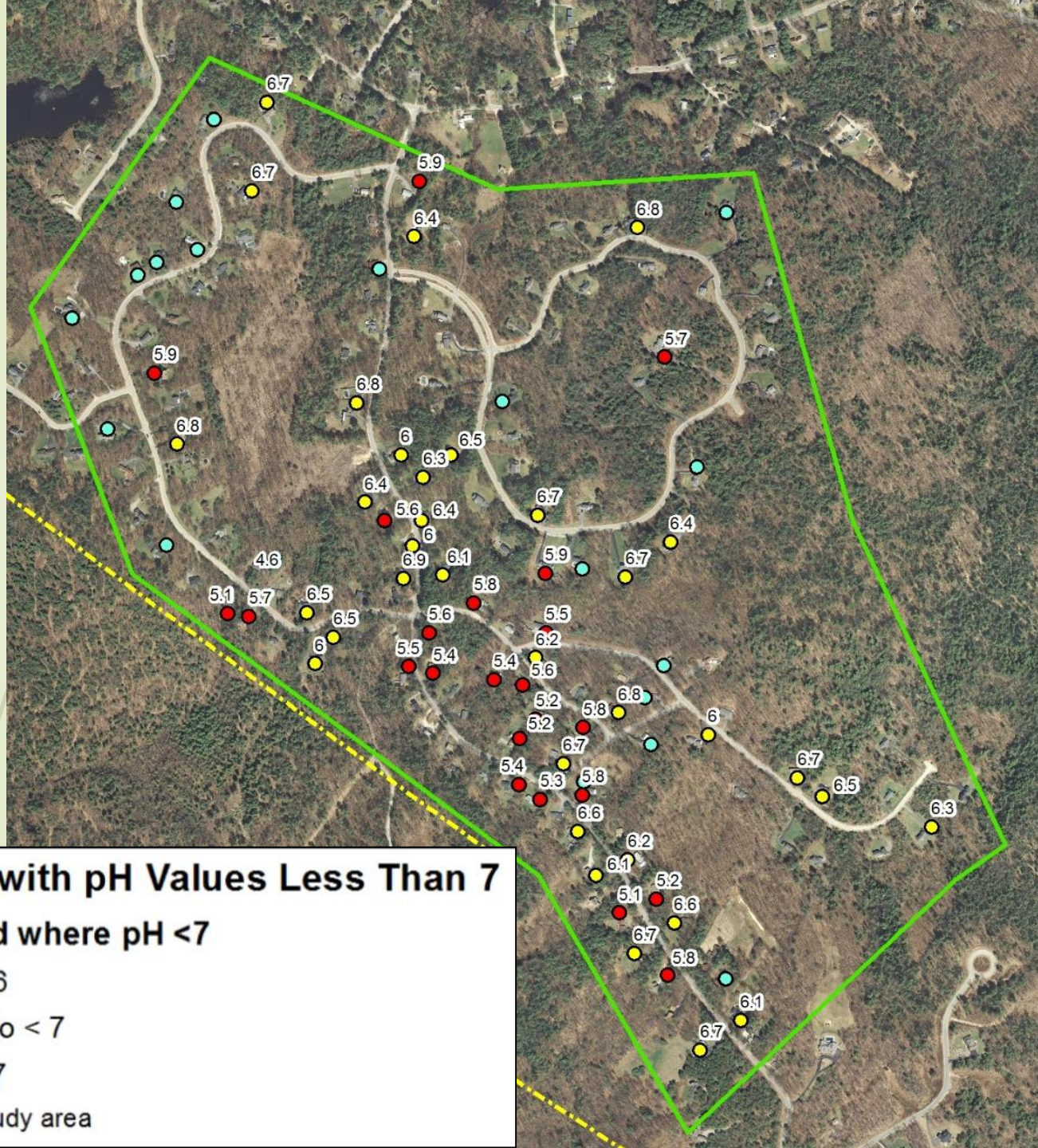


Town of Bow Winter Maintenance Practices

- Implemented in 1997 following Stearns & Wheeler (1996) study recommendation
- NHDOT guidance is 250 to 300 lb / lane mile
- Bow application rate is 140 lb per lane mile
- Alternative de-icers evaluated 1998-1999
- All DPW staff trained and certified under UNH T2 - **Green SnowPro™** best practices

Low pH

- pH Range 4.6 to 8.1
- 57 wells < 7.0 (72%)
- 25 wells < 6.0 (red)
- Acid rain influence:
 - older wells, less casing, not sealed
 - shallow bedrock
 - limited soil attenuation or time to equilibrate



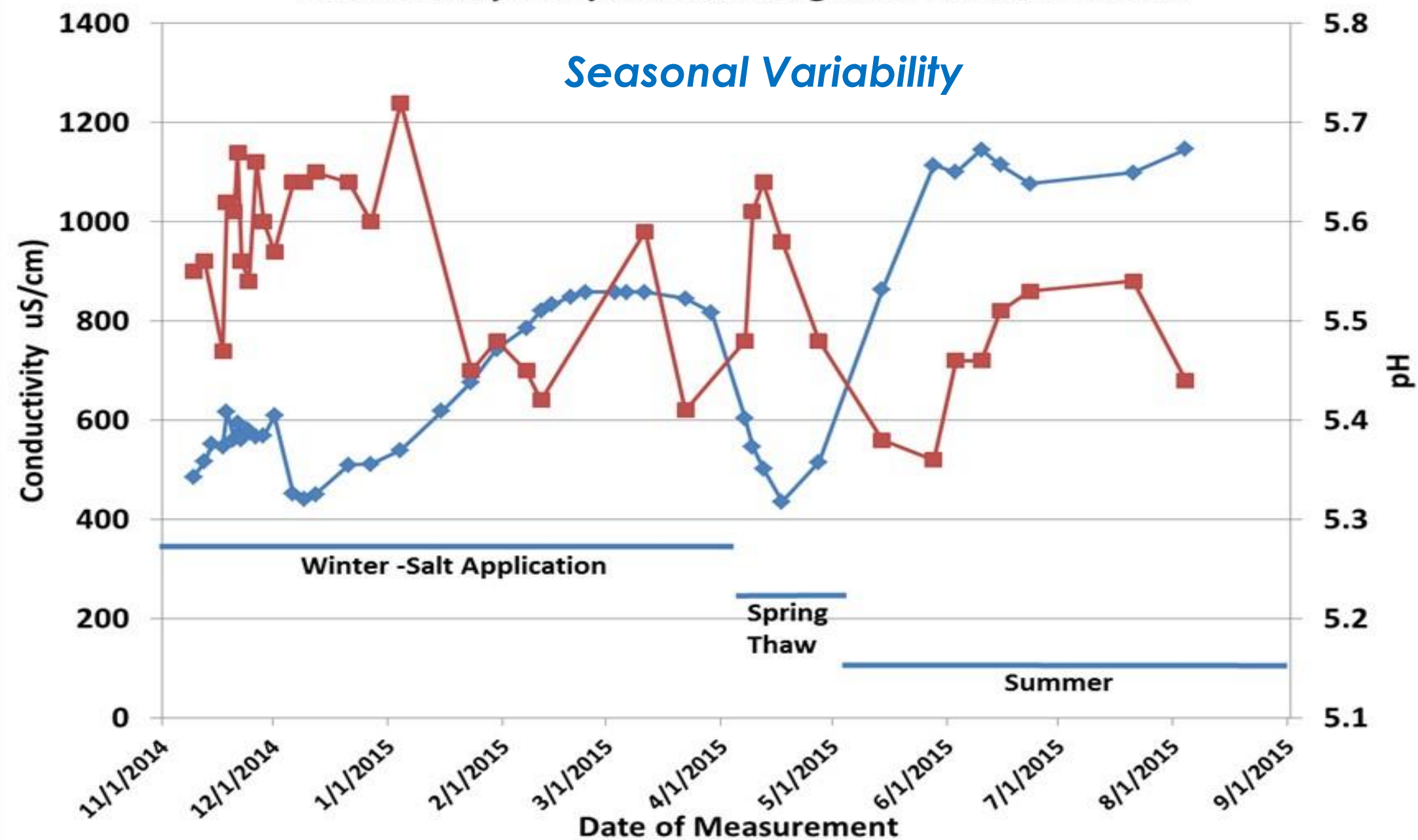
Well Age vs. Water Quality

Older Wells => Higher Chloride, Lower pH

	Chloride mg/L	pH	Chloride mg/L	pH
	<i>Pre-1985</i>		<i>Post-1985</i>	
Number of wells	24	24	41	41
Average Concentration	175	6.0	63	6.7
Range	24-400	5.1-7.0	0.85-430	5.5-8.0
Wells > 250 mg/L	7 of 24 (29%)		1 of 41 (2%)	

Conductivity and pH Monitoring at 39 Brown Hill Road

Seasonal Variability



—◆— Specific Conductance ($\mu\text{S}/\text{cm}$) —■— pH



Lead and Corrosive Water

- LEAD and COPPER can leach from plumbing fixtures when water sits for extended periods
- A few samples from this study showed either lead or copper even as “flushed” samples
- Prevent ingestion by infants and children
- FLUSH tap every day and use COLD water tap
- Test for stagnant lead and copper (\$30=)
- TAKE SAMPLE BOTTLES TODAY -**
- Consider calcite neutralizer (~\$1,000 to \$1,500)

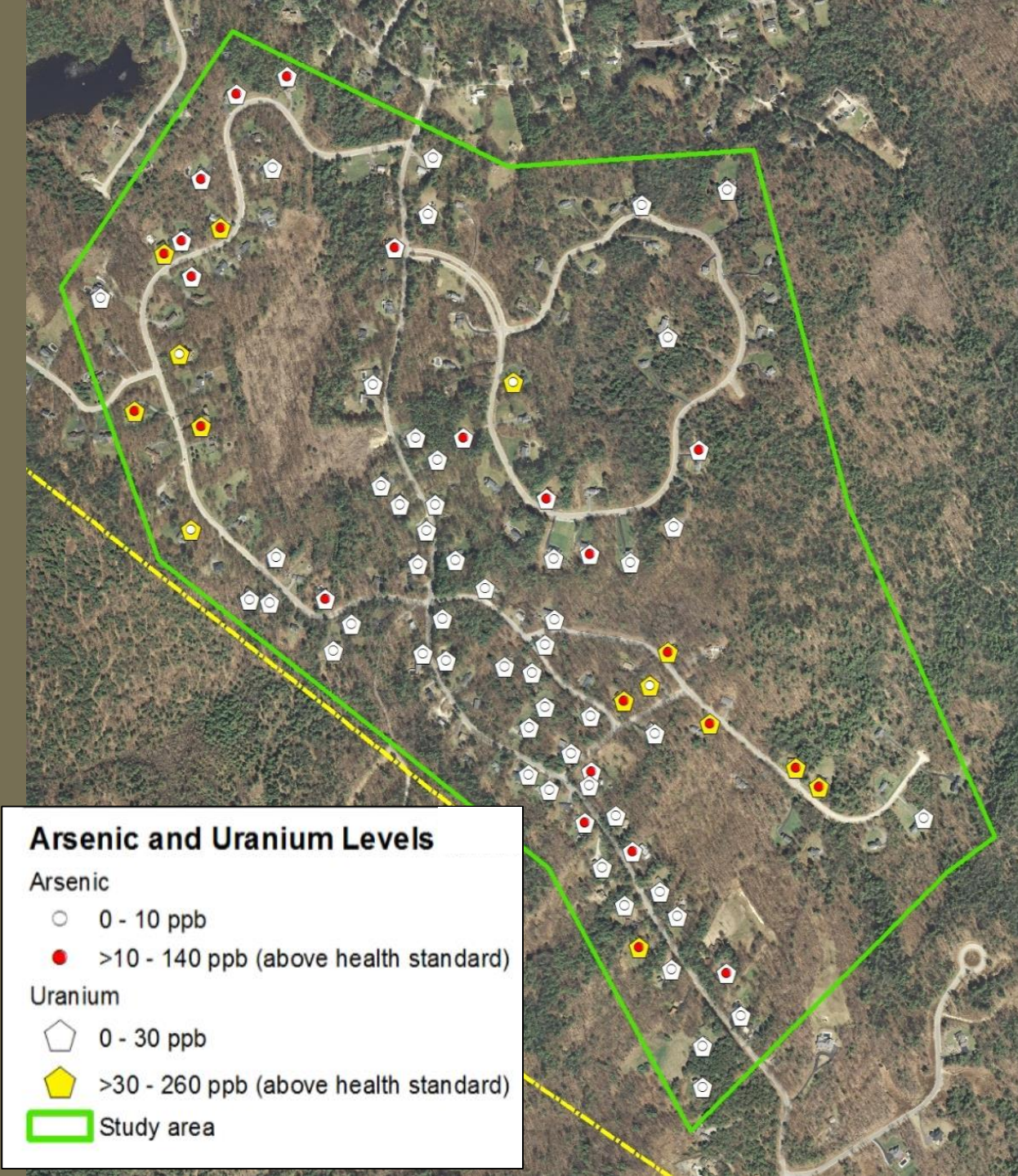


Other Water Quality Parameters:

Arsenic and Uranium

Arsenic and Uranium

- Post-1985 wells sealed into bedrock, no corrosion issues
- State-wide 1 in 5 probability
- **24 wells** (30%) with Arsenic above 10 ppb
- **14 wells** (18%) with Uranium above 30 ppb
- No taste, odor or color
- Point of Use treatment recommended (\$150 - \$1200)



Specific Conductance, Sodium, and Hardness

	Specific Conduc- tance (uS/cm)	Sodium mg/L	Hardness mg/L	Hardness in Wells w/softeners mg/L
Number	79	79	71	12
Average	521	63	97	116
Range	84-1722	4.6-240	3-480	29-300

2015 TOWN-WIDE RESULTS PROCESSED BY STATE OF NH LABORATORY

	Arsenic (ug/L)	Uranium (ug/L)	Radon (pci/L)	Total Coliform	E. coli	MTBE (ug/L)	Sodium (mg/L)	Chloride (mg/L)	Manganese (mg/L)	Iron (mg/L)
Maximum Contaminant Level or Advisory Level	10	30	2000	Present	Present	13	250	250	0.05	0.3
Number of samples	61	47	35	68	68	2	46	54	48	47
Detections	52	32	34	19	0	0	46	45	28	18
Samples above standard	29	4	26	19	0	0	0	0	18	5
High	136	55	85,310				90	230	1.86	6.15
Average	22.6	11	16,876				23	45	0.24	0.66
% Above Standard	48%	9%	74%	28%	0%	0%	0%	0%	38%	11%

Conclusions

- Chloride contamination is attributable to road salt drainage and salt brine discharges from water softeners.
- Both low pH and high chloride contribute to water corrosivity.
- Geologic conditions, well location, and well construction are important contributing factors.
- Older (pre-1985) wells show higher chloride, lower pH, and reported corrosion.
- Newer (post-1985) wells show naturally occurring arsenic and uranium, though no corrosion issues.
- Current salt levels compared to 20 years ago suggest that the town's low salt practices are working well.

Recommendations

RESIDENTS

- Test “stagnant” lead and copper.
- Flush taps every day, use cold water tap for drinking.
- Consider non-salt technologies for iron and manganese by using the NHDES “**Be Well Informed**” webtool.
- Consider volume-based backwash for softeners.
- Consider installing a neutralizer for corrosion control, and/or POU for arsenic and uranium treatment.

TOWN

- Continue low salt application practices and maintain vigilance for effective alternatives.
- Evaluate infiltration ditches in the Brown Hill Rd area.

[PUBLIC](#)[GOVERNMENT](#)[BUSINESS](#)[A to Z LIST](#)

The NHDES Be *Well* Informed Guide

PROTECT YOUR FAMILY'S HEALTH AND HOME

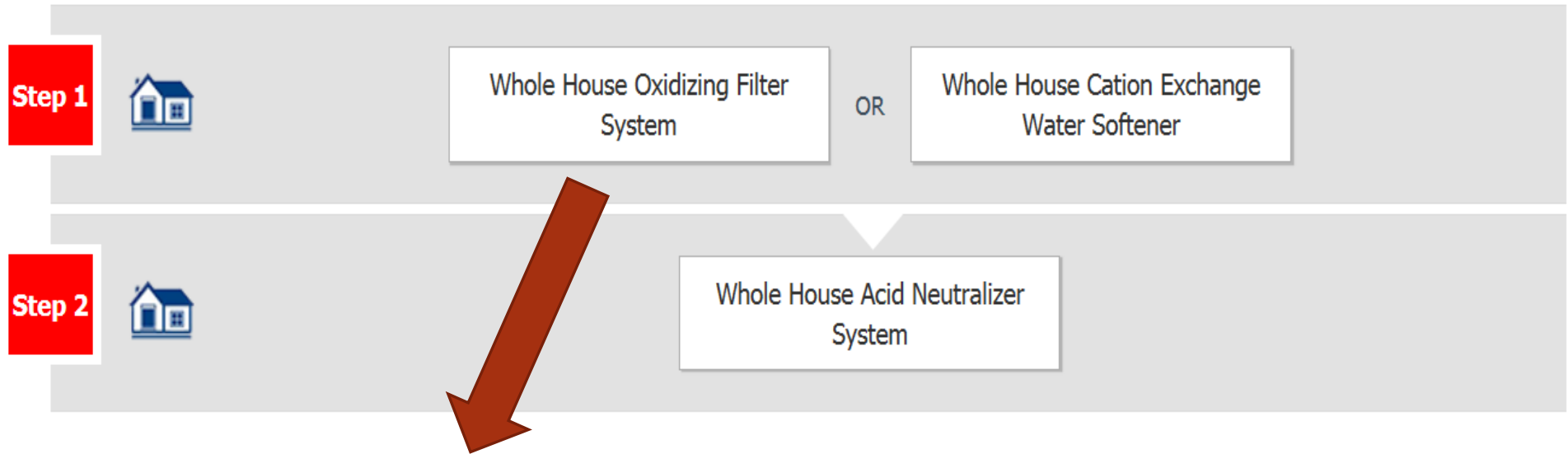
INFORMATION AND GUIDANCE FOR
TREATING YOUR WELL WATER



Water Treatment Systems That Remove Copper Stagnant, Lead Stagnant, Manganese

The following water treatment is based on the water quality information you entered. Details concerning water treatment are below.

Treatment Order



Non-salt options for Iron and/or Manganese:

- Greensand
- Birm
- Sediment Cartridge

Bow Drinking Water Protection Committee

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Matt Taylor (Bow Comm Dev), Noel Gourley (Bow DPW)



www.des.nh.gov

A to Z Topics - "Private wells"

Direct web search:

"NHDES Factsheets", "NHDES Be Well Informed"

THANK
YOU !



Town of Bow

NEW HAMPSHIRE



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Development

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Bow, NH 03304

Phone:

603-228-1187 ext. 120

Fax:

603-225-2982

MEETINGS:

1st or 2nd Mon each month, six or more times
per year, Municipal Building 5:30 pm.



Drinking Water Protection Committee

[Meeting Agendas](#)

[Meeting Minutes](#)