

Update on Drought in NH

Brandon Kernen, NHDES

March 26, 2021



U.S. Drought Monitor Northeast

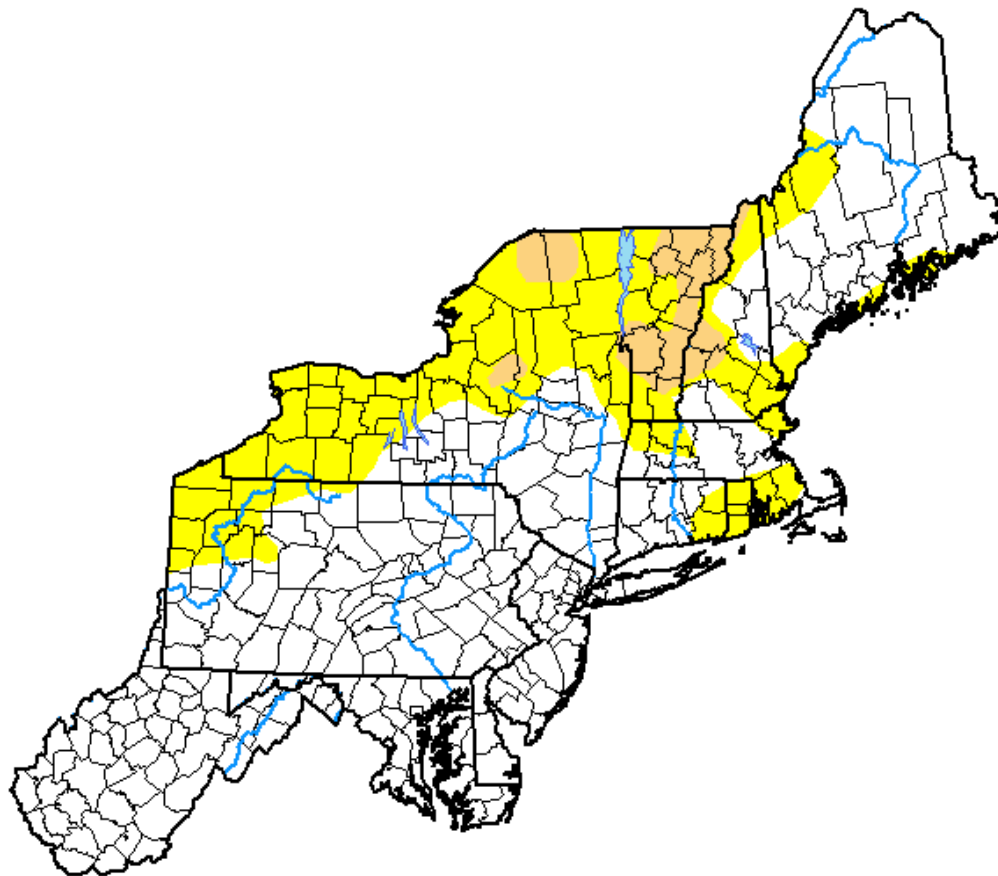
March 23, 2021

(Released Thursday, Mar. 25, 2021)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	70.01	29.99	4.74	0.00	0.00	0.00
Last Week <i>03-16-2021</i>	74.47	25.53	3.90	0.00	0.00	0.00
3 Months Ago <i>12-22-2020</i>	60.32	39.68	16.87	0.00	0.00	0.00
Start of Calendar Year <i>12-29-2020</i>	77.61	22.39	3.63	0.00	0.00	0.00
Start of Water Year <i>09-29-2020</i>	29.83	70.17	45.34	26.30	3.91	0.00
One Year Ago <i>03-24-2020</i>	96.77	3.23	0.00	0.00	0.00	0.00



Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

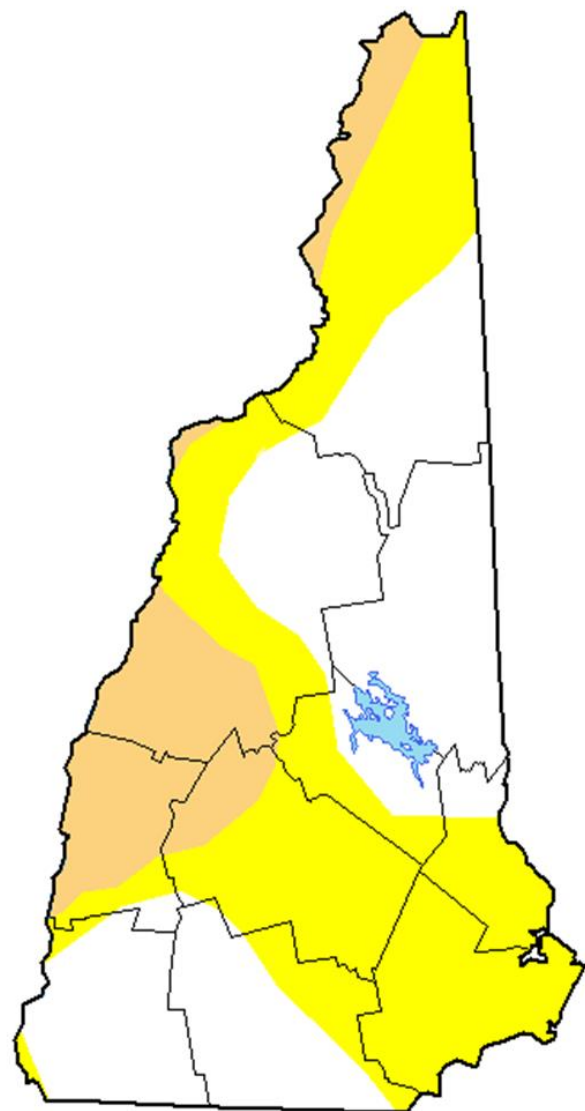
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

Author:
Brad Pugh
CPC/NOAA



droughtmonitor.unl.edu

U.S. Drought Monitor New Hampshire



March 23, 2021

(Released Thursday, Mar. 25, 2021)

Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	43.70	56.30	14.93	0.00	0.00	0.00
Last Week <i>03-16-2021</i>	46.85	53.15	14.93	0.00	0.00	0.00
3 Months Ago <i>12-22-2020</i>	37.79	62.21	40.04	0.00	0.00	0.00
Start of Calendar Year <i>12-29-2020</i>	51.64	48.36	12.20	0.00	0.00	0.00
Start of Water Year <i>09-29-2020</i>	0.00	100.00	100.00	95.06	10.59	0.00
One Year Ago <i>03-24-2020</i>	100.00	0.00	0.00	0.00	0.00	0.00

Intensity:

None	D2 Severe Drought
D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to <https://droughtmonitor.unl.edu/About.aspx>

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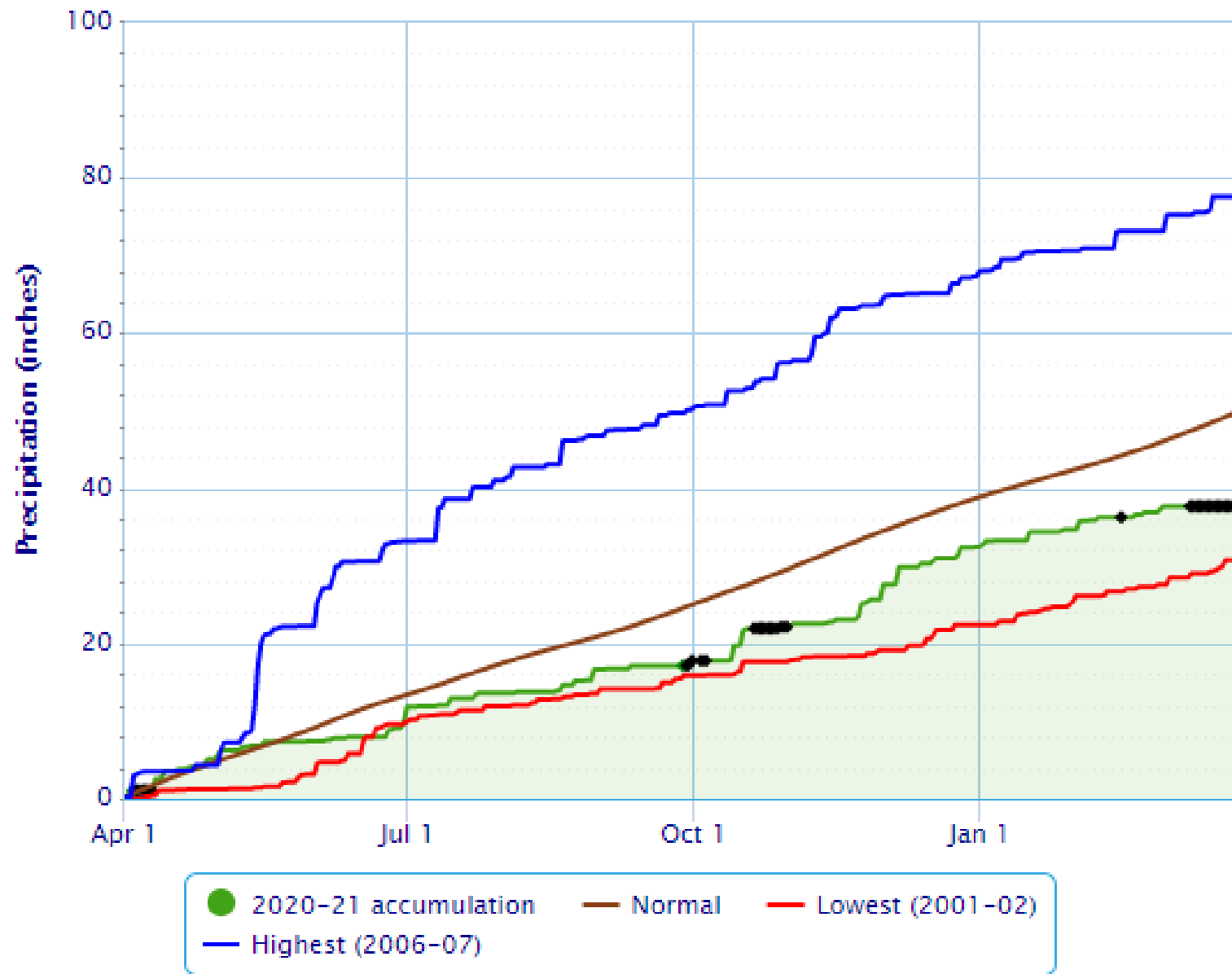


droughtmonitor.unl.edu

Precipitation Received/Precipitation Deficit (inches)

	March 2021	30 Days	60 Days	90 Days	180 Days	365 Days
Rockingham	0.79/-2.45	1.11/-2.85	3.79/-3.60	7.36/-3.27	19.27/-3.55	34.87/-11.72
Strafford	0.70/-2.52	1.10/-2.83	3.79/-3.56	7.24/-3.31	20.52/-2.48	37.56/-9.68

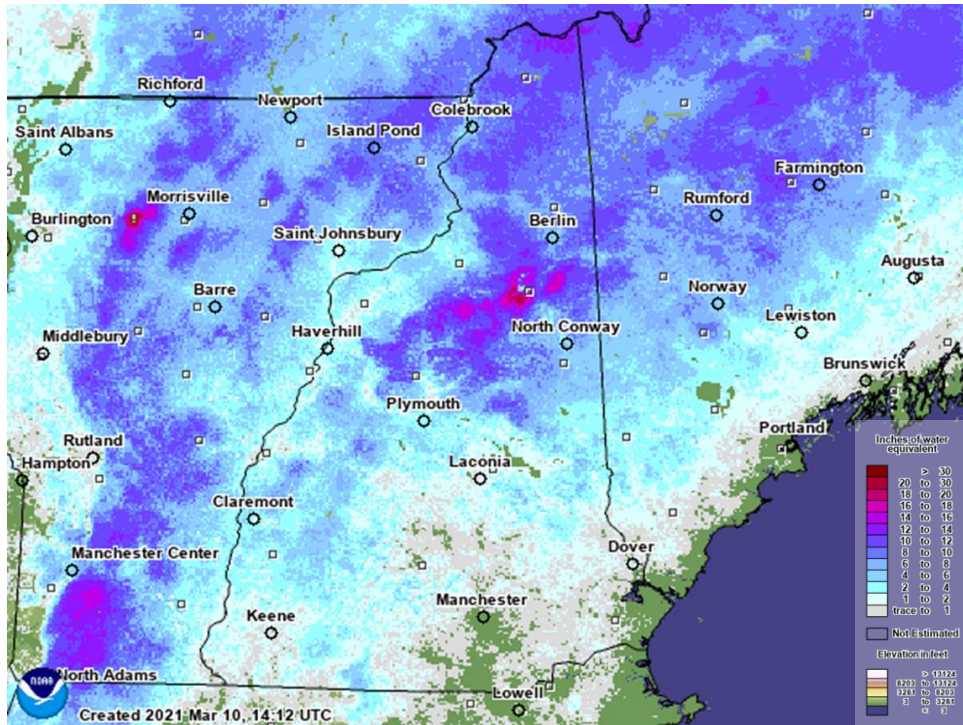
Accumulated Precipitation - GREENLAND, NH



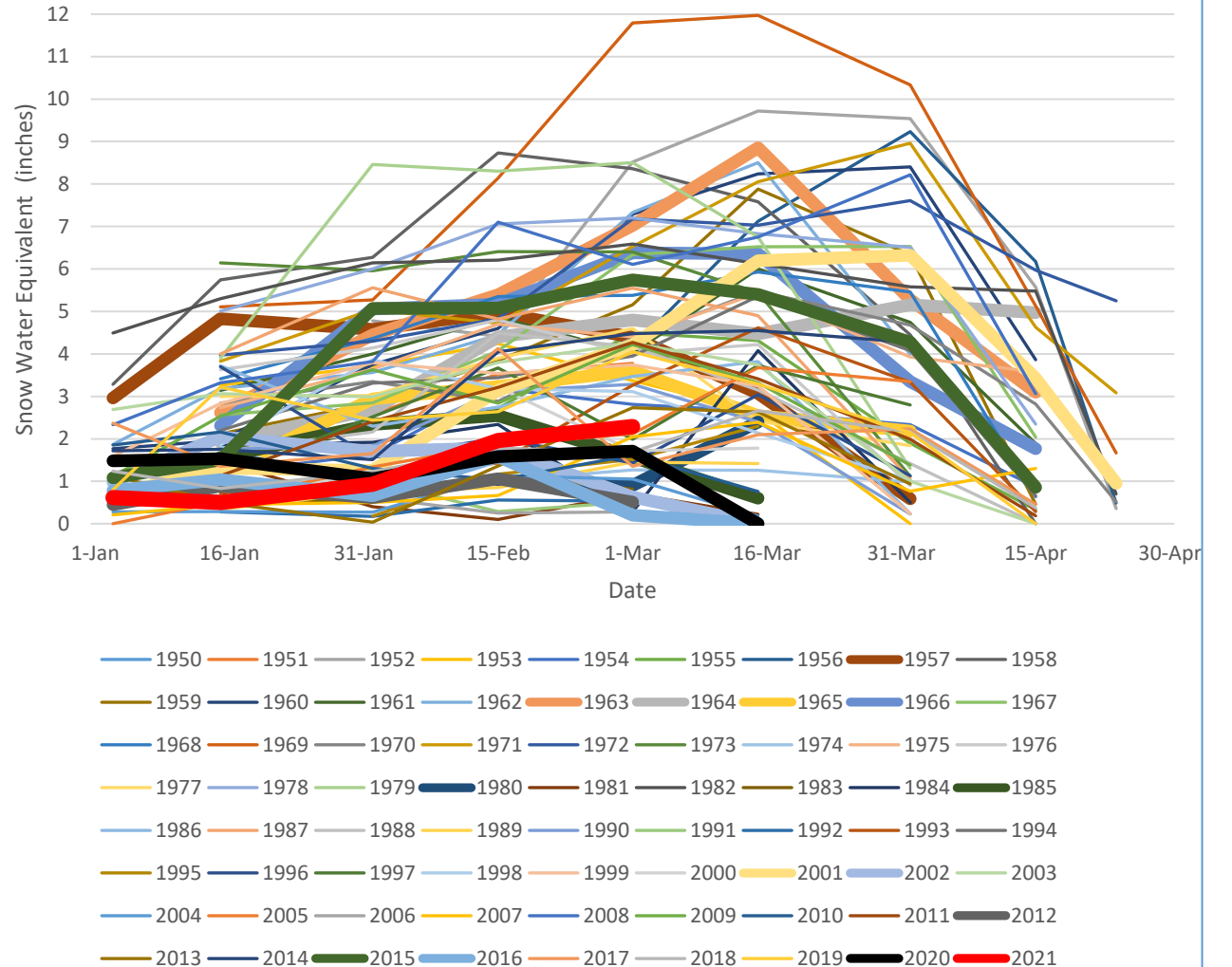


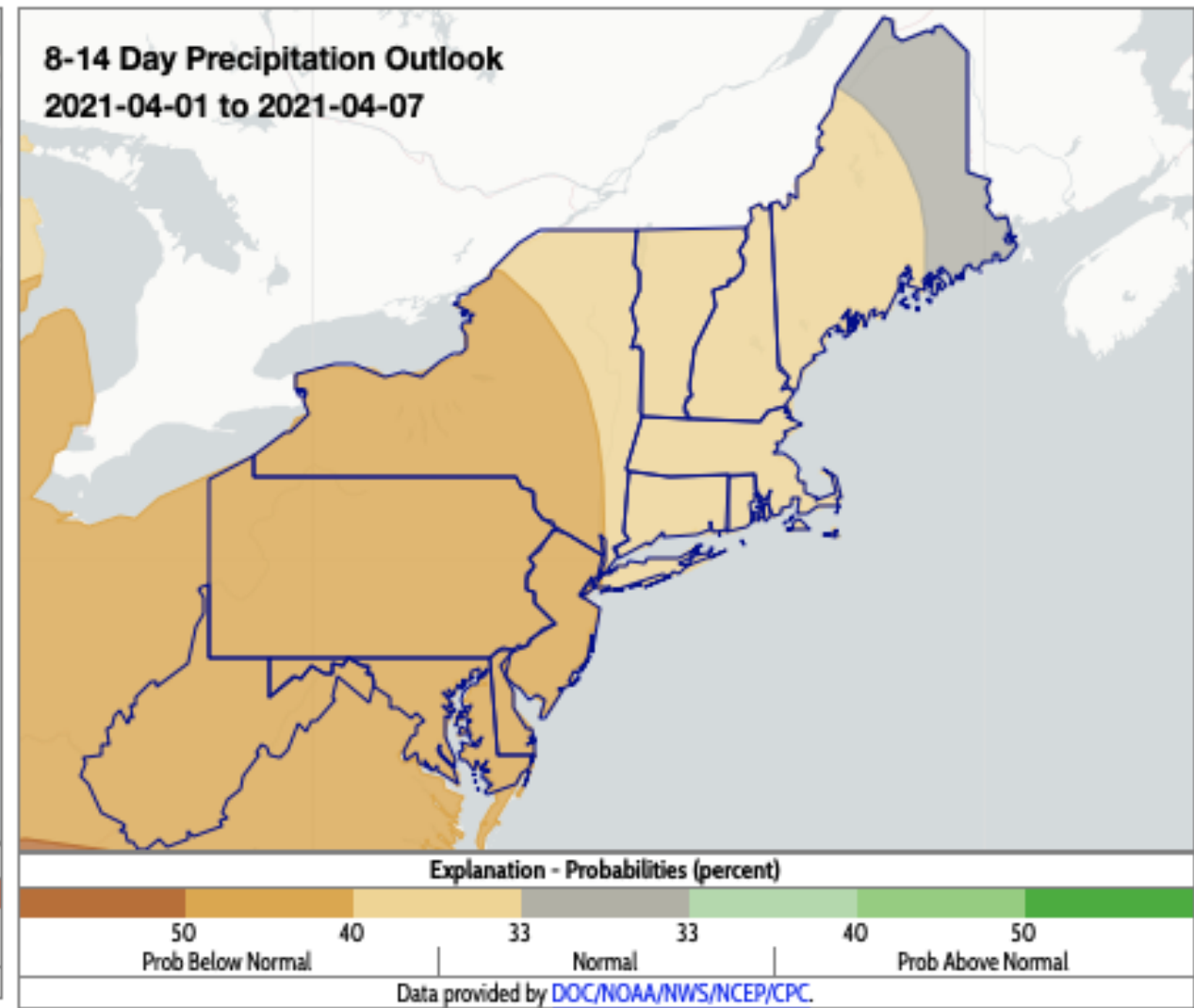
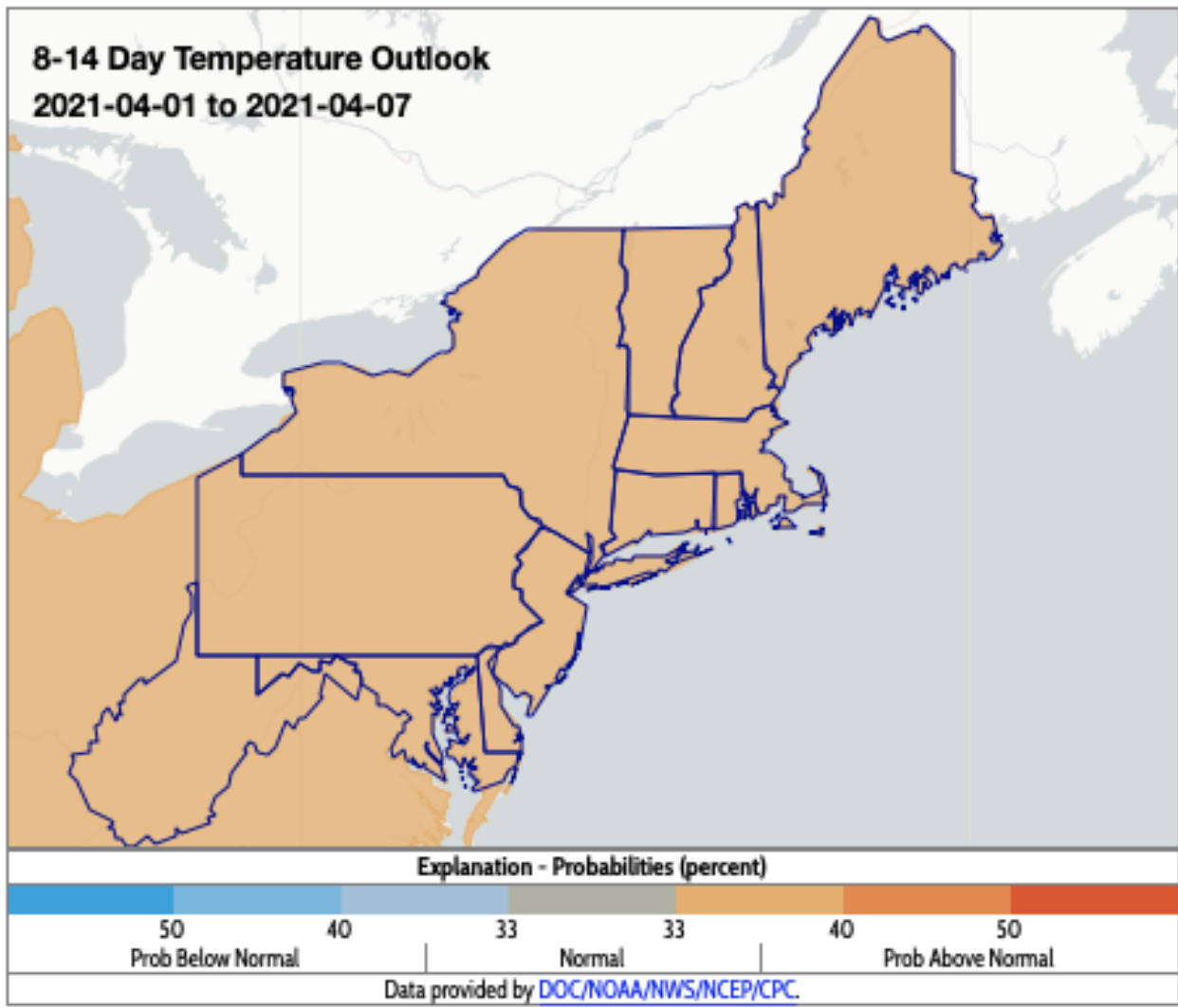
Drought: Snowpack

SNOW WATER EQUIVALENT March 11, 2021



WINNIPESAUKEE BASIN
SNOWPACK DATA 1950-PRESENT





NOAA's Climate Prediction Center (CPC) 8-14 day outlook for April 1-7 slightly favors above-normal temperatures for the entire region. The outlook favors below-normal precipitation for most of the region, excluding a portion of Maine.

Private Well Emergency Drought Assistance

Application Status as of 3/25/21 – 80 applications received – 6 received in March 2021

Tier 1 approved – 49

Tier 2 approved – 29

Approved financial assistance to date - \$881,447

Total project costs = approximately \$1.14 M

With the exception of 8 projects, ALL approved projects to date have been well replacements of a dug well with drilled well.

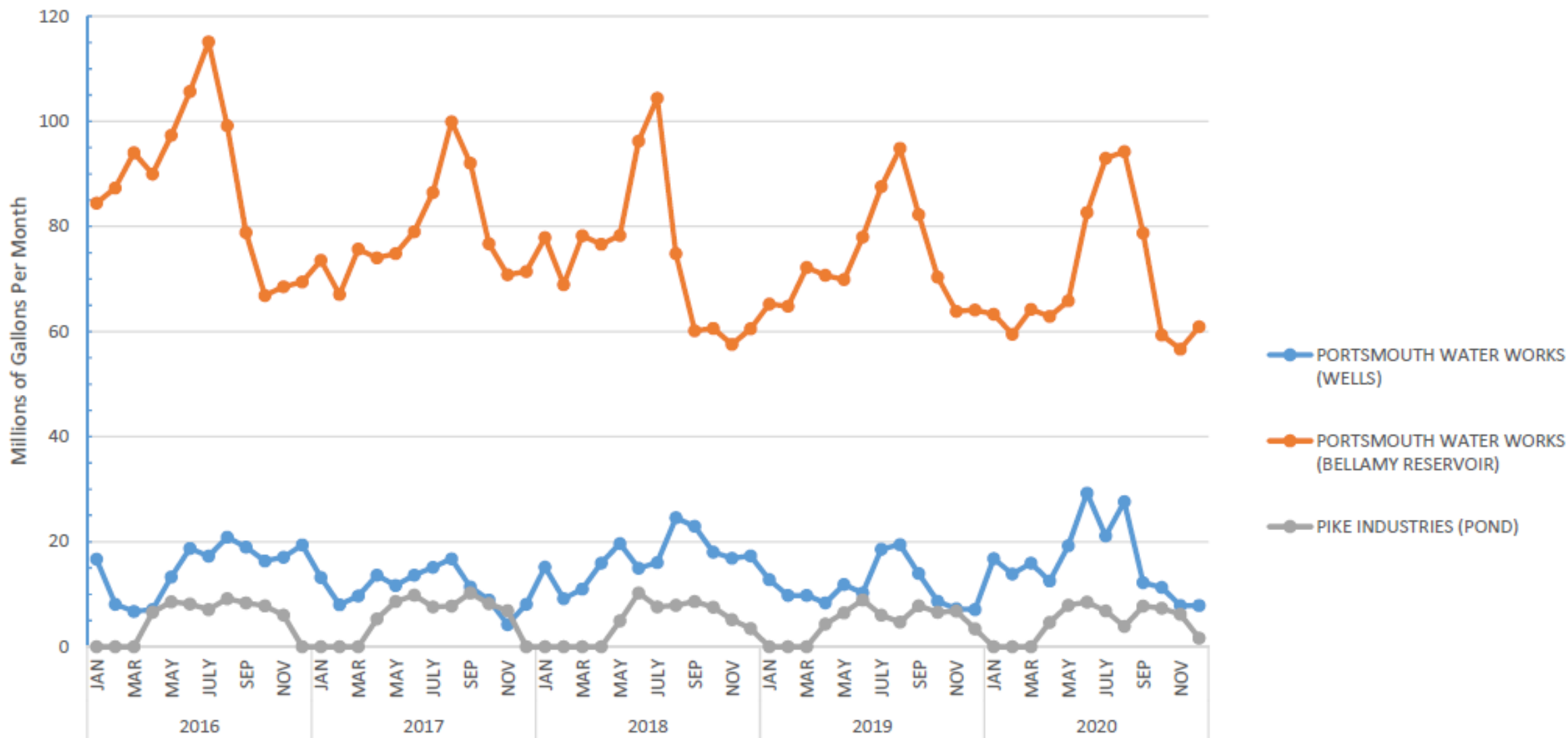
Water Resources in Madbury

Brandon Kernen, NHDES

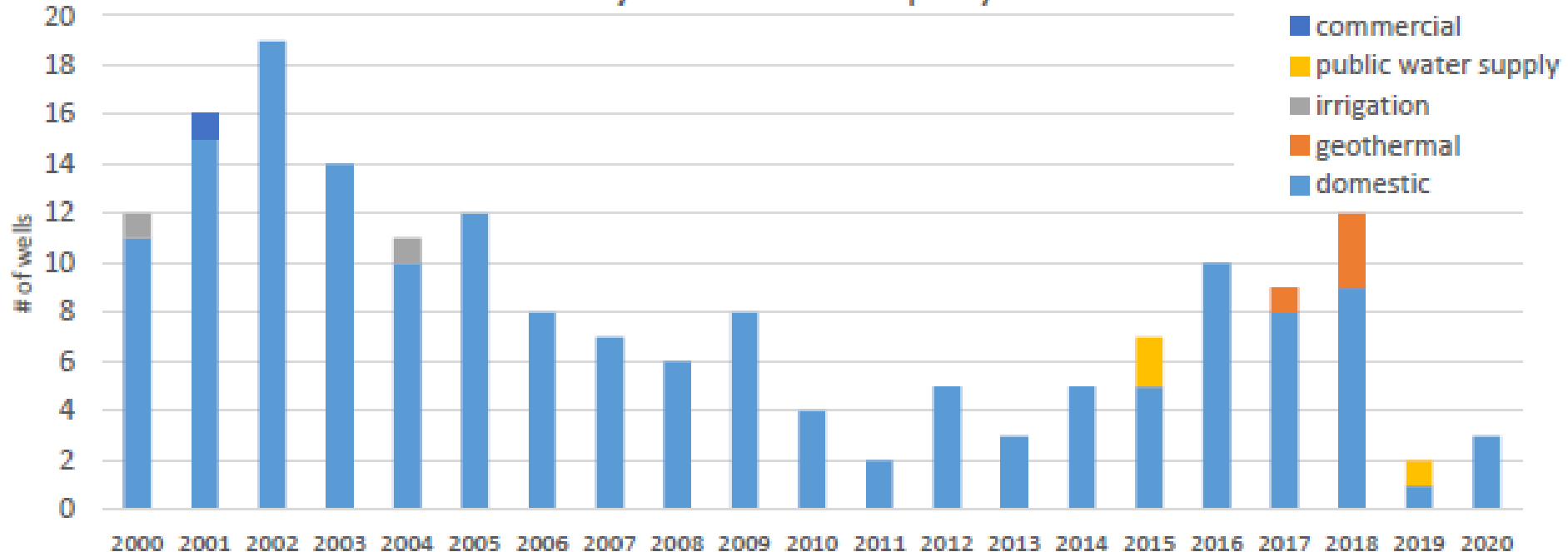
March 26, 2021



Town of Madbury Water Withdrawals 2016-2020

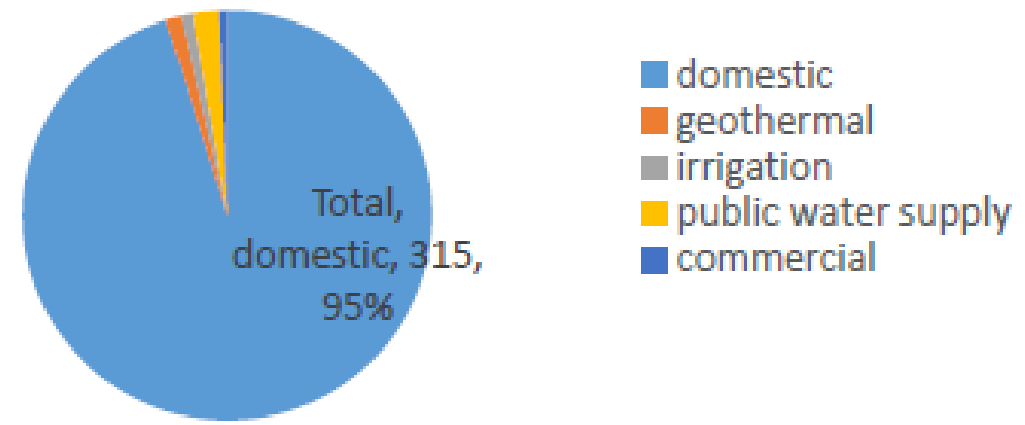


Town of Madbury - Wells drilled per year 2000-2020



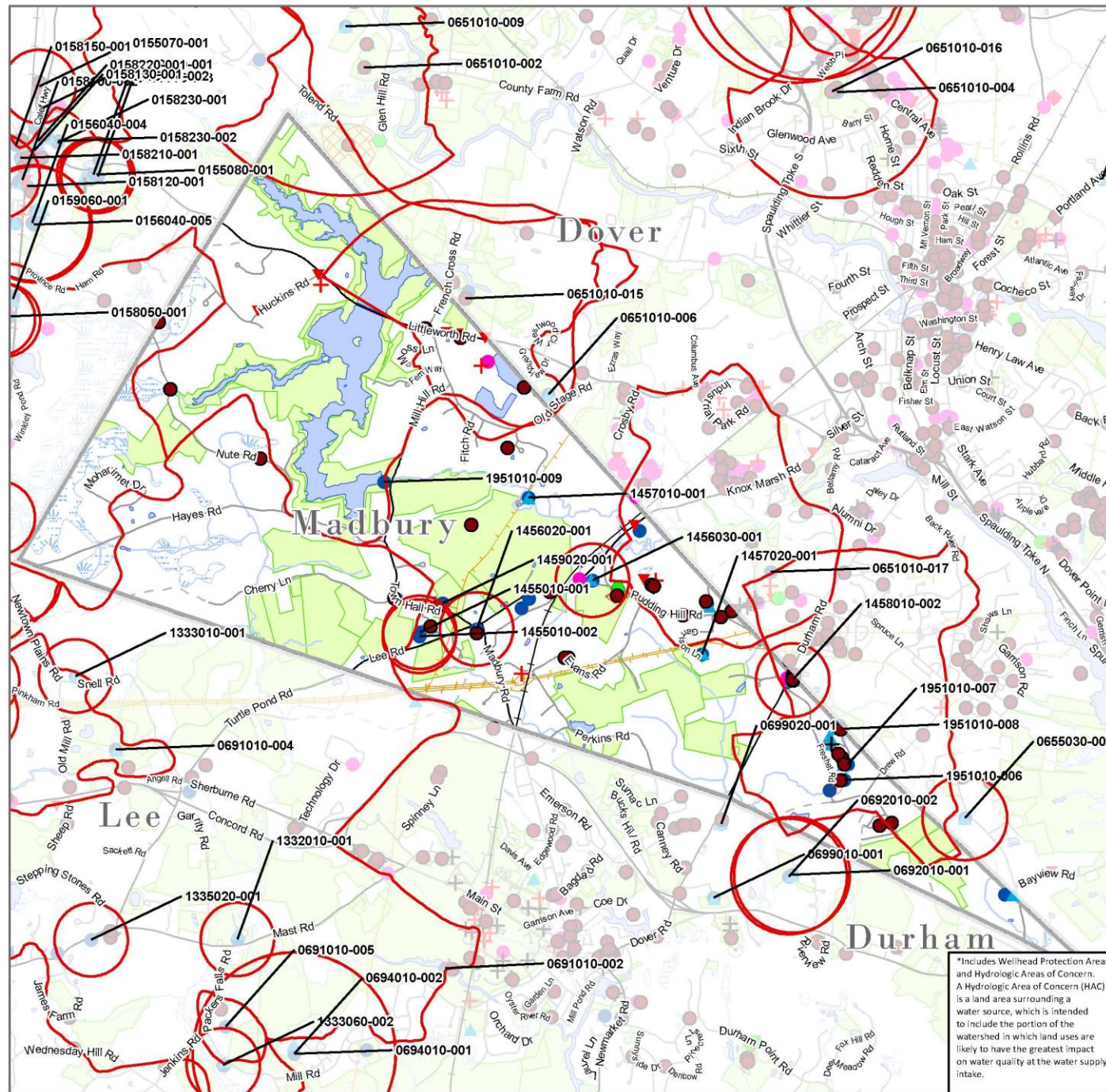
Well Type	Count
domestic	315
geothermal	4
irrigation	3
public water supply	7
commercial	2
Grand Total	331

Town of Madbury - Well Reports 1984-2020



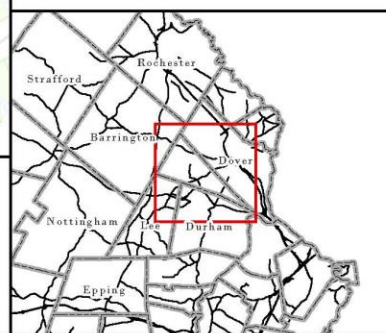
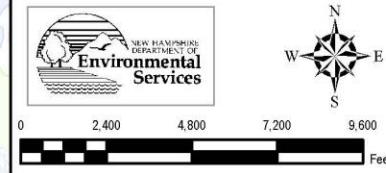
TOWN OF MADBURY

PUBLIC WATER SUPPLY RESOURCES & HAZARDS



- Source Water
- ⊠ Hazard Inventory Site
- ⊠ Source Water Hazard Inventory Area
- ⊕ Aboveground Storage Tank Facility
- ⊕ Underground Storage Tank Facility
- ⊕ RCRA Hazardous Waste Generator
- ⊕ RCRA Hazardous Waste Generator Area
- Solid Waste Facilities
- ⊠ Automobile Salvage Yard Facility
- ▼ Local PCS Inventory
- NPDES Outfall
- Public Water Supply Source
- ▲ PWS Facility or Pump House
- Source Water Protection Areas*
- ▭ Town Boundaries
- ⊕ Conservation Lands
- ⊕ Primary Route
- ⊕ Other road or street
- ⊕ Class VI Road
- ⊕ Railroad
- ⊕ Transmission or Pipeline
- ⊕ River or Stream
- ⊕ Lake or Pond
- ⊕ Swamp or Marsh

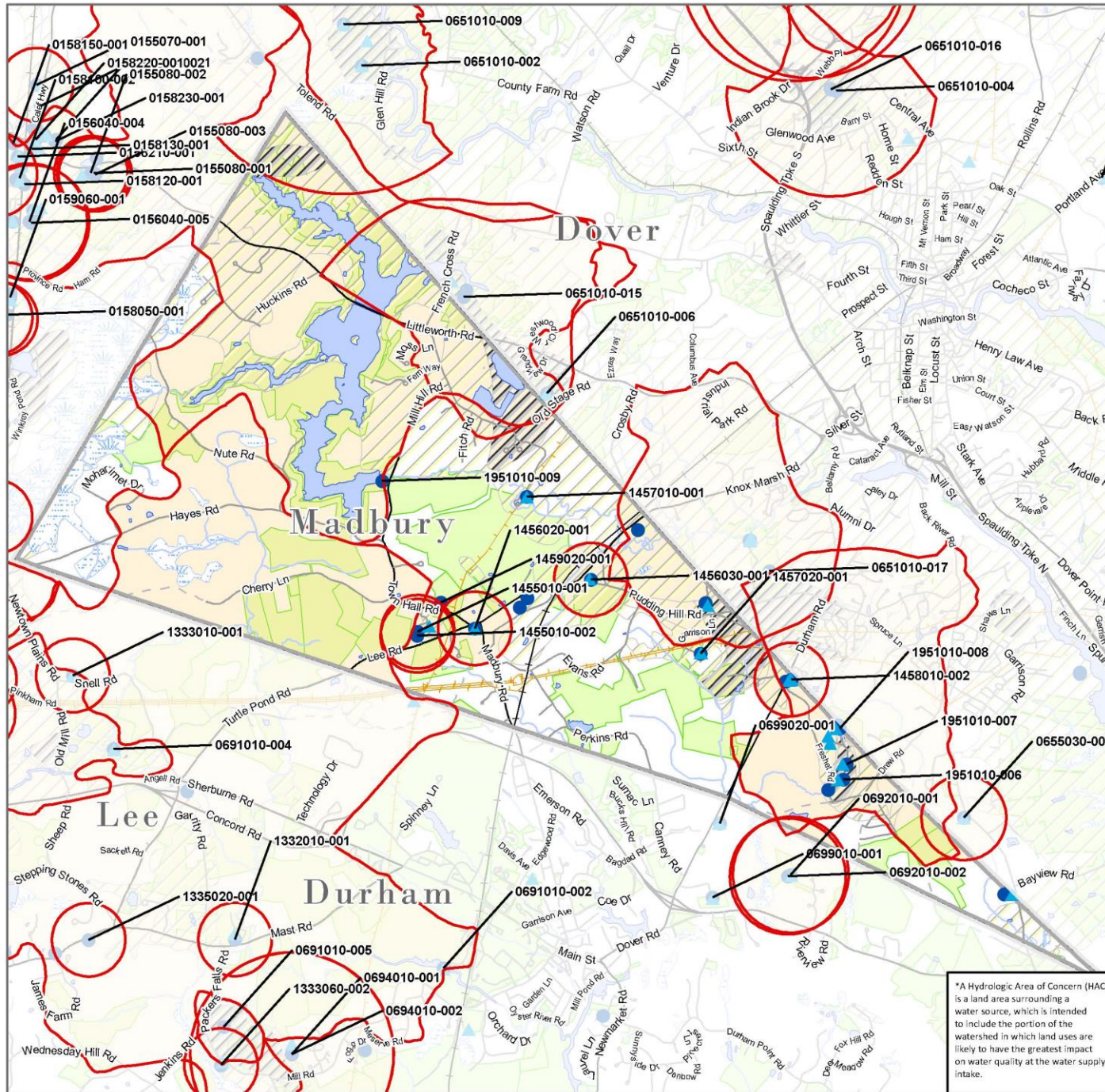
Notes:
The data presented is under constant revision as new information is available. They may not contain all of the potential or existing sites or facilities. NHDES is not responsible for the use or interpretation of this information. Not intended for legal purposes. Information on this map shall be considered security sensitive. Do not circulate or publish.



*Includes Wellhead Protection Areas and Hydrologic Areas of Concern. A Hydrologic Area of Concern (HAC) is a land area surrounding a water source, which is intended to include the portion of the watershed in which land uses are likely to have the greatest impact on water quality at the water supply intake.

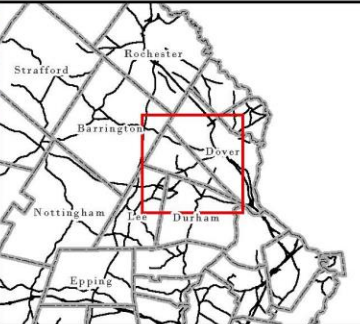
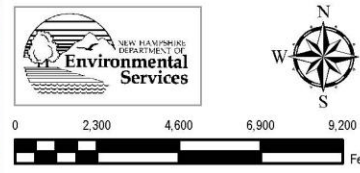
TOWN OF MADBURY

SOURCE WATER PROTECTION



- High Priority Water Supply Lands
- Stratified Drift Aquifers High Transmissivity (>= 1,000 ft2/day)
- Stratified Drift Aquifers High Transmissivity (< 1,000 ft2/day)
- Public Water Supply Source
- PWS Facility or Pump House
- Source Water Protection Areas (Includes Wellhead Protection Areas and Hydrologic Areas of Concern*)
- Town Boundaries
- Conservation Lands
- Primary Route
- Other road or street
- Class VI Road
- Railroad
- Transmission or Pipeline
- River or Stream
- Lake or Pond
- Swamp or Marsh

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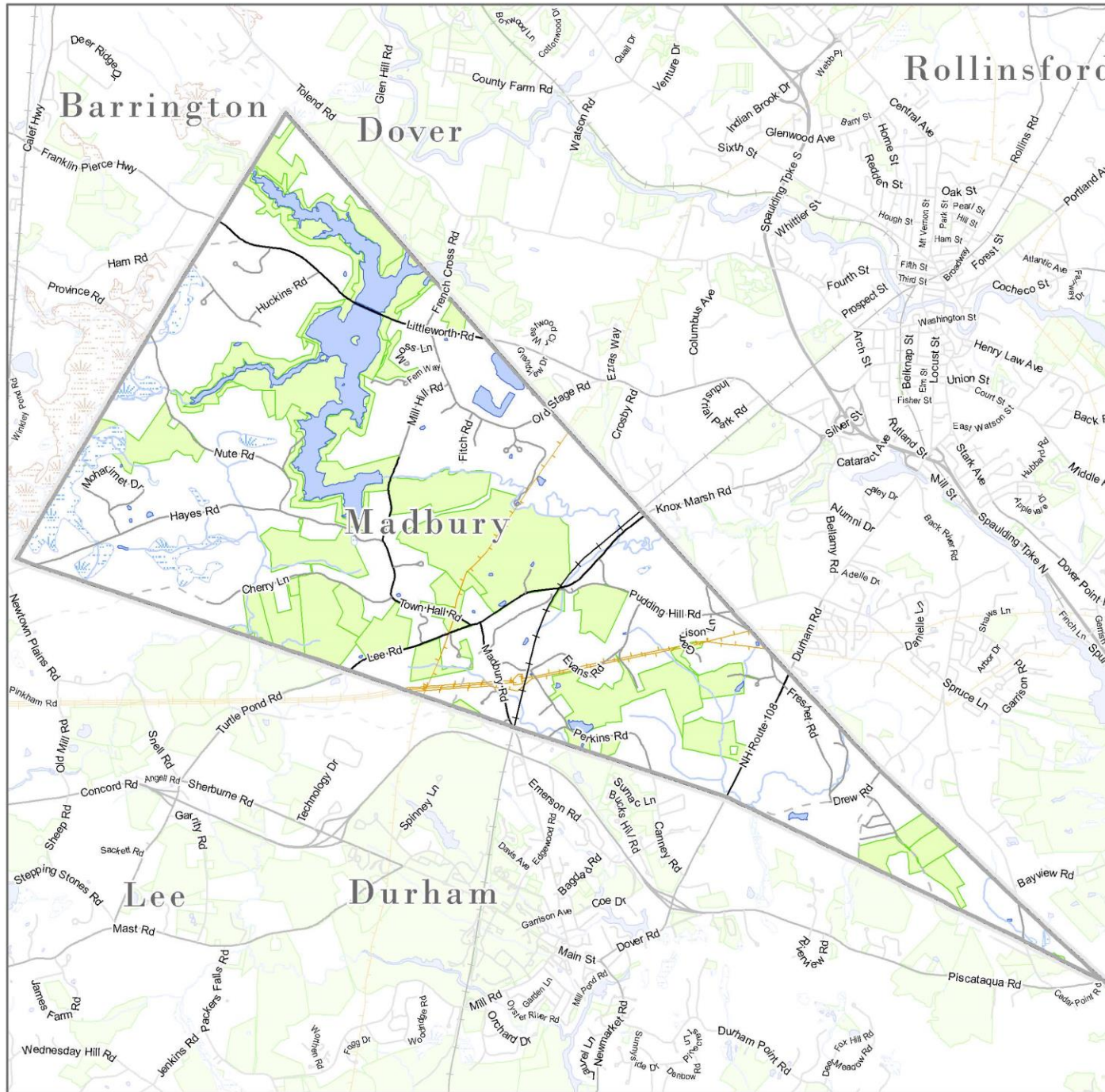
*A Hydrologic Area of Concern (HAC) is a land area surrounding a water source, which is intended to include the portion of the watershed in which land uses are likely to have the greatest impact on water quality at the water supply intake.

Source Water Protection for the Town of MADBURY, NH Total Town Acreage = 7799.04						
GIS LAYER	TOTAL AC.	DEVELOPED AC.	CONSERVED AC.	PROTECTION ZONING AC.	TOTAL PROTECTED AC.*	UNPROTECTED
WELLHEAD PROTECTION AREAS (WHPA)	1752.75	257.54	351.2	1340.5	1479	216.19
HYDROLOGIC AREAS OF CONCERN (HAC)	3631.76	200.75	1030.75	575.48	1452.55	2035.88
HIGH YIELD STRATIFIED DRIFT AQUIFERS (HYSDA)	332.67	56.34	60.77	210.69	241.02	71.46
HIGH PRIORITY WATER SUPPLY LANDS (WHPA + HAC + HYSDA)	4869.84	422.21	1225.84	1340.5	2353.65	2304.5

* "Conserved Ac" and "Protection Zoning Ac" are overlapping and cannot be added together to equal "Total Protected Ac."

** "Unprotected, undeveloped" areas include lands not protected by conservation or local zoning and are not developed according to 2016 land use GIS data.

Summary of Protection in MADBURY Zoning		
Zoning Ordinance Name	Aquifer and Wellhead Protection Overlay District	
District Boundary	Wellhead Protection Areas and Stratified Drift Aquifers	
Zoning Provisions	Yes/No	Type of Provision
	Yes	Refers to NHDES Best Management Practices for Groundwater Protection (Env-Wq 401)
	No	Prohibits Underground Storage Tanks (USTs) holding a regulated substance (defined under Env-Wq 401)
	Yes	Prohibits high-risk land uses recommended by NHDES
	No	Requires blasting follow state/local BMPs
Yes	Limits impervious surface for development proposals	

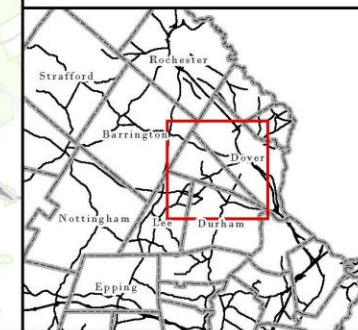


TOWN OF MADBURY

PRIME WETLANDS &
WETLANDS

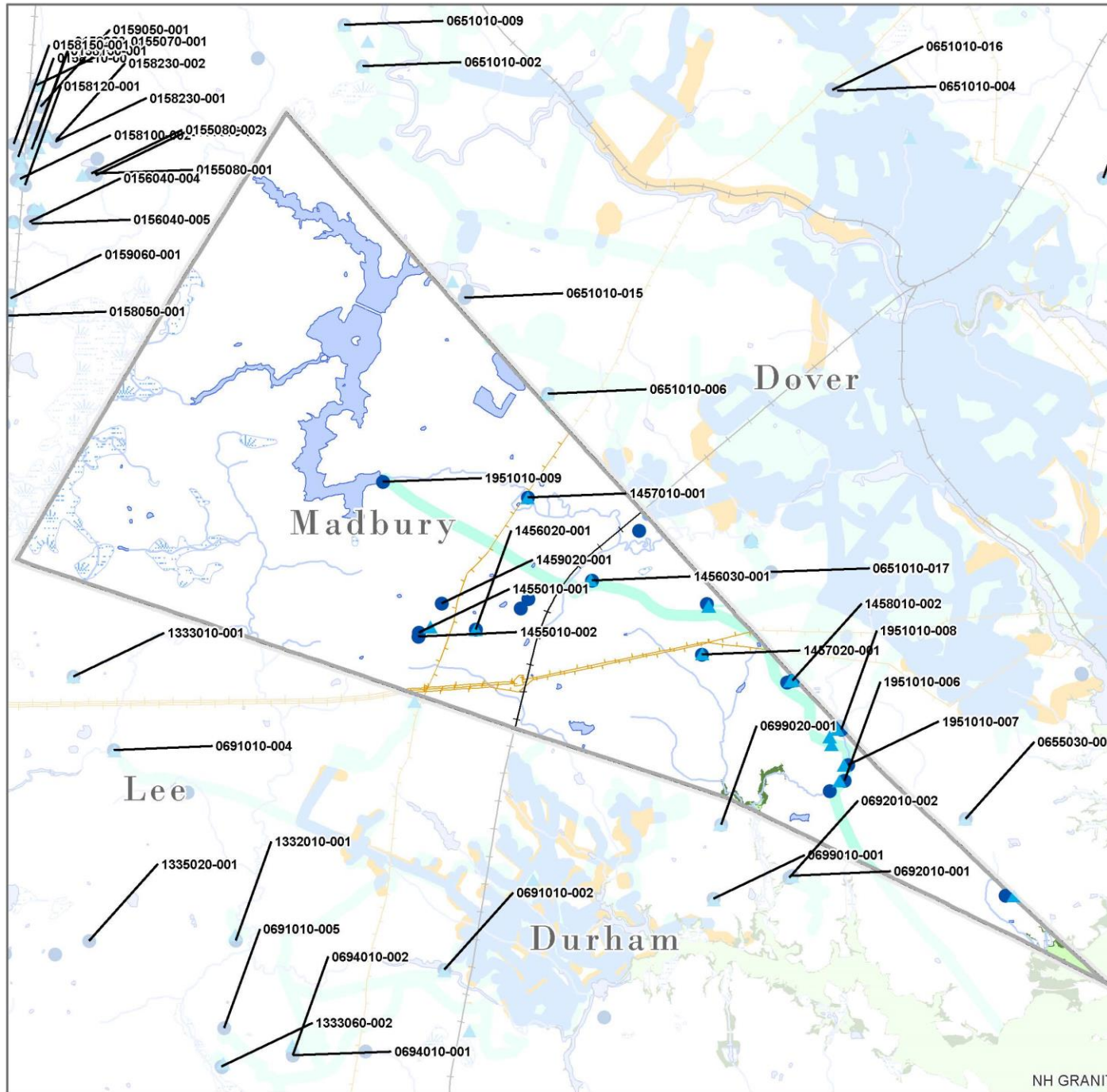
- Town Boundaries
- Conservation Lands
- Primary Route
- Other road or street
- Class VI Road
- Railroad
- Transmission or Pipeline
- River or Stream
- Lake or Pond
- Swamp or Marsh
- Prime Wetlands

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TOWN OF MADBURY

POTENTIAL SEA LEVEL RISE EXTENT
100-YEAR STORM SURGE SCENARIOS

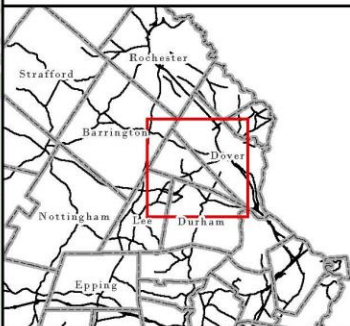


- | | |
|--|--------------------------|
| Mean higher high water + 2' sea level rise | Town Boundaries |
| Mean higher high water + 8' sea level rise | Primary Route |
| Public Water Supply Source | Other road or street |
| PWS Facility or Pump House | Class VI Road |
| Water & Sewer Service Area | Railroad |
| Sewer Service Area | Transmission or Pipeline |
| Water Service Area | River or Stream |
| | Lake or Pond |
| | Swamp or Marsh |

Notes:
The four data layers that incorporate the 100-year storm surge event are based on the April, 2014 preliminary Digital Flood Insurance Rate Maps (DFIRMs) for Rockingham County and the September, 2015 effective DFIRMs for Strafford County.

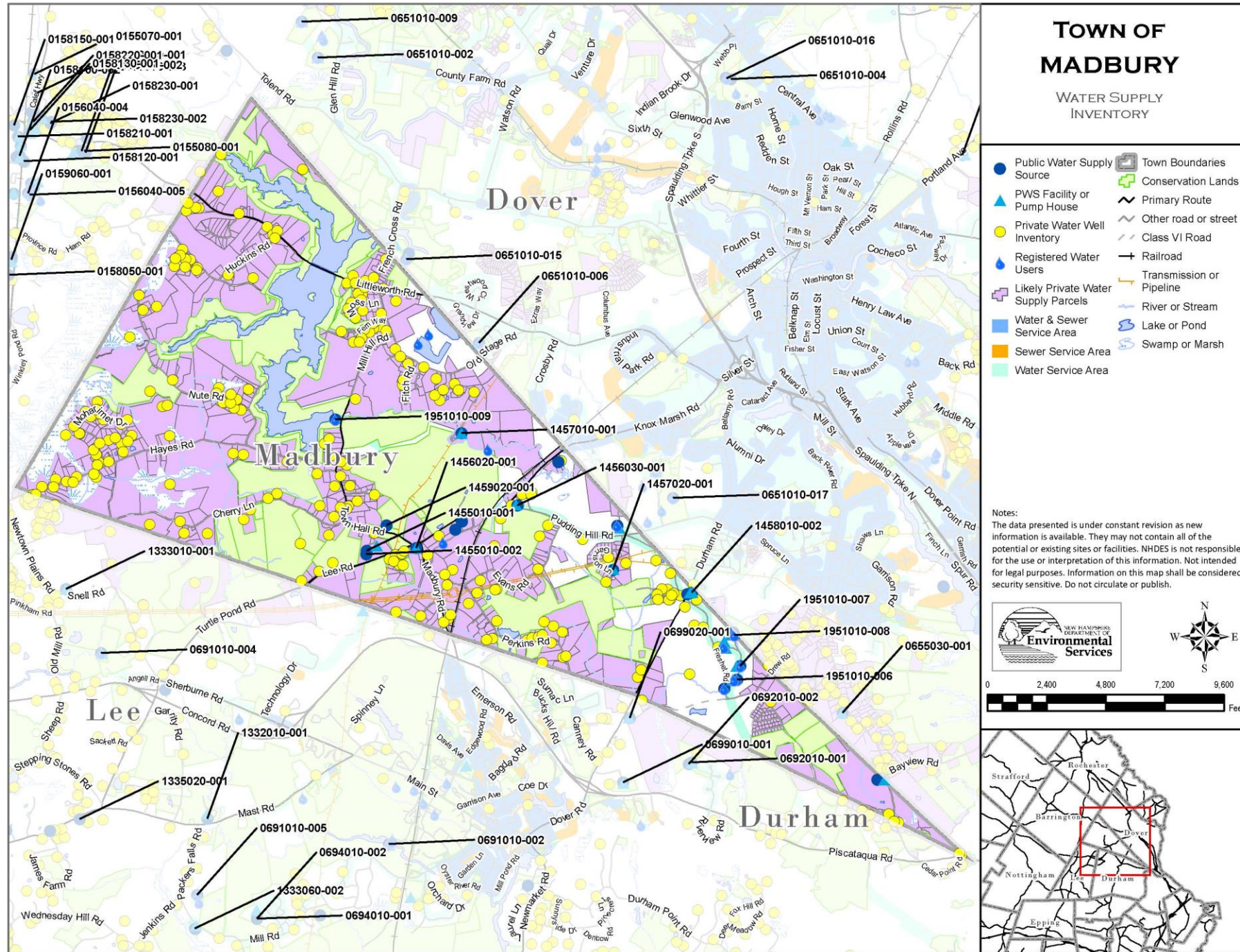
The data set includes interior inundation areas that may appear isolated but are hydrologically connected by culverts, tidal crossings, etc.

Digital data in NH GRANIT represent the efforts of the contributing agencies to record information from the cited source materials. Earth Systems Research Center, under contract to the NH Office of Energy and Planning, and in consultation with cooperating agencies, maintains a continuing program to identify and correct errors in these data. OEP, ESRC, and the cooperating agencies make no claim as to the validity or reliability or to any implied uses of these data.



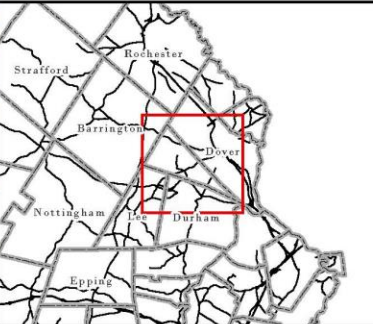
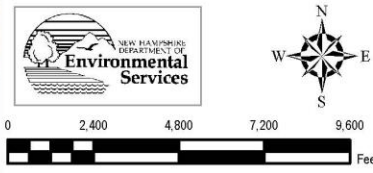
TOWN OF MADBURY

WATER SUPPLY INVENTORY



- Public Water Supply Source
- ▲ PWS Facility or Pump House
- Private Water Well Inventory
- Registered Water Users
- Likely Private Water Supply Parcels
- Water & Sewer Service Area
- Sewer Service Area
- Water Service Area
- Town Boundaries
- Conservation Lands
- Primary Route
- Other road or street
- Class VI Road
- Railroad
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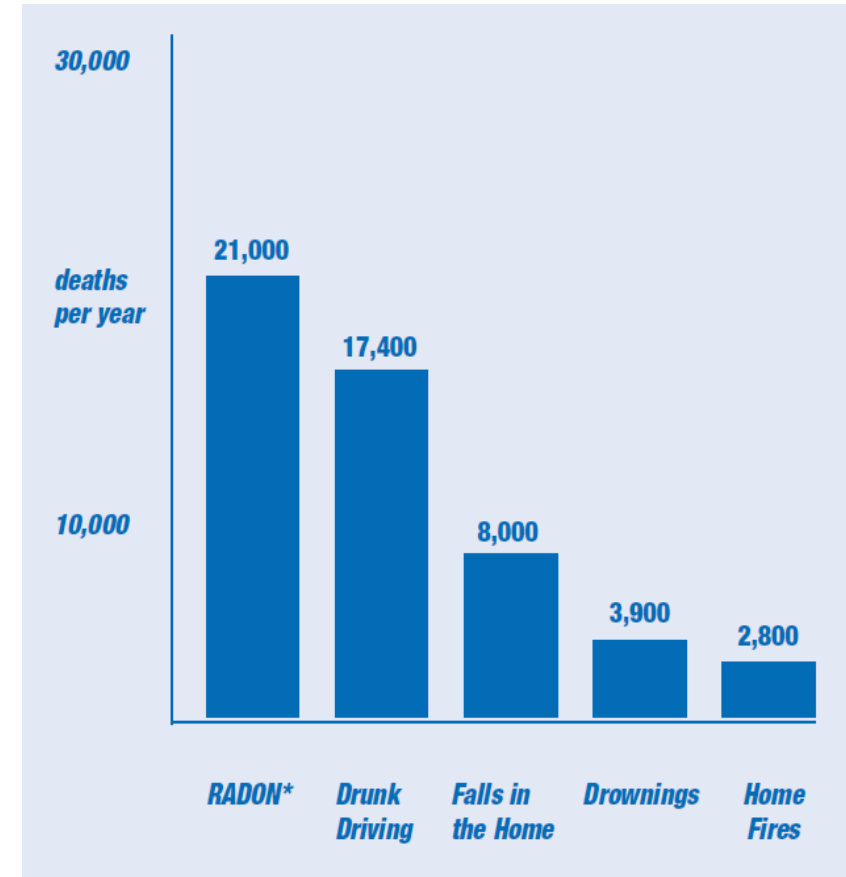


Madbury

		Percent of Samples Above Health Standard			
Analyte	Health Limit	Wells Tested (n)	Percent Exceeded Town	Percent Exceeded by County	Percent Exceeded by State
Arsenic	> 0.005 mg/L	47	40.4%	39.8%	25.3%
Chloride	> 250 mg/L	52	0.0%	2.6%	2.8%
Copper (flushed)	> 1.3 mg/L	46	0.0%	0.2%	0.8%
Copper (stagnant)	> 1.3 mg/L	NA	NA	10.7%	11.9%
Fluoride	> 4 mg/L	51	0.0%	0.0%	0.8%
Iron	> 0.3 mg/L	46	8.7%	15.3%	17.0%
Lead (flushed)	> 0.015 mg/L	46	0.0%	0.9%	1.5%
Lead (stagnant)	> 0.015 mg/L	NA	NA	7.1%	12.9%
Manganese	0.3 mg/L		~3 - 7% - will update the table		
Nitrate	> 10 mg/L	52	1.9%	0.7%	0.4%
Nitrite	> 1 mg/L	52	0.0%	0.0%	0.0%
Radon	> 2000 pCi/L	NA	NA	32.7%	27.3%
Sodium	> 20 mg/L	47	51.1%	43.9%	33.5%
Uranium	> 30 mg/L	NA	NA	2.0%	4.2%

Health Impacts – Rn and As

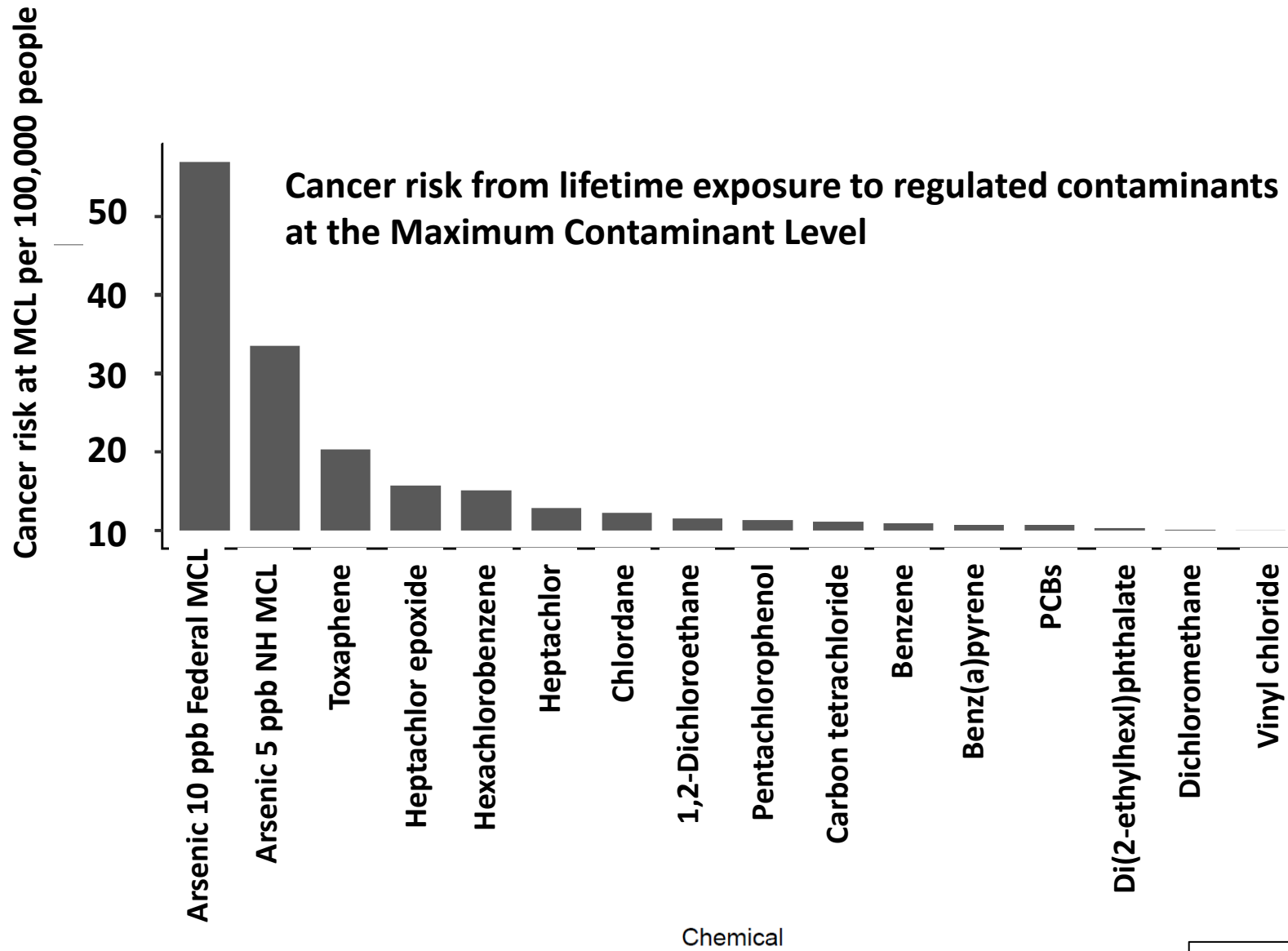
- Radon (air)
 - 21,000 lung ca deaths/yr in U.S.
 - 100 deaths/yr in N.H.
- Arsenic (water and food)
 - DW limit 10 ppb since 2001
 - 20% of wells in NH over 10 ppb
 - “100s of cases of cancer among current N.H. population”
 - Maine study: reduced intelligence at 5 ppb



Health Impacts - Arsenic

Low dose, chronic, long term exposure to Arsenic in drinking water can lead to:

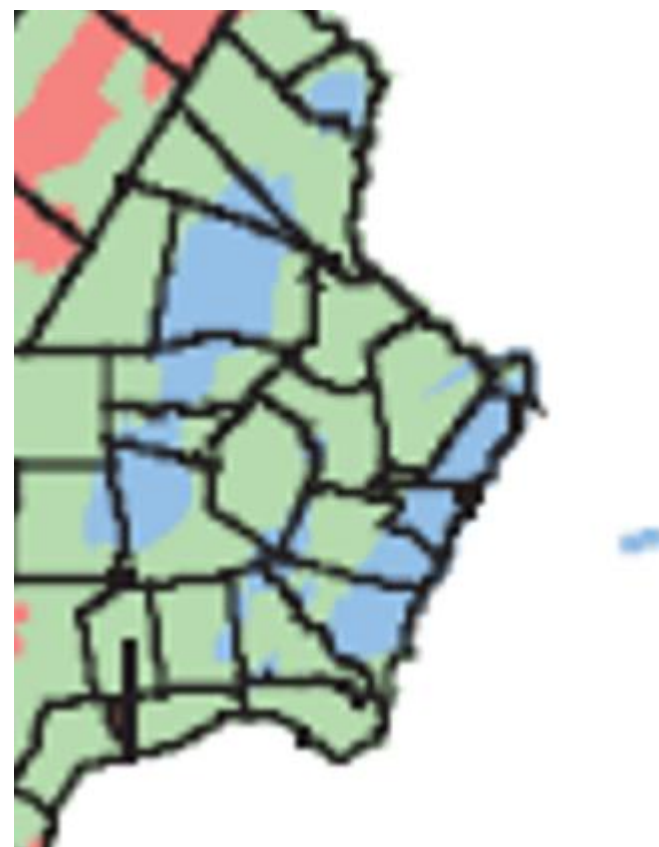
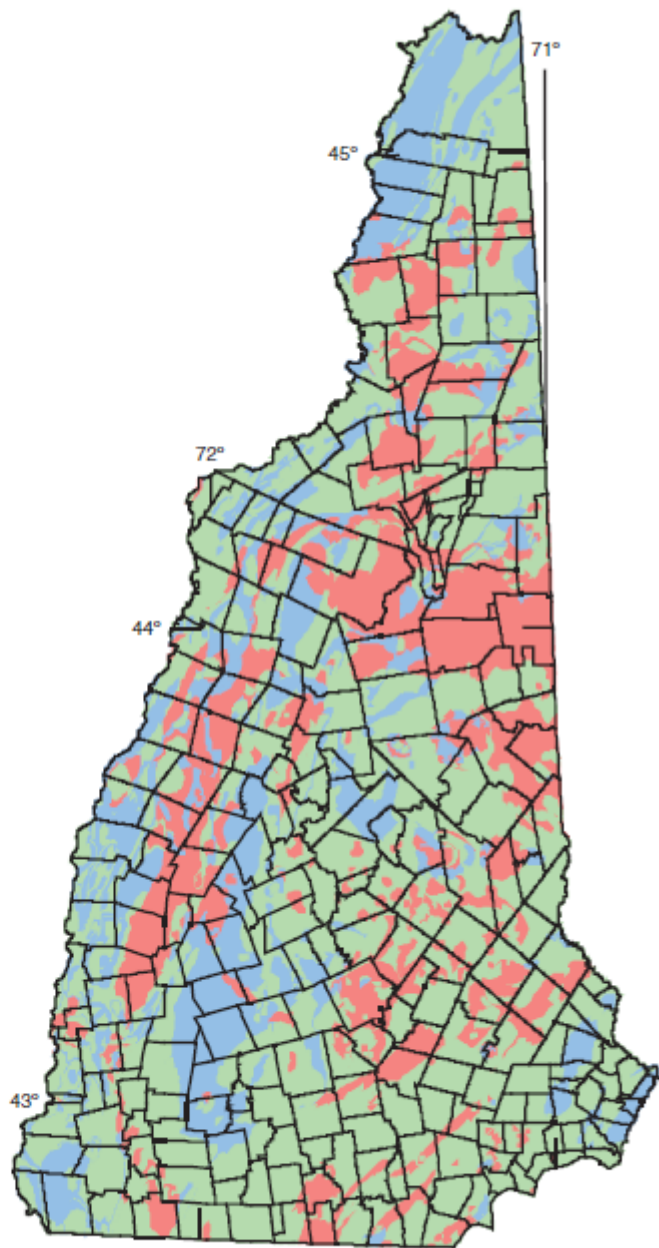
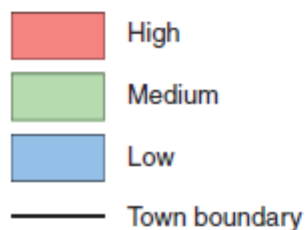
- **Cancers (bladder, skin, kidney, liver, prostate and lung)**
- **Vascular and cardiovascular disease**
- **Reproductive and developmental effects**
- **Cognitive and neurological effects**
- **Diabetes and other metabolic disorders**
- **Neuropathy**



Prepared by NHDES and Dartmouth TMSRP (2019)
 Data source: EPA Integrated Risk Information System

EXPLANATION

RADON-POTENTIAL CATEGORIES

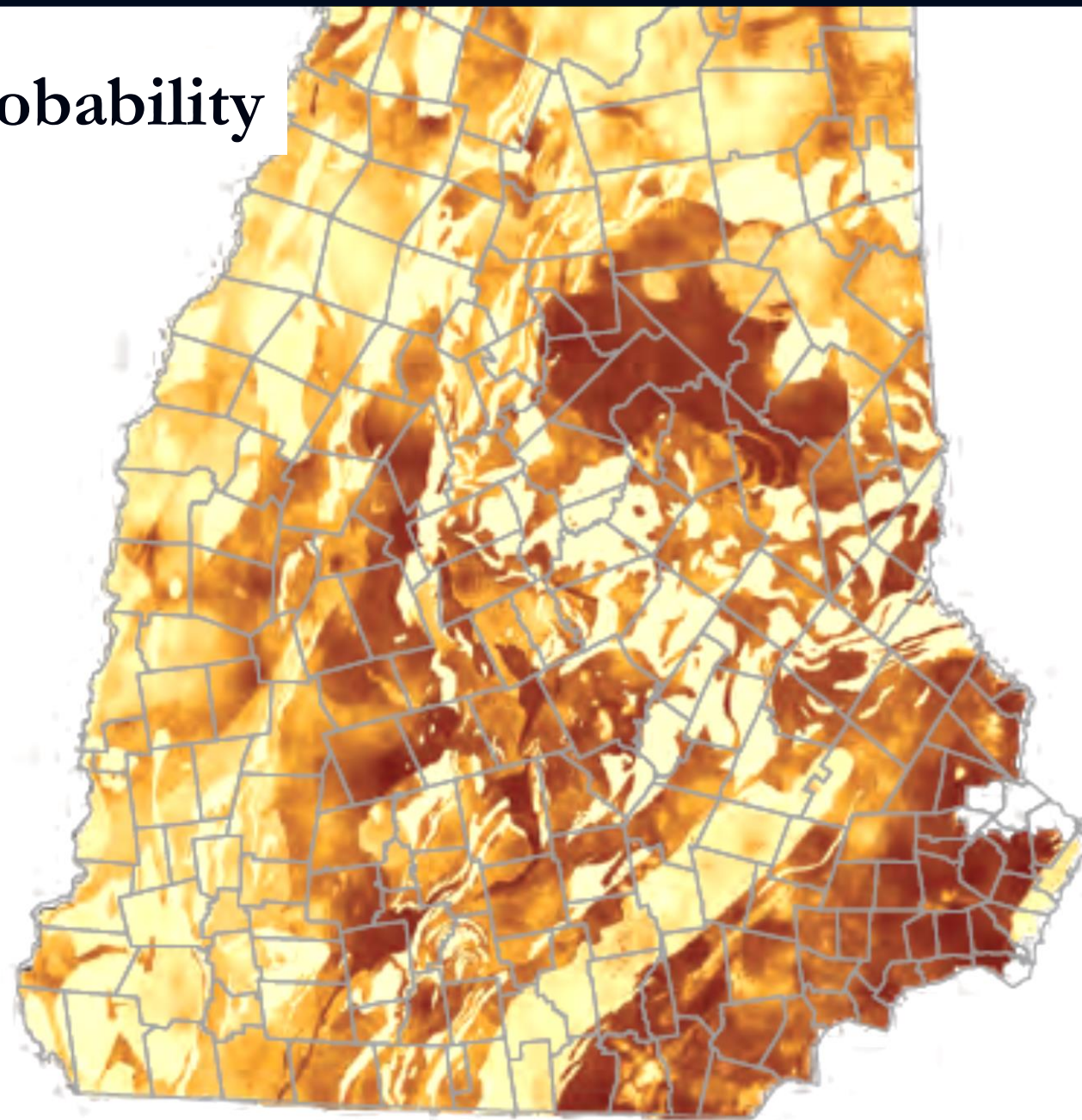
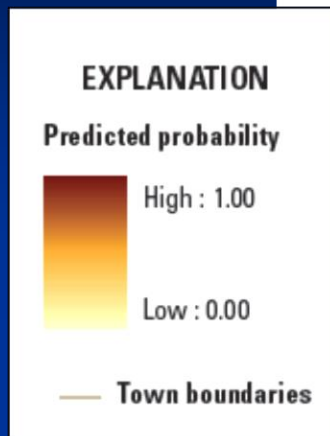


Distribution of radon in water concentrations by radon-potential category

Quantile, in percent	Radon potential		
	High 1 a	Medium b	Low b
90	65,700	19,500	6,300
50 (median)	5,900	2,250	1,350
10	1,400	620	300

Base from U.S. Geological Survey, 1:24,000
New Hampshire State plane feet projection

Arsenic Probability



Estimated probability of As ≥ 1 ppb

Lead in Homes on Private Wells

- Very common in stagnant tap water
 - Detected in 70% of 10,000 samples
 - Above EPA Action Level in 15% of samples
- Source: plumbing and fixtures
 - Lead pipes – dull gray, soft, non-magnetic
 - Pre-1987 lead solder
 - Pre-2014 fixtures and fittings
- No safe level
 - Especially under age 6 – use lead-free water
- Flushing plumbing greatly reduces levels
- Test stagnant and flushed for lead and copper

**Drinking Water Health Advisory
for Manganese**

Prepared by:

U.S. Environmental Protection Agency
Office of Water (4304T)
Health and Ecological Criteria Division
Washington, DC 20460

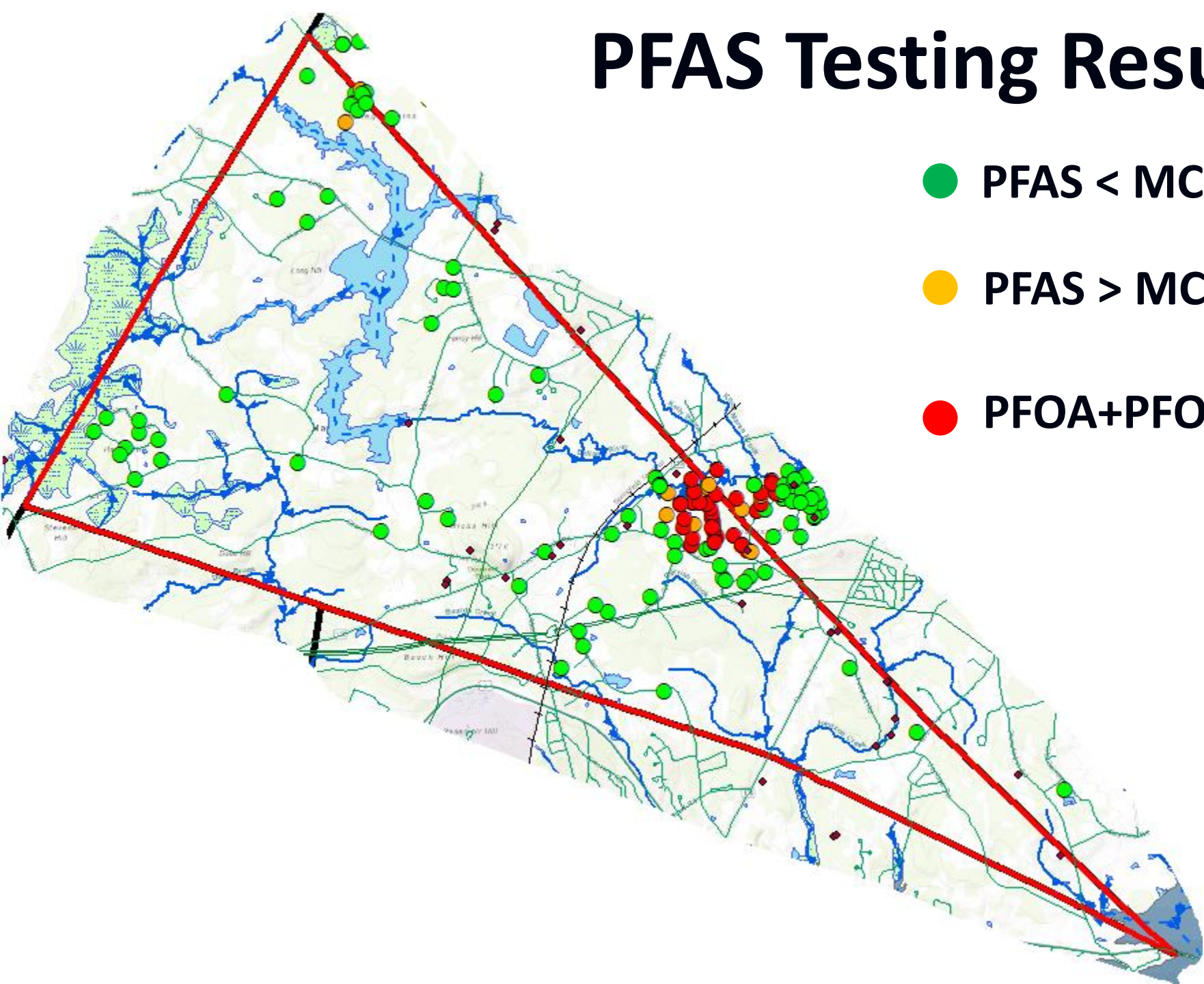
<http://www.epa.gov/safewater/>

EPA-822-R-04-003
January, 2004

The lifetime health advisory value of 0.3 mg/L will protect against concerns of potential neurological effects. In addition, this document provides a One-day and 10-day HA of 1 mg/L for acute exposure. However, it is advised that for infants younger than 6 months, the lifetime HA of 0.3 mg/L be used even for an acute exposure of 10 days, because of the concerns for differences in manganese content in human milk and formula and the possibility of a higher absorption and lower excretion in young infants.

PFAS Testing Results

- PFAS < MCL
- PFAS > MCL
- PFOA+PFOS > 70 ppt



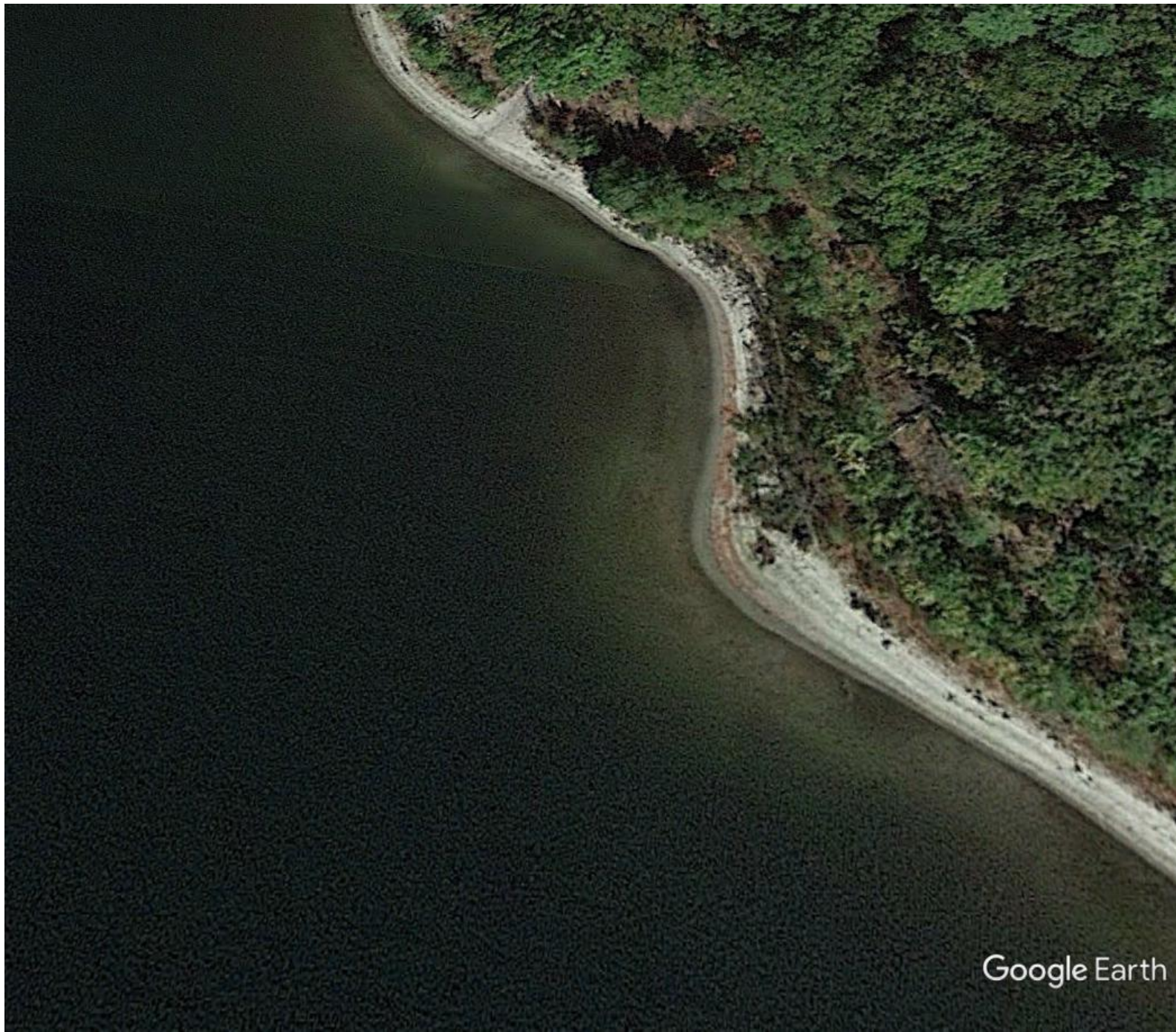
Barbados Pond

2003



2021





Google Earth

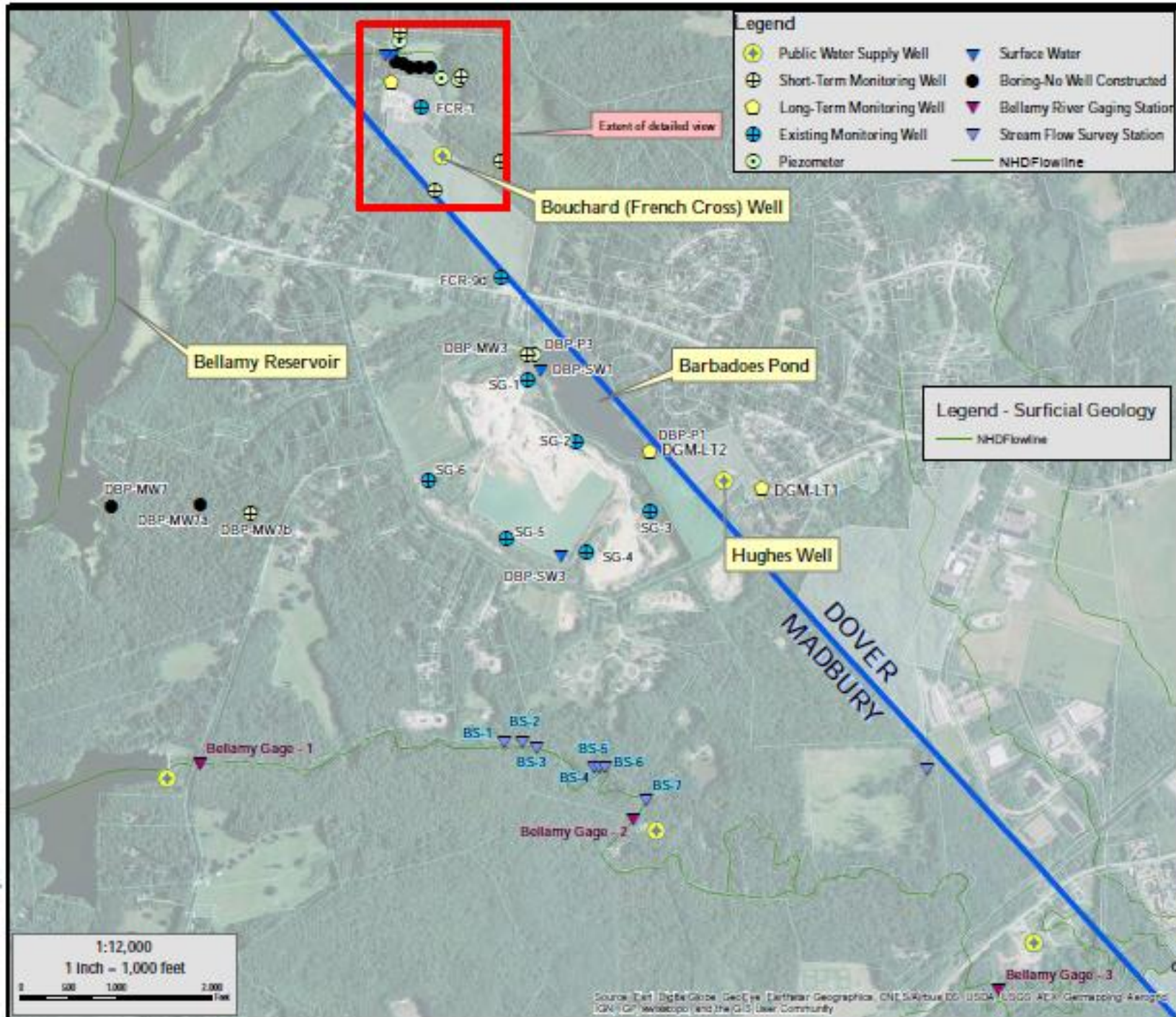
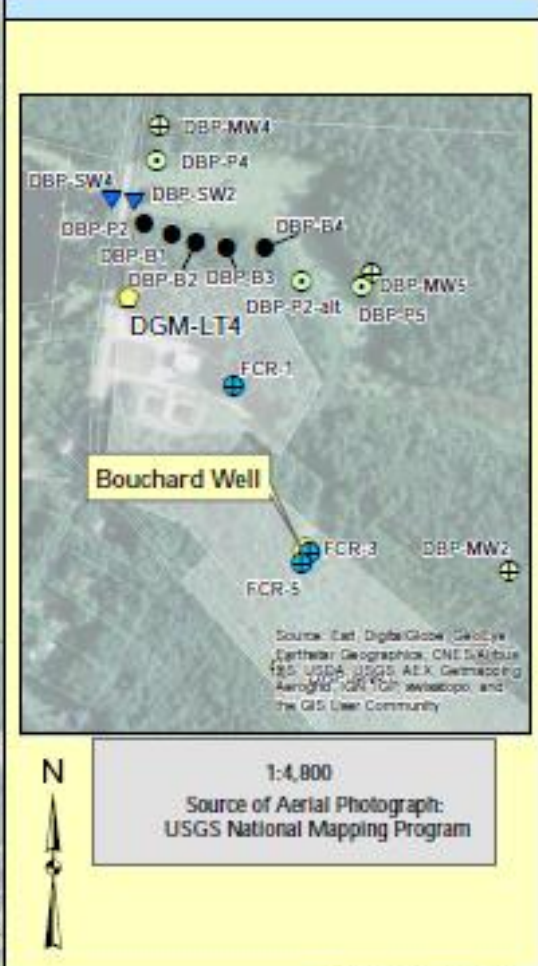
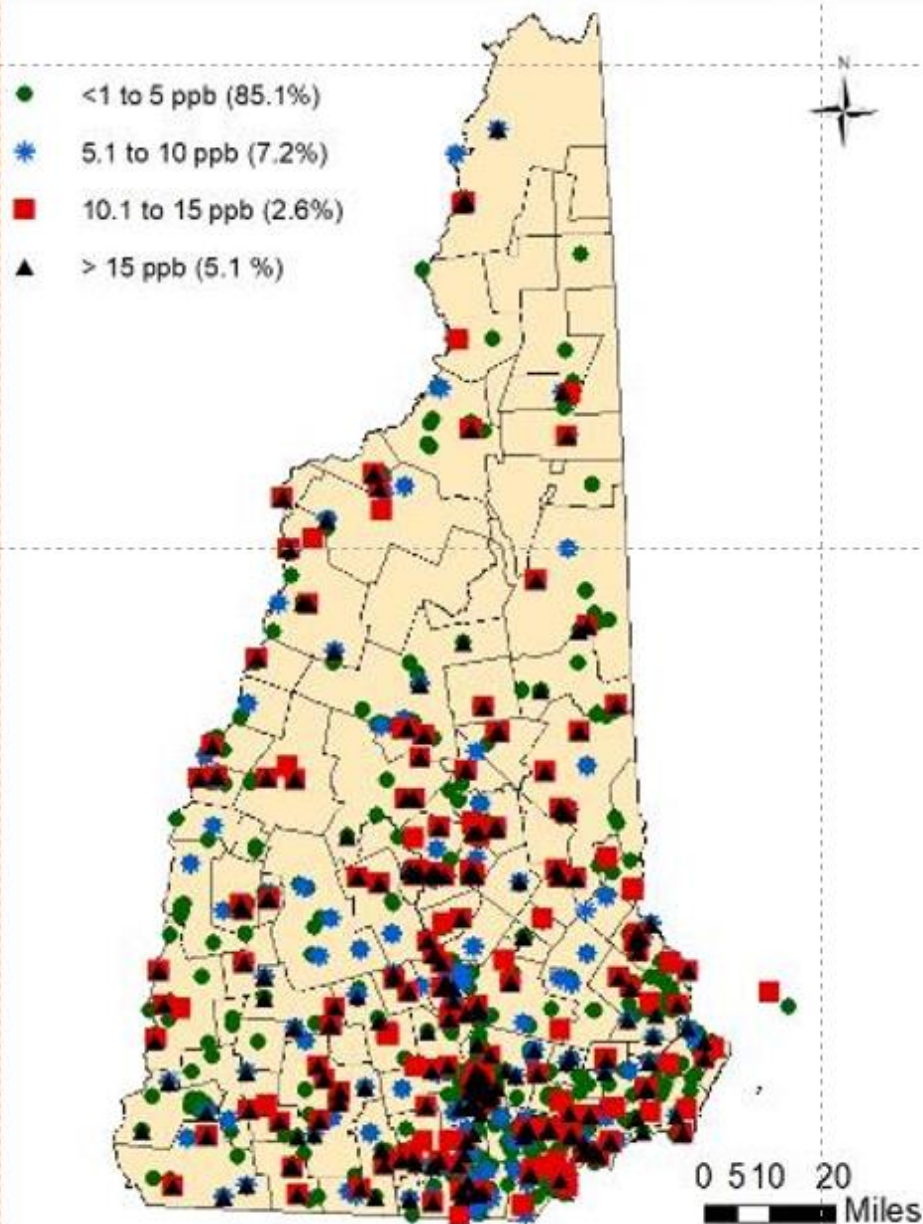


FIGURE 2
Production Wells,
Monitoring Locations,
Tax Lot Boundaries,
and Aerial Photograph
in Barbadoes Pond Area

City of Dover Water System Project



SB247 Lead in Drinking Water Testing at Schools and Childcare Facilities (Sept 2019)



SB247 Round 1

- 90% of schools and 60% of daycares reported (of 1500 total facilities)
- Stagnant $\geq 5\text{ ppb}$
 - 62% of Schools
 - 32% of Daycares
- Stagnant $\geq 15\text{ ppb}$
 - 38% of Schools
 - 16% of Daycares