

Dover Utilities Commission Water Supply Update

(October 20, 2025)

Emery &
Garrett
GROUNDWATER
INVESTIGATIONS
A Division of GZA



Background

Water supply infrastructure

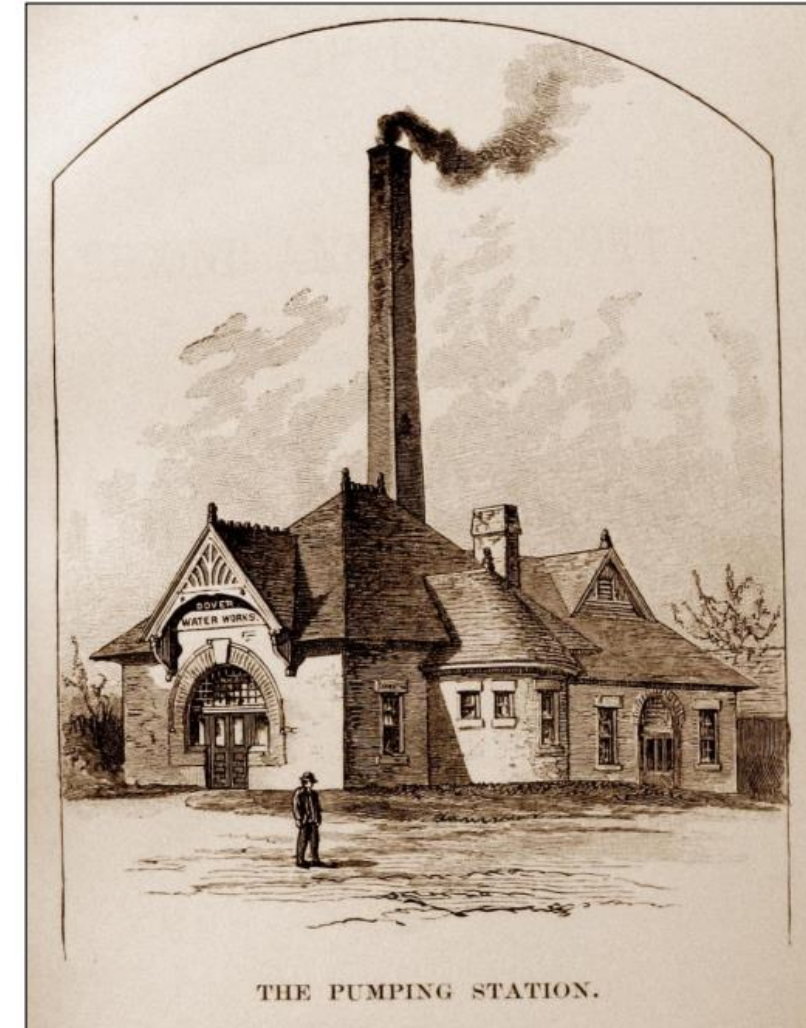
Groundwater withdrawals

Water quality trends (PFAS, chloride, metals)

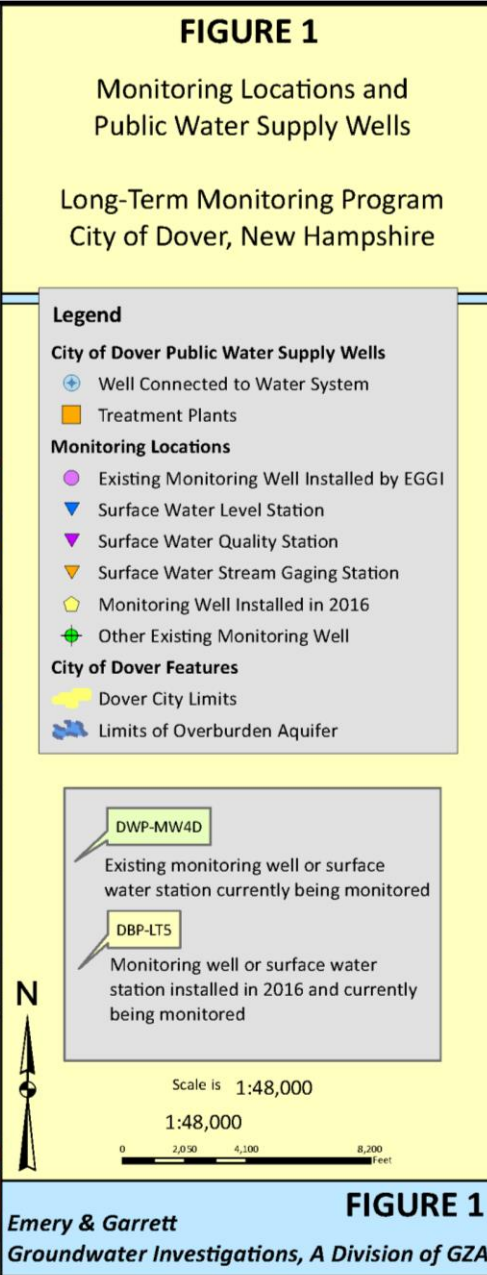
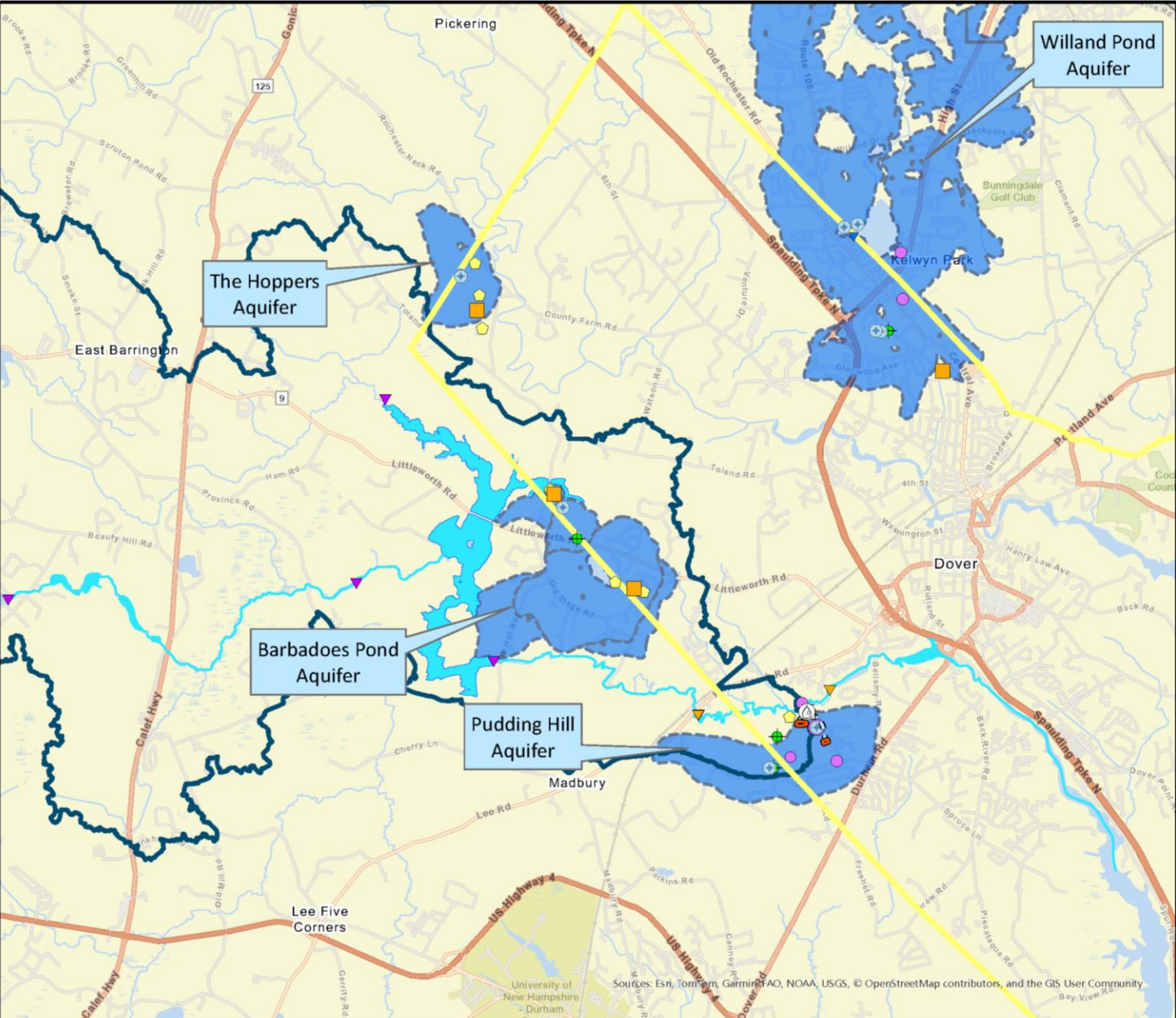
Water level trends

Aquifer management

Source exploration



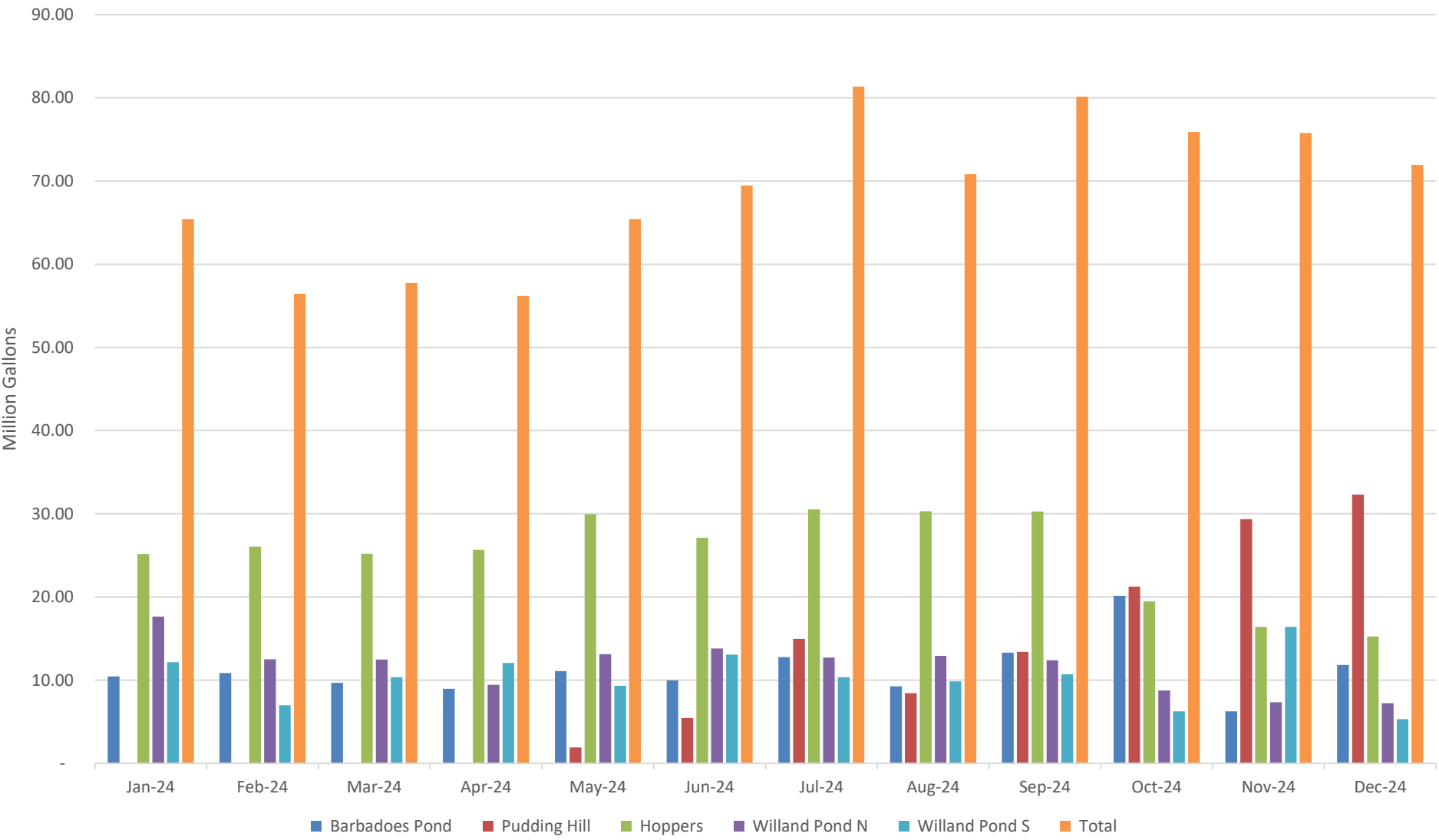
Dover Water Supply Infrastructure



- 4 Aquifers
- 11 Production Wells
- 5 Treatment plants
- 2 Artificial recharge Facilities
- Monitoring Well network
- Surface water quality (Bellamy River)
- Level sensors

Dover Groundwater Withdrawals

2024 Groundwater Withdrawals



- Total 2024 827 M
- Ave 2.3 MGD

Dover Production Well PFAS Data Summary August 2025

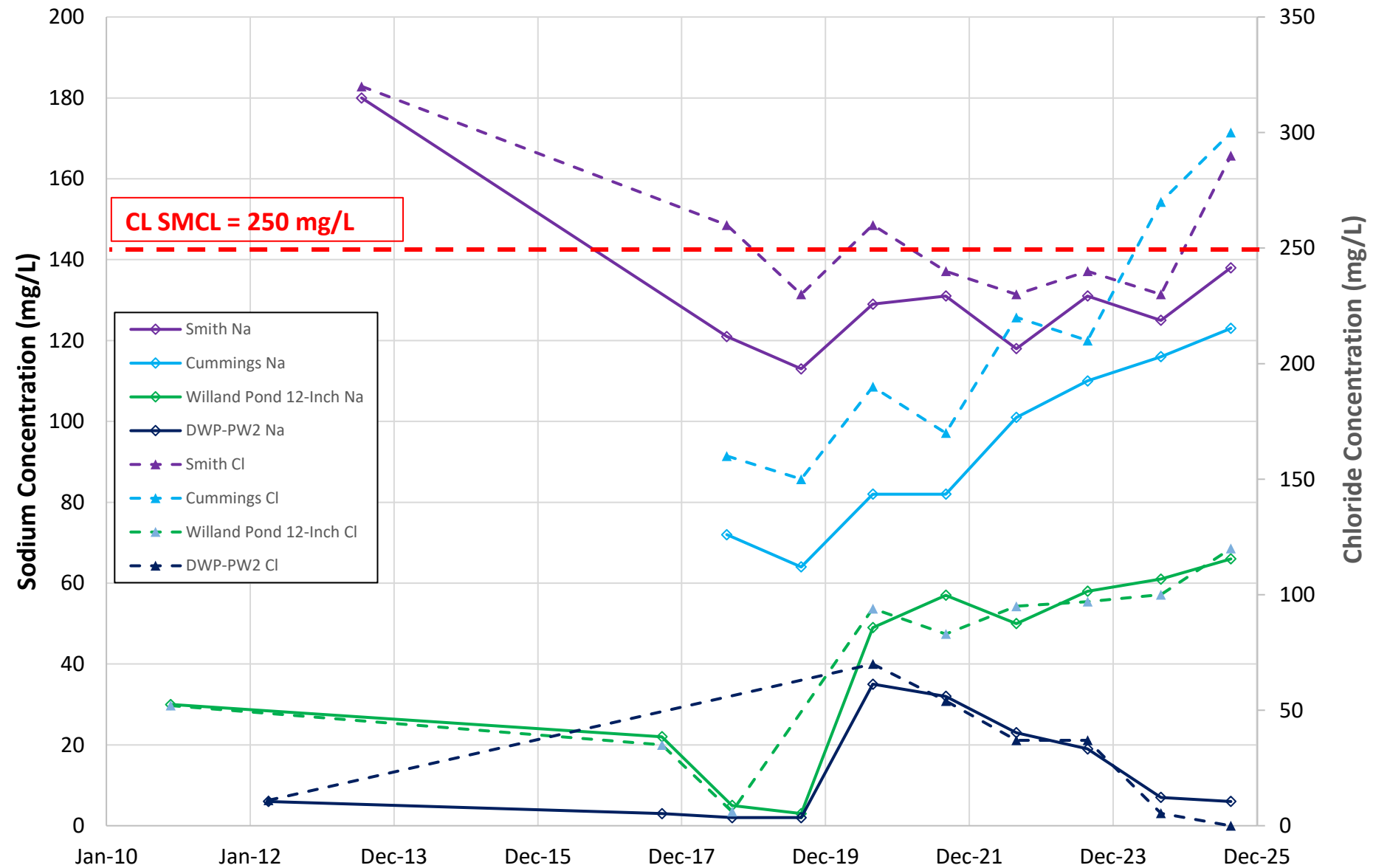
Aquifer	Production Wells	Per- and poly fluoroalkyl substance (PFAS) - August 2025					Historical Summary		
		PFOA	PFNA	PFOS	PFHxS	PFBS	Number of Sampling Rounds	Number of Rounds PFAS Detected	Monitored Since
Willand Pond	Smith Well	2.0	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	8	1	2018
	Cummings Well	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	8	1	2018
	Willand Pond #1	2.2	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	8	2	2017
	Willand Pond #2	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	8	None	2017
Hoppers	Calderwood Well	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	8	None	2018
	Campbell Well	2.8	NON-DETECT	1.9	NON-DETECT	NON-DETECT	8	4	2018
Barbadoes Pond	Hughes Well	2.8	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	8	2	2018
	Bouchard Well	1.9	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	7	1	2018
Pudding Hill	Well DPH#1	5.2	NON-DETECT	2.31	NON-DETECT	NON-DETECT	75	49	2017
	Ireland Well	36	9.2	34	2.0	3.7	45	33	2016
	Griffin Well	15	NON-DETECT	14	2.9	4.4	2	2	2018

Boldface concentrations exceed federal MCL.

Dover Finished Water PFAS Data Summary August 2025

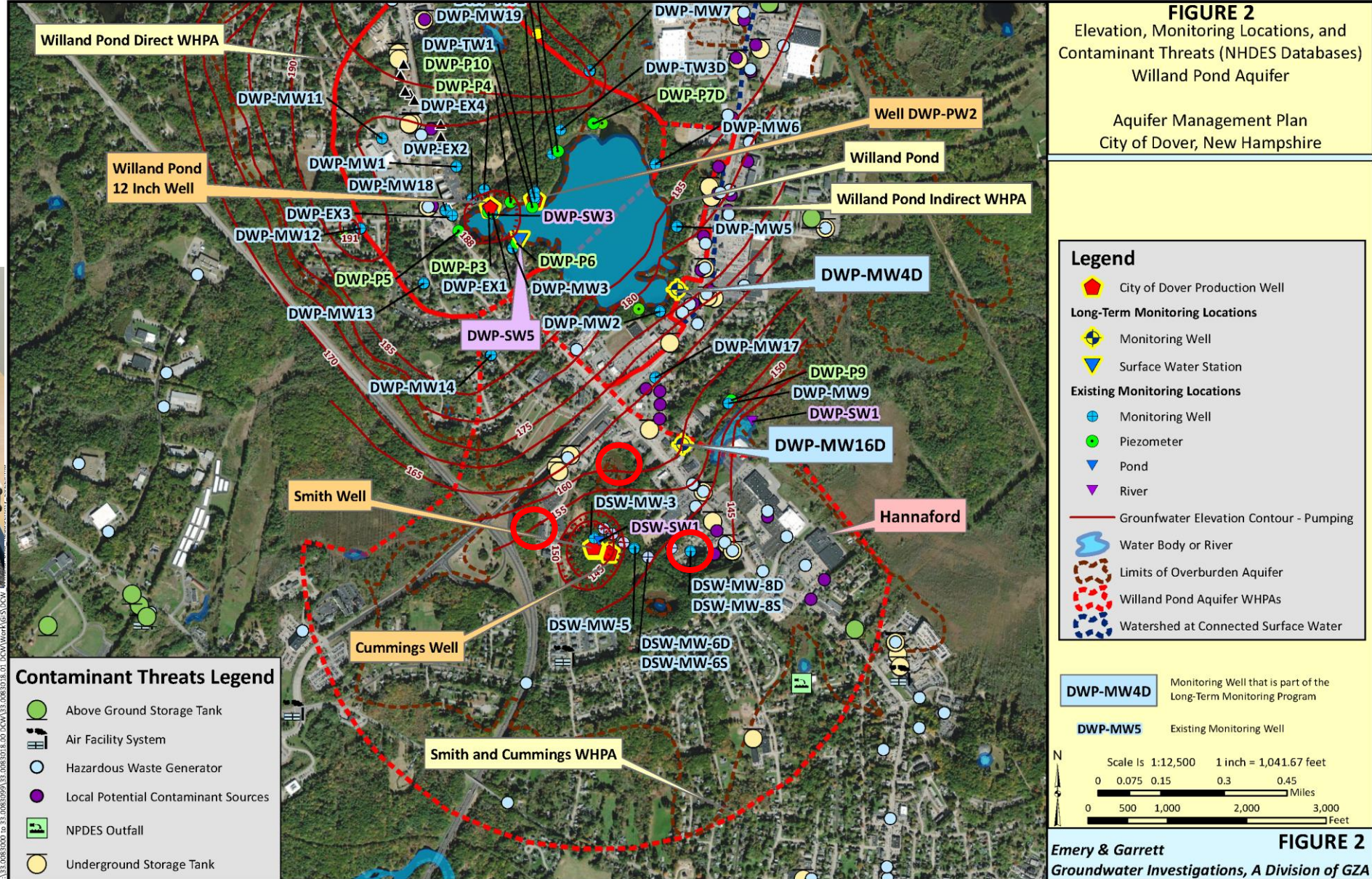
Aquifer	Sample Location ID	Per- and poly fluoroalkyl substance (PFAS) - August 2025					Historical Summary		
		PFOA	PFNA	PFOS	PFHxS	PFBS	Number of Sampling Rounds	Number of Rounds PFAS Detected	Monitored Since
Willand Pond	#003 - Lowell Ave	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	16	5 (PFOA + non-regulated)	Oct-19
Hoppers	#505 - Campbell/ Calderwood	1.9	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	17	4 (PFOA + non-regulated)	Oct-19
Barbadoes Pond	#502 - Old Stage Rd	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	15	2 (PFOA + non-regulated)	Oct-19
	#515 - Bouchard	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	17	3 (PFOA + non-regulated)	Aug-19
Pudding Hill	#517 - DPH #1/ Ireland	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	NON-DETECT	3	None	Aug-24

Willand Pond Aquifer Na and Cl

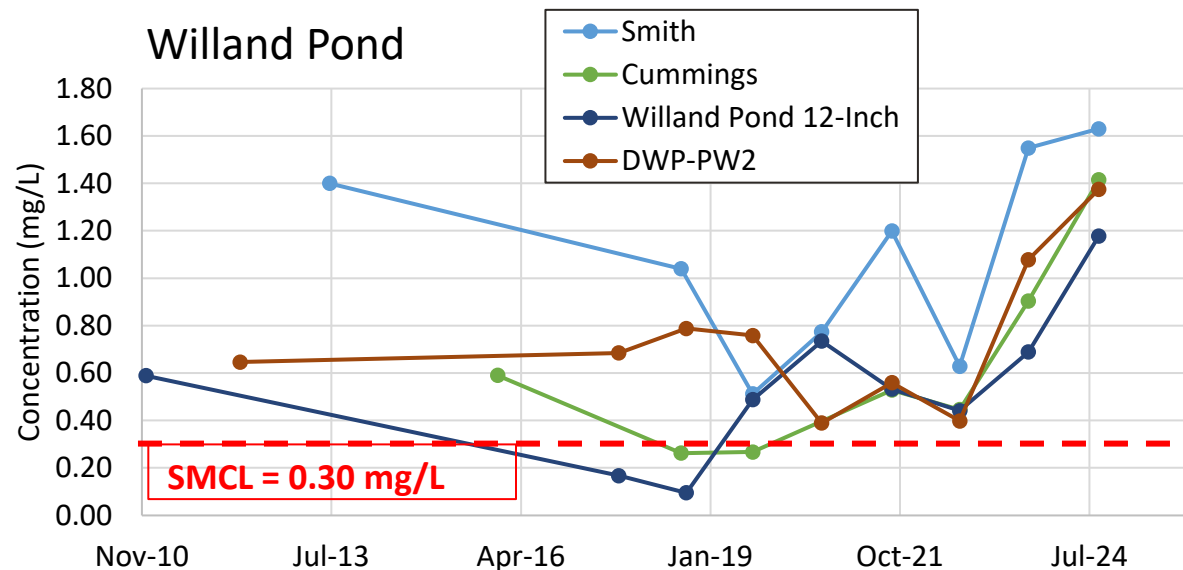


Chloride Sonde Locations

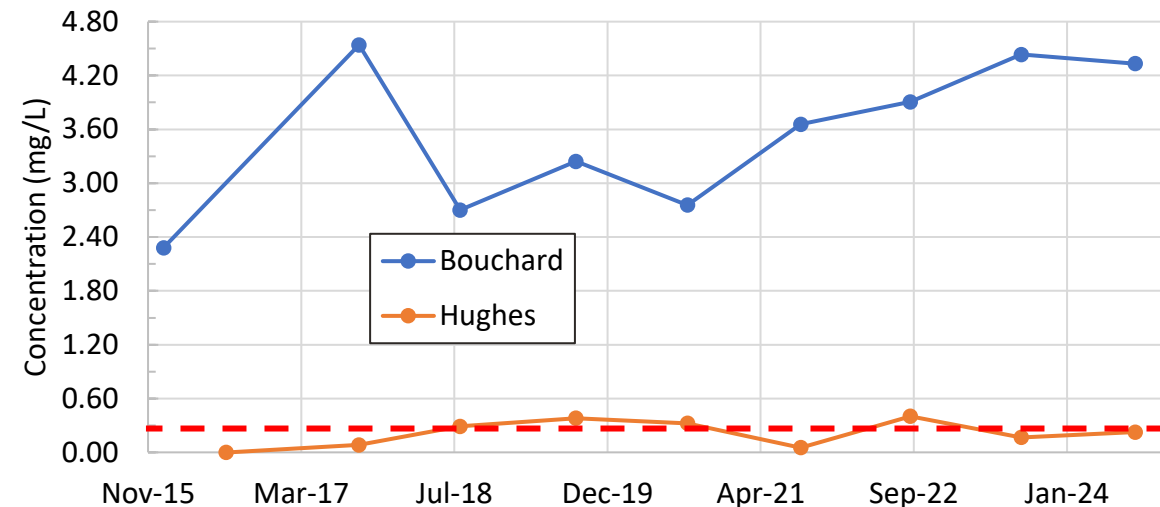
Deploy three sondes
(One existing and two proposed MWs)



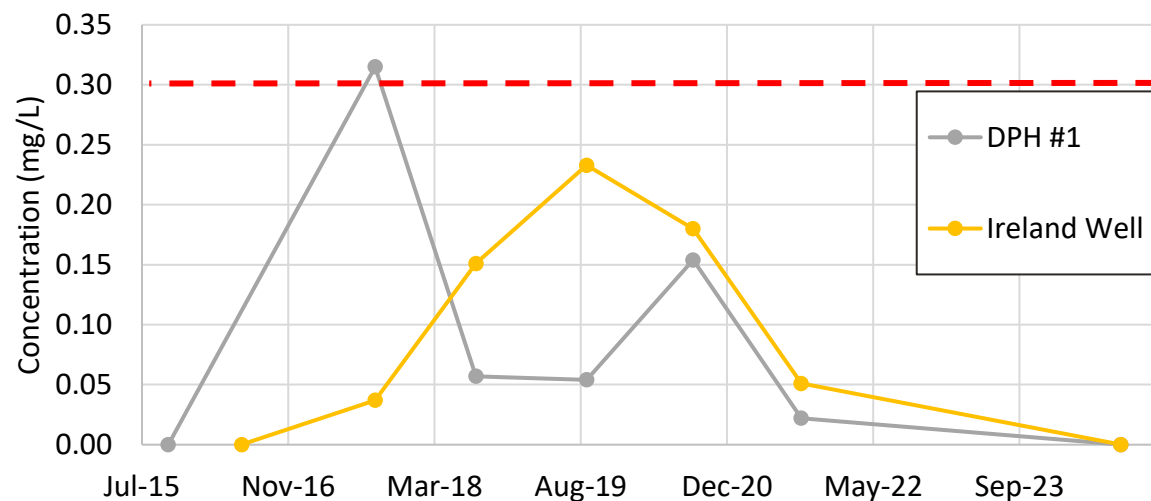
Willand Pond



Barbadoes Pond



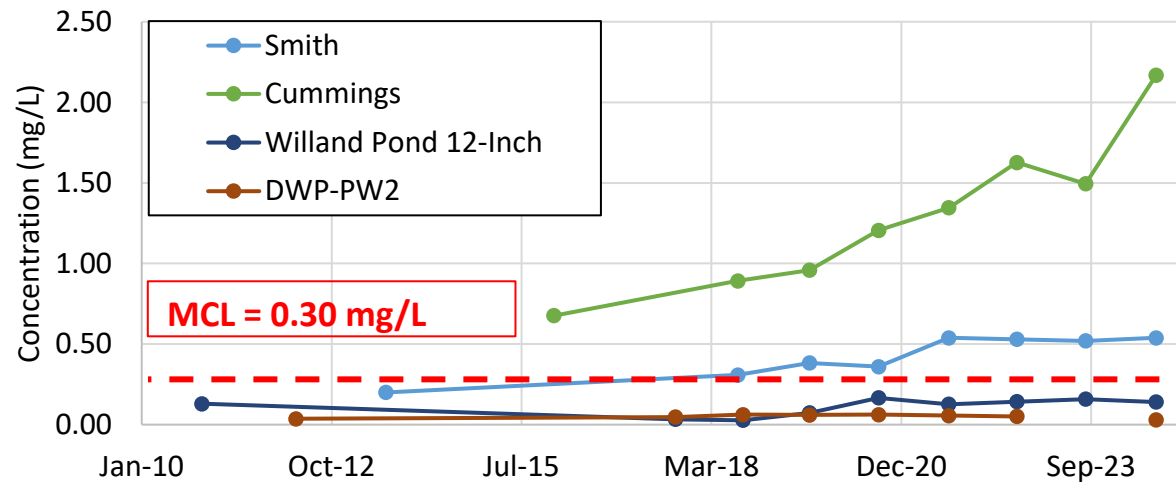
Pudding Hill



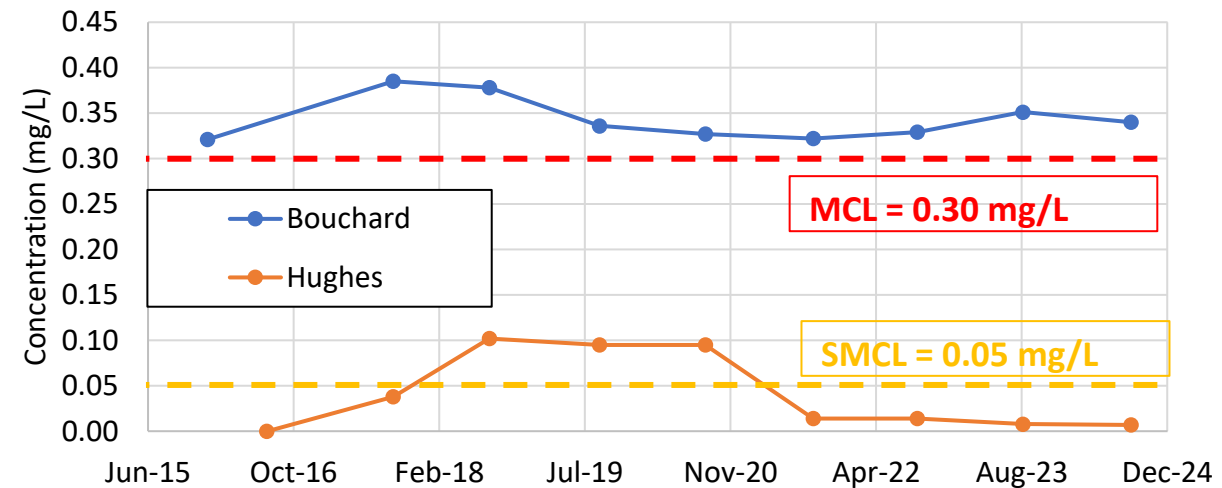
Hoppers
Calderwood and Campbell Wells
< Reporting Limits

Production Well Manganese Concentration

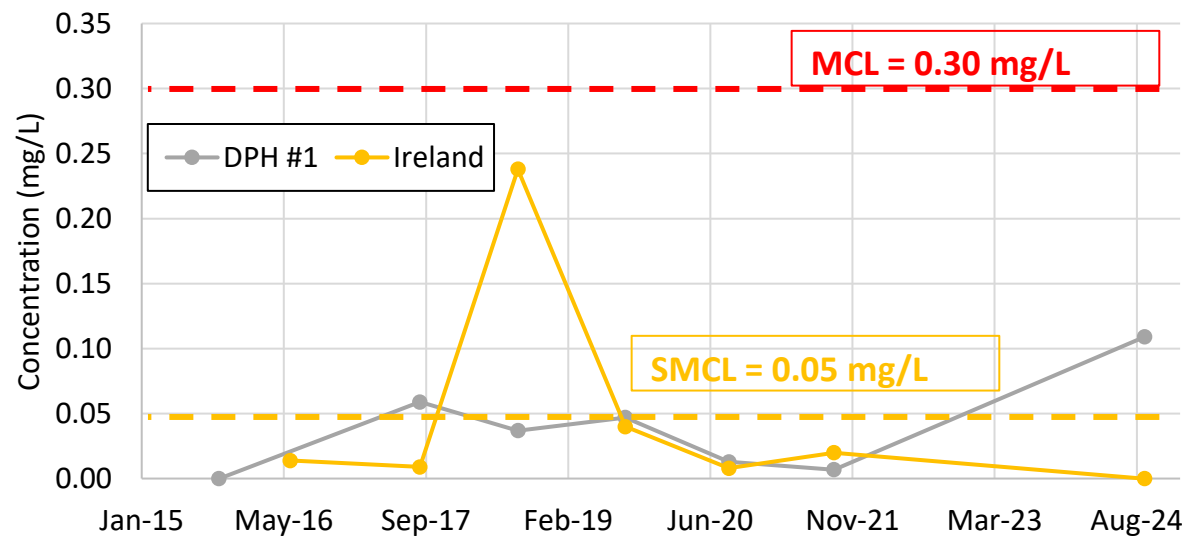
Willand Pond



Barbadoes Pond



Pudding Hill



Hoppers
Calderwood and Campbell Wells
< Reporting Limits

Aquifer Water Quality Considerations

Hoppers Aquifer

- None

Pudding Hill Aquifer

- NEMAR contaminants

Willand Pond Aquifer

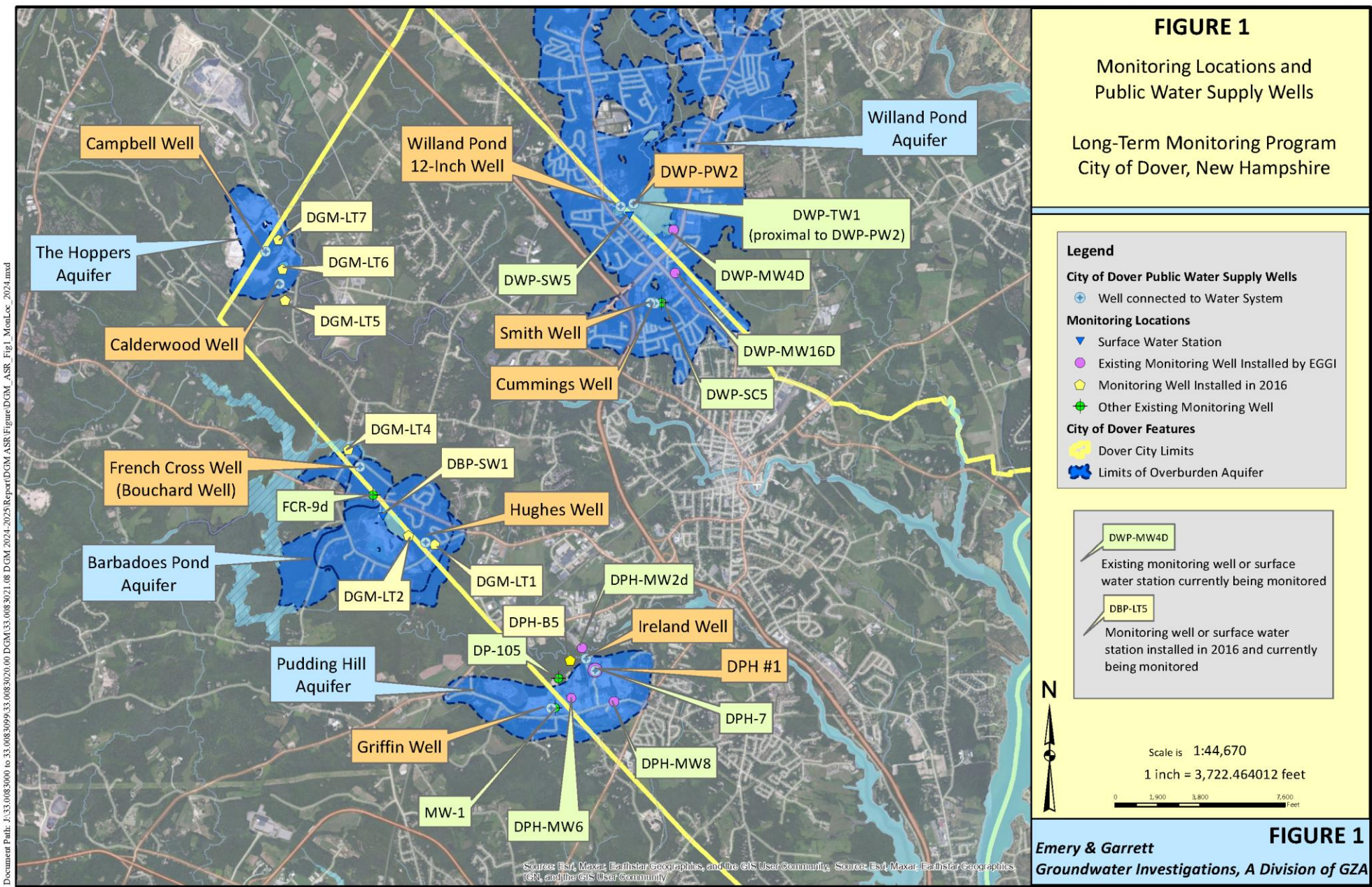
- Iron
- Manganese (DWP-12-Inch and DWP-PD2 Wells)
- Chloride (DWP-12-Inch and DWP-PD2 Wells)

Barbados Pond Aquifer

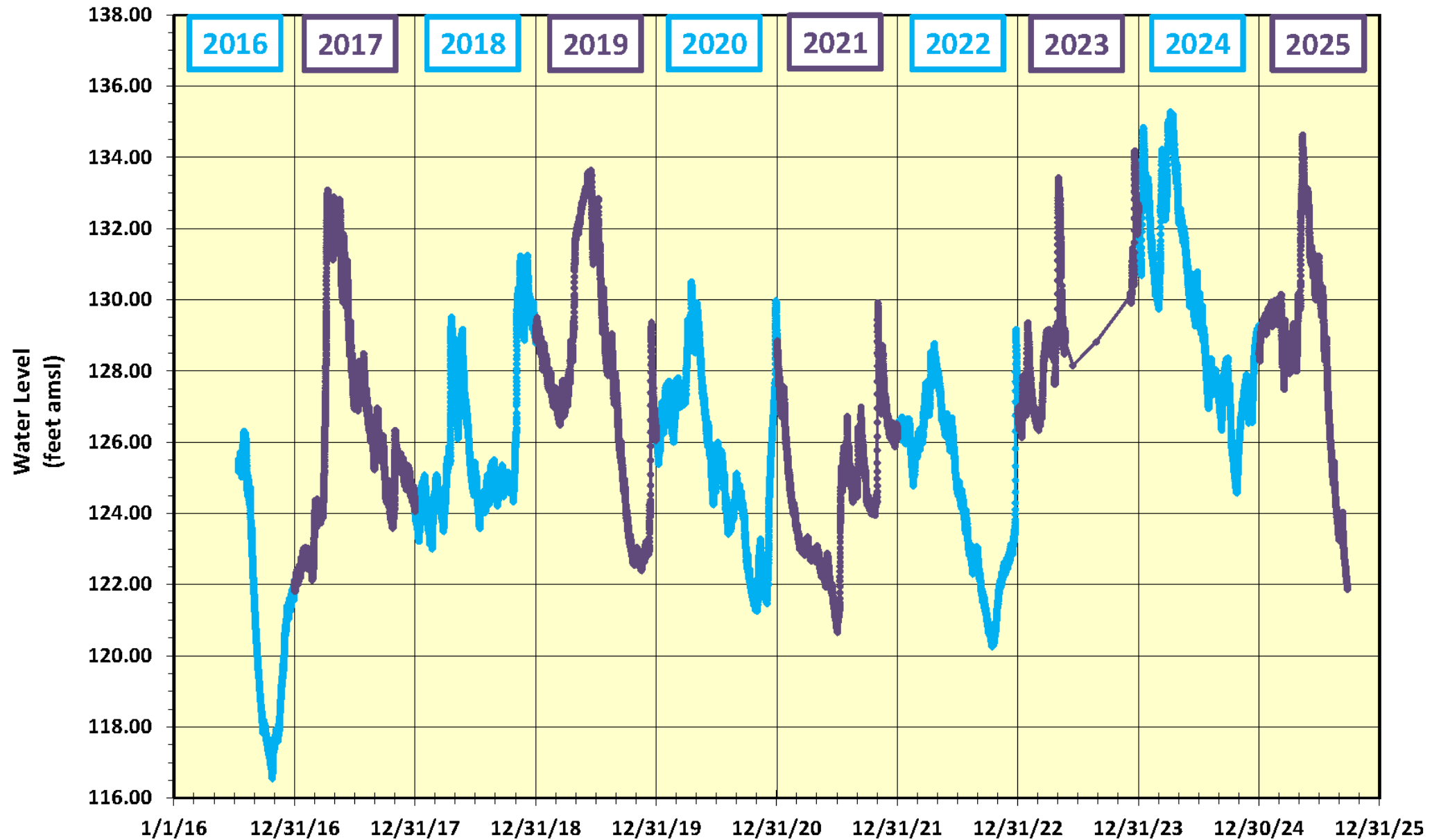
- Iron
- Manganese (Bouchard Well)
- Arsenic (Bouchard Well)

PFAS Generally

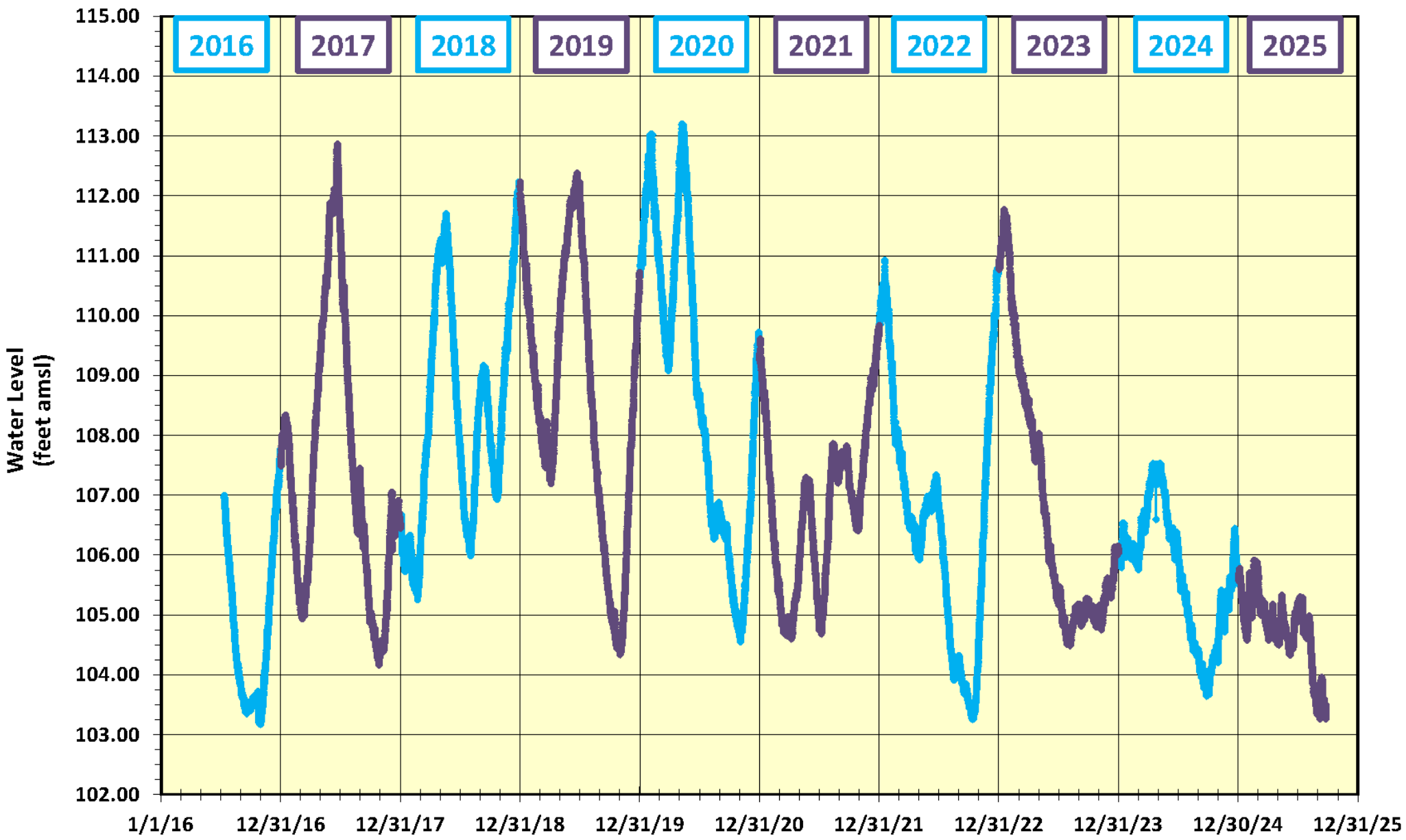
Aquifer Water Level and Quality Monitoring Locations



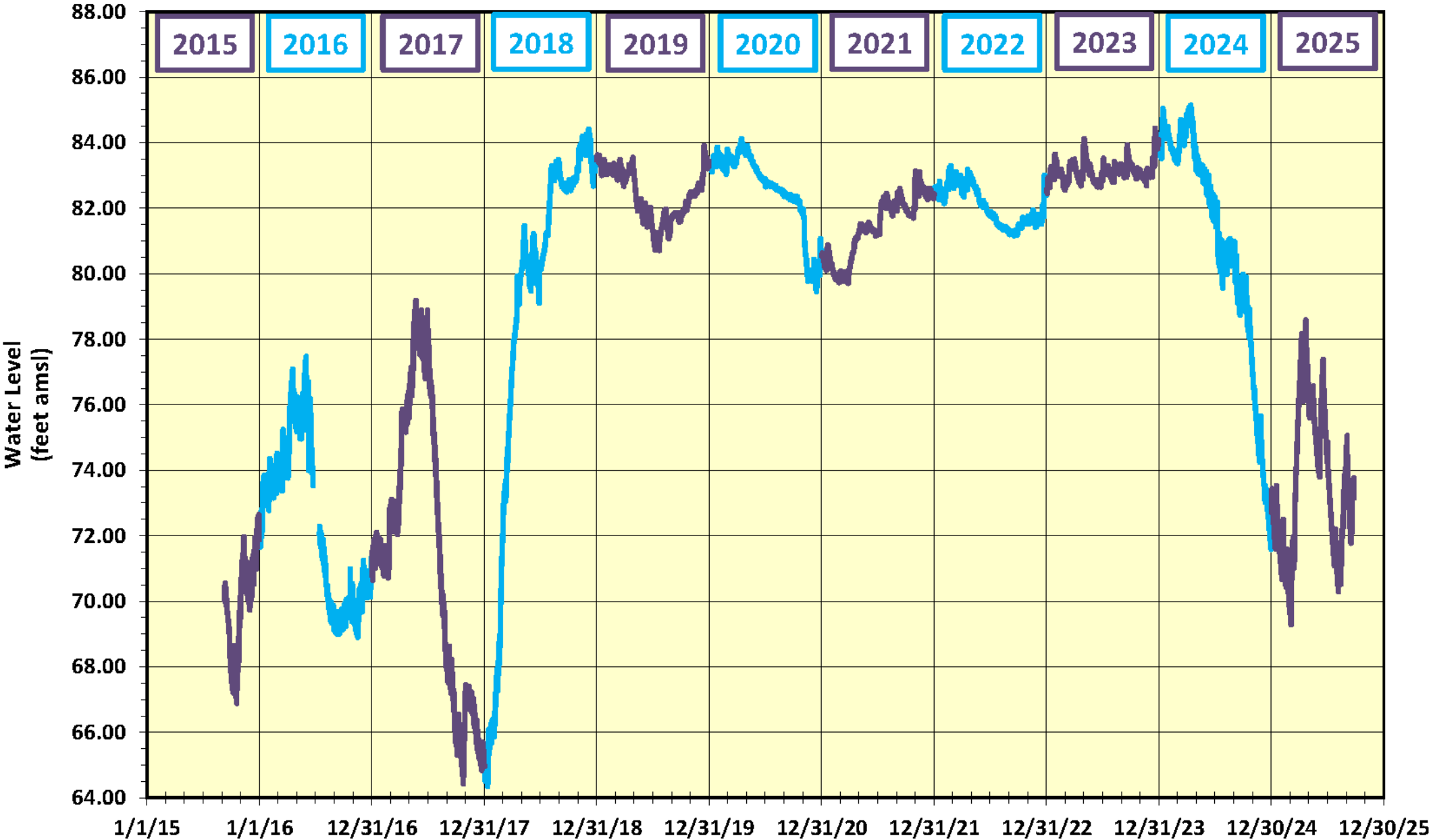
Barbadoes Pond Aquifer – Well LT4



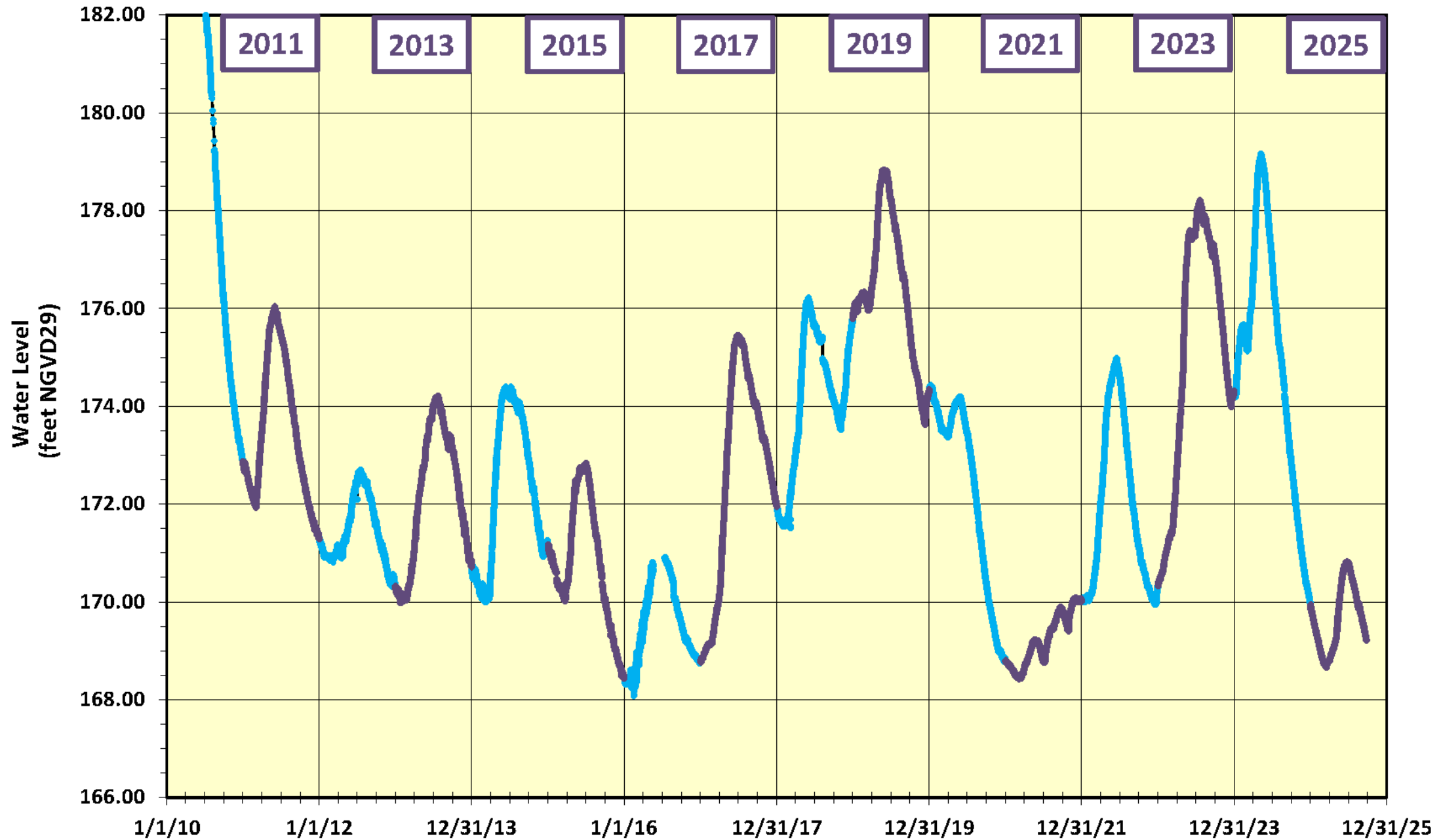
Hoppers Aquifer – Well LT5



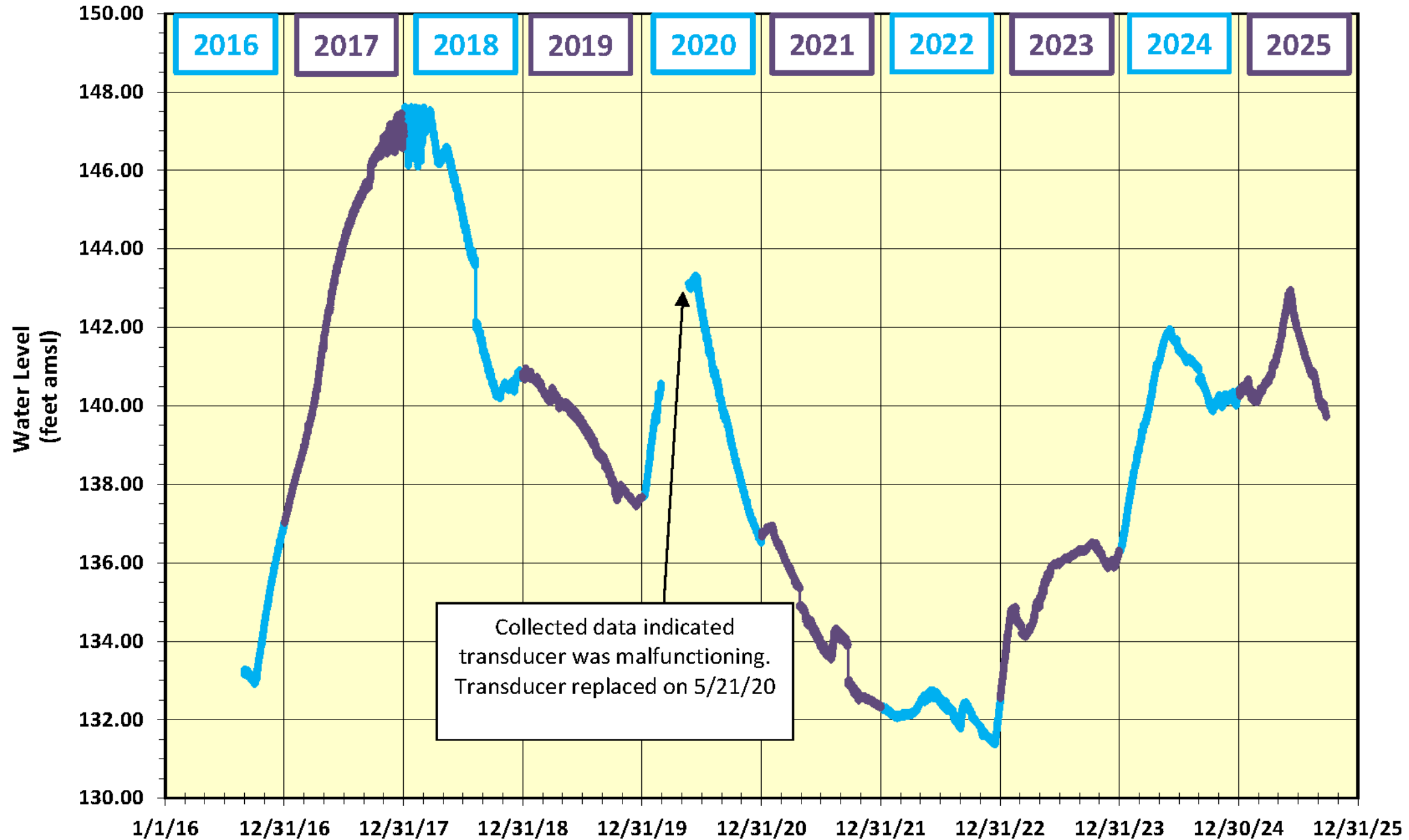
Pudding Hill Aquifer – Well DPH-MW2d



Willand Pond Aquifer, North – Well MW4



Willand Pond Aquifer, South – Well MW16D



Aquifer Management



Quality

- Aquifer and Production Well monitoring
- Aquifer protection
 - Ordnance 170.33
 - SWPPs

Quantity

- Aquifer level
- Production Well level
- Production Well performance monitoring
- New source exploration

Dover Water Infrastructure

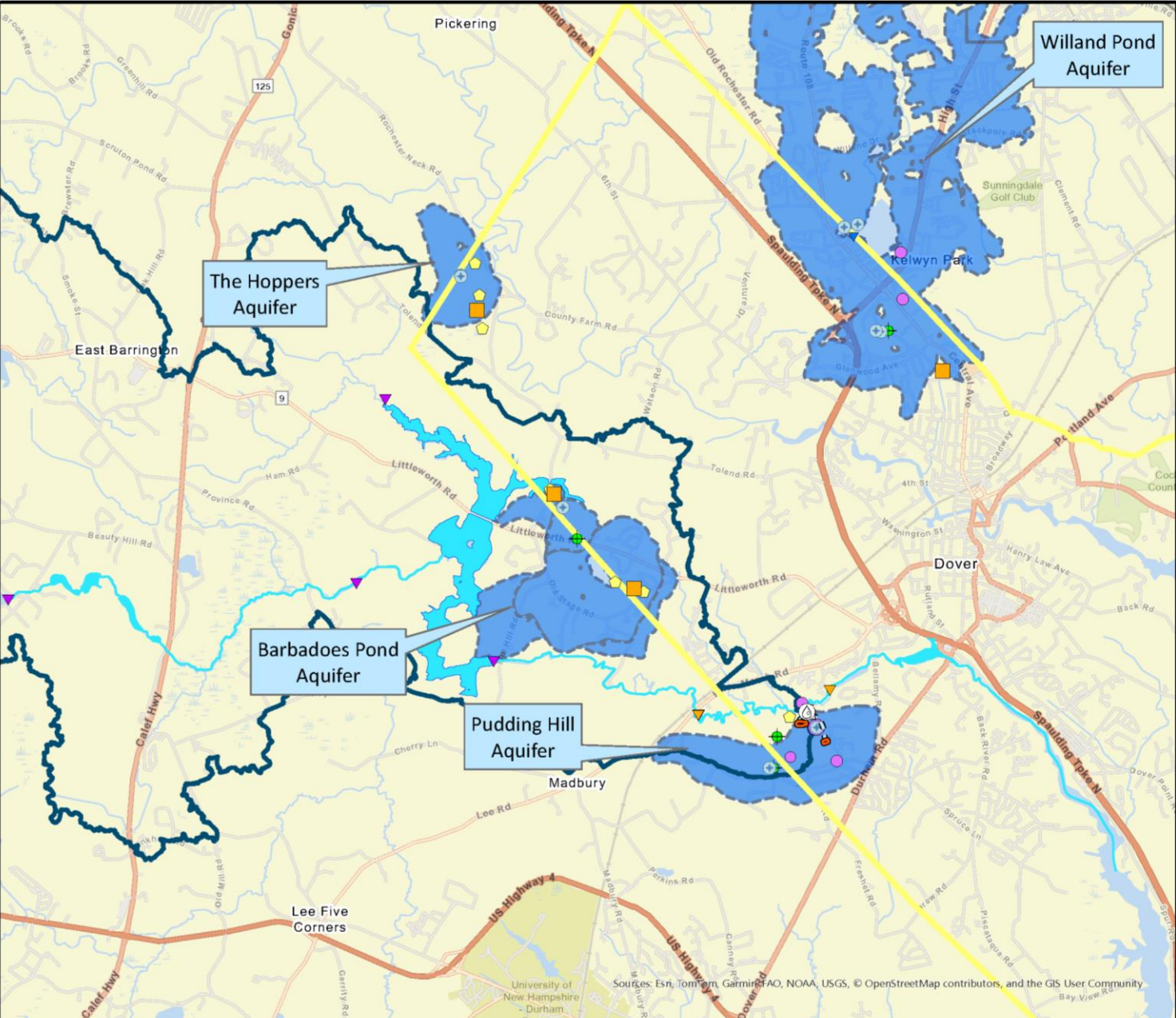


FIGURE 1

Monitoring Locations and
Public Water Supply Wells

Long-Term Monitoring Program
City of Dover, New Hampshire

Legend

City of Dover Public Water Supply Wells

- Well Connected to Water System
- Treatment Plants

Monitoring Locations

- Existing Monitoring Well Installed by EGGI
- Surface Water Level Station
- Surface Water Quality Station
- Surface Water Stream Gaging Station
- Monitoring Well Installed in 2016
- Other Existing Monitoring Well

City of Dover Features

- Dover City Limits
- Limits of Overburden Aquifer

DWP-MW4D

Existing monitoring well or surface water station currently being monitored

DBP-LT5

Monitoring well or surface water station installed in 2016 and currently being monitored

Scale is 1:48,000

1:48,000

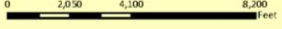


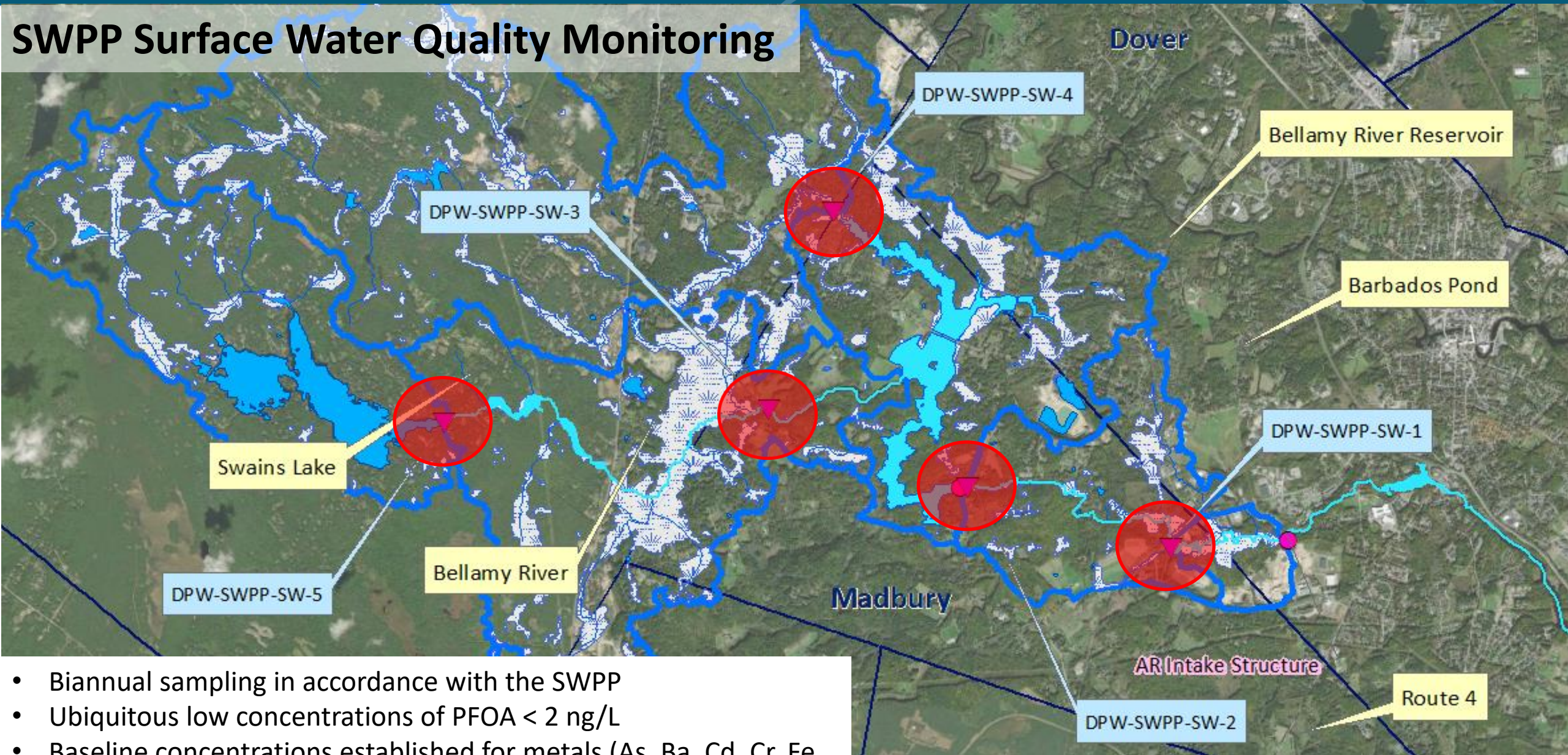
FIGURE 1

Emery & Garrett
Groundwater Investigations, A Division of GZA

- 4 Aquifers
- 11 Production Wells
- 5 Treatment Plants
- 2 Artificial Recharge Facilities
- Monitoring Well Network
- Surface water quality (Bellamy River)
- Level Sensors

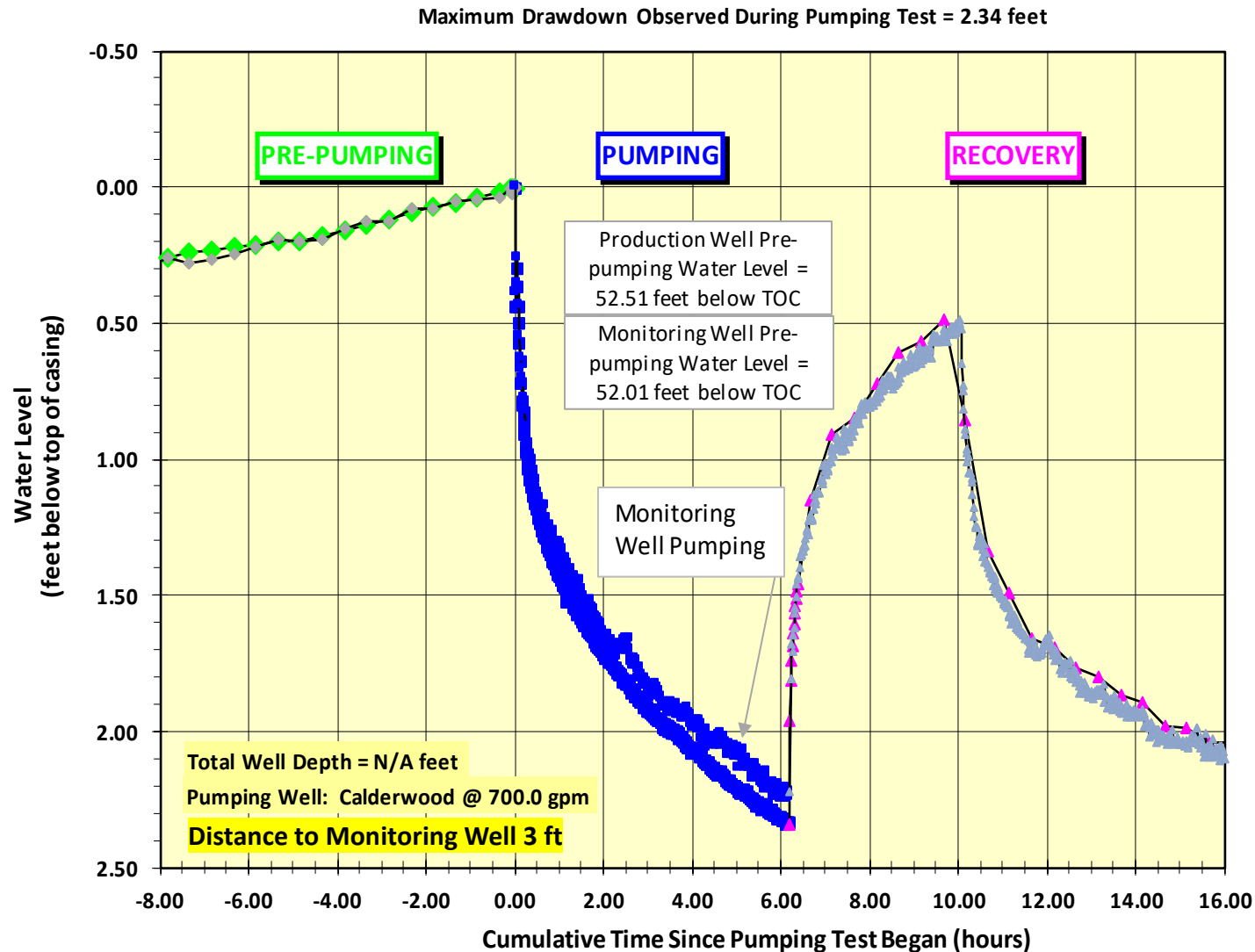
Pudding Hill Aquifer – Artificial Recharge Update

SWPP Surface Water Quality Monitoring



- Biannual sampling in accordance with the SWPP
- Ubiquitous low concentrations of PFOA < 2 ng/L
- Baseline concentrations established for metals (As, Ba, Cd, Cr, Fe, Mn, Hg, Se, Ag, and Na) and chloride

Example – Good Condition Well Calderwood Production Well



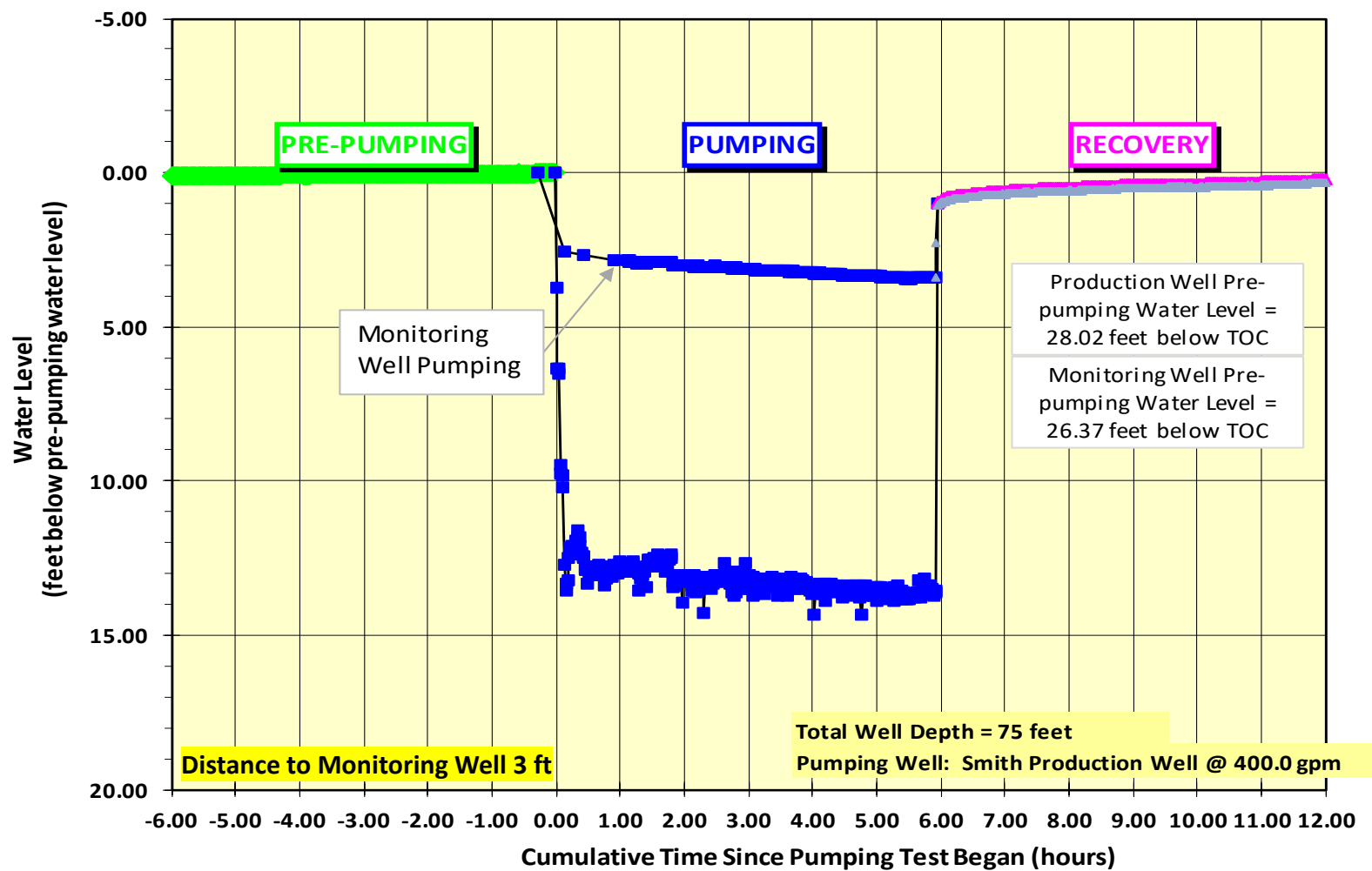
Plot of Water Level versus Time for April 30 to May 1, 2024

Production Well Testing and Operating Recommendations

Example – Poor Condition Well

Smith Production Well

Maximum Drawdown Observed During Pumping Test = 14.33 feet



Plot of Water Level versus Time for May 8 to May 9, 2024

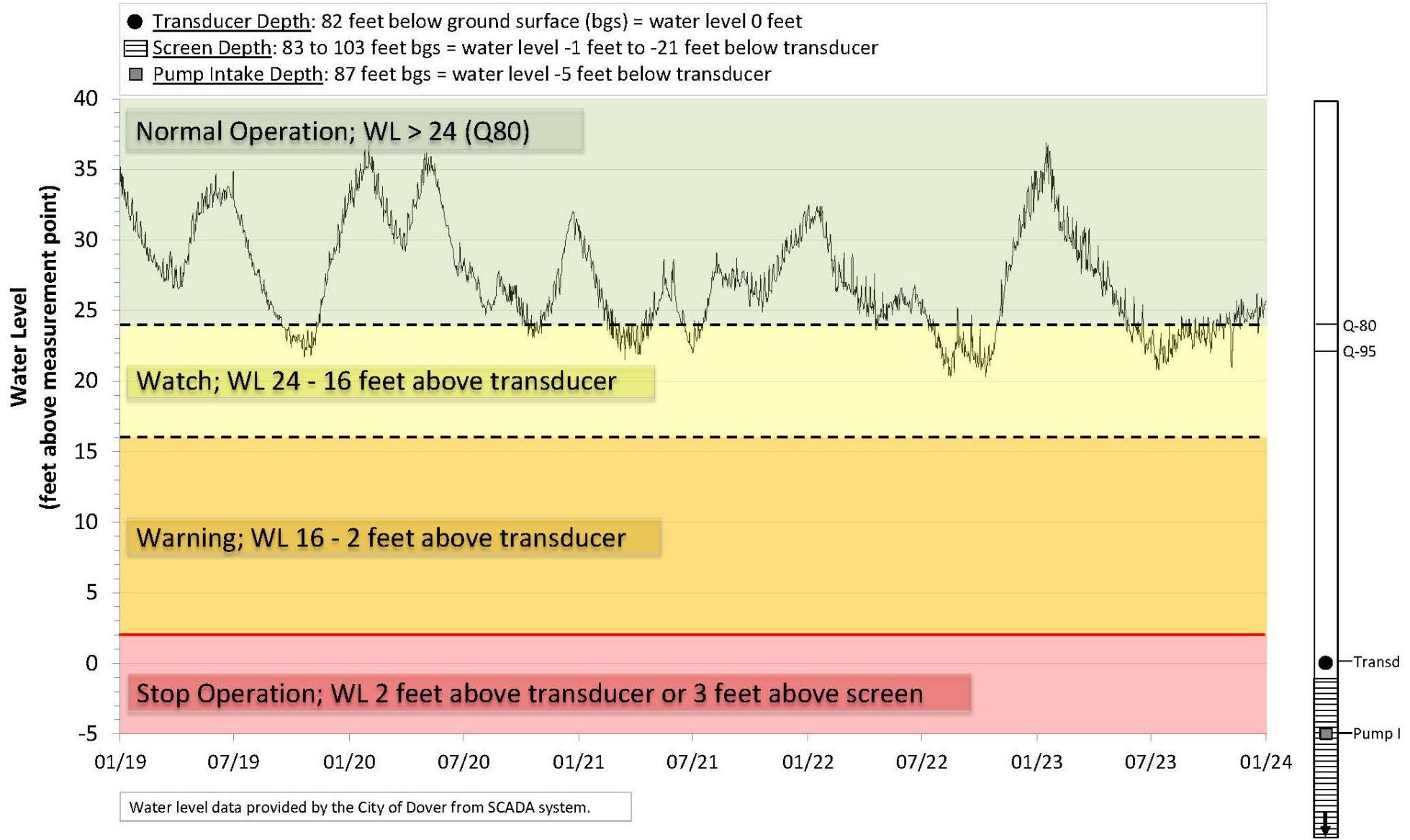
Production Well Test Results and Recommendations Summary

Historical and April 2024 Withdrawal Testing Program

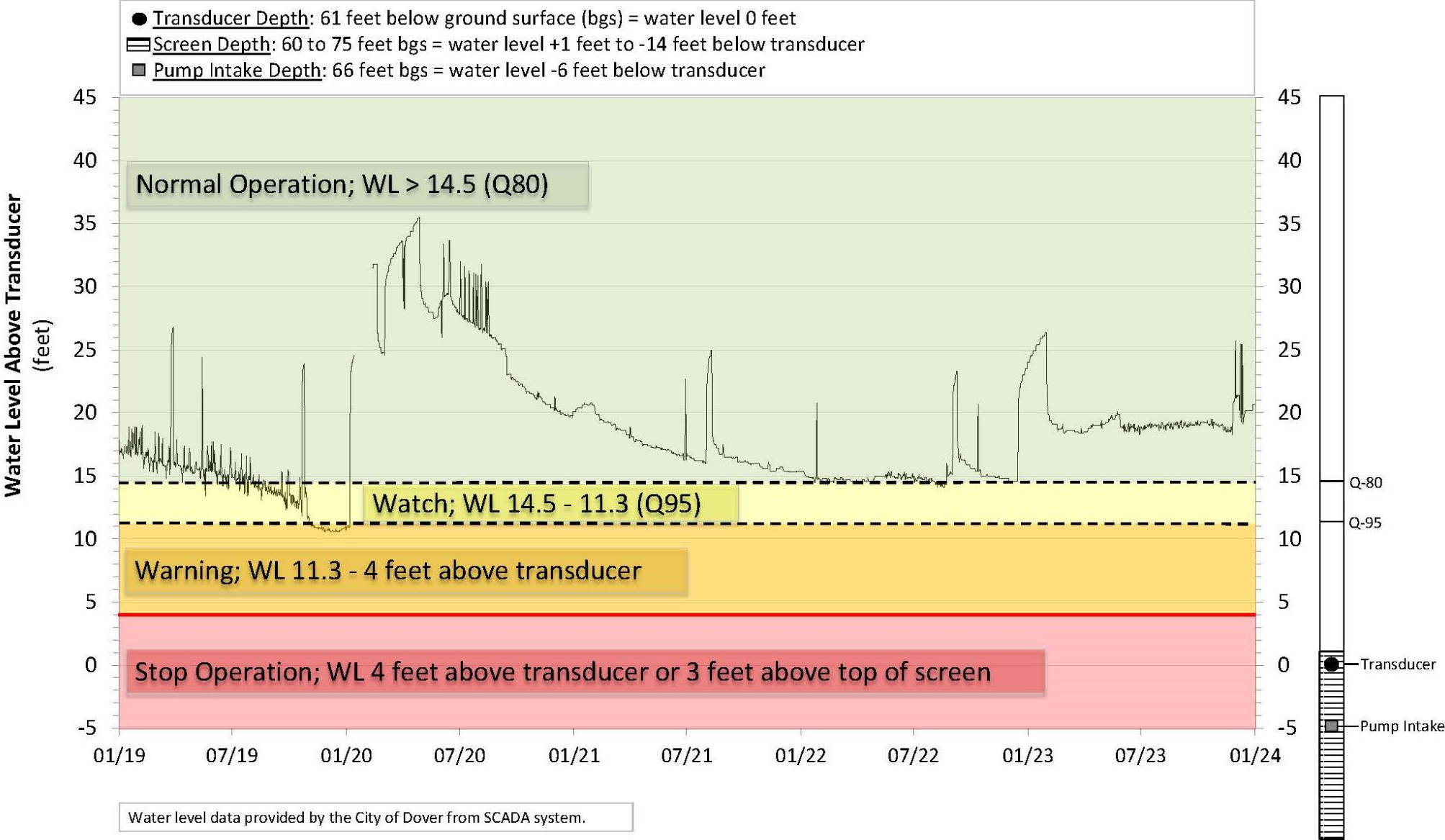
City of Dover, New Hampshire

Aquifer	Production Well	Date of Historical Withdrawal Test (mm/yyyy)	Flow Rate (gpm)		Production Well Drawdown (ft)		Specific Capacity (gpm/ft)		Change in Specific Capacity (gpm/ft)	Comments/Recommendations	Recommended Redevelopment Frequency	Additional Recommendations
			Historical	April 2024	Historical	April 2024	Historical	April 2024				
Barbadoes Pond	Bouchard	08/2016	556	400	44.8	107.4	12.4	3.7	8.7	Well redevelopment recommended based on data (recently completed) Compare new data to old	Annual	Confirm pump intake depth adjust transducer depth to 3 feet above intake
	Hughes	09/2016	478	NT	16.8	NT	28.5	NT	NT	Future well use to be determined If continued use needed conduct baseline testing	Biennial	Lower transducer to top of screen
The Hoppers	Calderwood	NA	NA	700	NA	2.3	NA	299.1	NA	Well redevelopment not currently recommended	Triannual	Confirm intake depth
	Campbell	NA	NA	600	NA	3.4	NA	178.6	NA	Monitoring well recommended	Biennial	Confirm pump intake depth adjust transducer depth to 3 feet above intake
Pudding Hill	DPH #1	09/2015	500	NT	17.7	NT	28.2	NT	NT	Baseline testing needed	Triannual	Confirm intake depth
	Griffin	09/2015	395	NT	3.0	NT	131.7	NT	NT	Baseline testing needed	Triannual	
	Ireland	06/2016	500	NT	10.7	NT	45.5	NT	NT	Baseline testing needed	Triannual	Confirm intake depth and aAdjust transducer depth to 3 feet above intake
Willand Pond	DWP-12inch (Willand Pond #1)	07/2010	600	360	30.7	18.5	19.6	19.4	0.1	Well redevelopment not currently recommended Monitoring well recommended	Biennial	Confirm intake depth
	DWP-PW2 (Willand Pond #2)	03/2012	203	200	22.3	24.7	9.1	8.1	1.0	Well redevelopment not currently recommended	Biennial	Confirm intake depth
	Smith	07/2013	567	400	12.8	13.5	47.1	29.5	17.6	Well redevelopment recommended	Annual	Confirm intake depth
	Cummings	5/2012	315	400	3.7	17.8	84.9	22.5	62.4	Well redevelopment recommended	Annual	Confirm intake depth and adjust transducer depth to 3 feet above intake

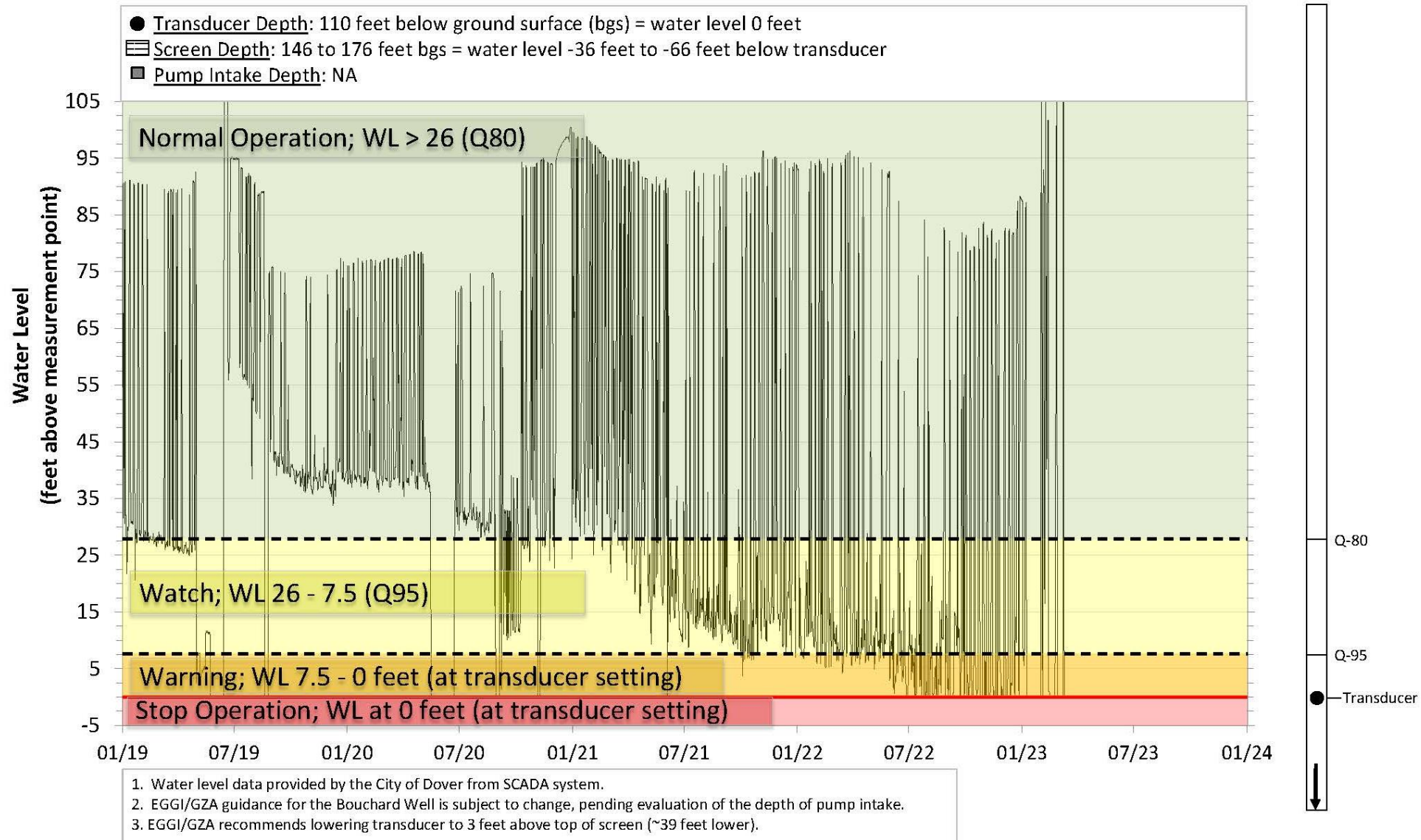
Production Well Operation Guidance - Calderwood Well Hoppers Aquifer, Dover, New Hampshire



Production Well Operation Guidance - Smith Well Willand Pond South Aquifer, Dover, New Hampshire



Production Well Operation Guidance - Bouchard Well Barbadoes Pond Aquifer, Dover, New Hampshire



Aquifer Level Considerations

Water Level Elevation (ft)	Water Elevation	5-Year Average	Elevation Trigger Point
Barbadoes Pond			
DGM-SW1	131.08	128.30	125.0
FCR-9D	132.94	130.47	129.0
DGM-LT1	130.34	127.59	125.0
DGM-LT2	131.12	128.22	126.0
DGM-LT4	127.78	125.79	123.0
Pudding Hill			
DP-105	95.92	93.58	80.0
DPH-7	84.63	79.76	60.0
DPH-B5	64.48	68.20	70.0
DPH-MW-1	49.90	92.90	80.0
DPH-MW2D	80.88	82.01	75.0
DPH-MW6	96.76	94.91	80.0
DPH-MW8	89.43	88.12	85.0
Hoppers			
DGM-LT5	104.32	105.53	106.0
DGM-LT6	103.59	106.21	110.0
DGM-LT7	108.05	110.12	112.0
Willand Pond			
DWP-MW4D	174.37	173.02	171.0
DWP-MW16D	140.81	135.79	136.0
DWP-SW5*	193.99	189.22	184.0
DWP-TW1	187.89	187.90	185.0

Monitoring Well Triggers

> 3 feet above trigger

< 3 feet above trigger
but still above trigger

at or below trigger

Pumping is ok

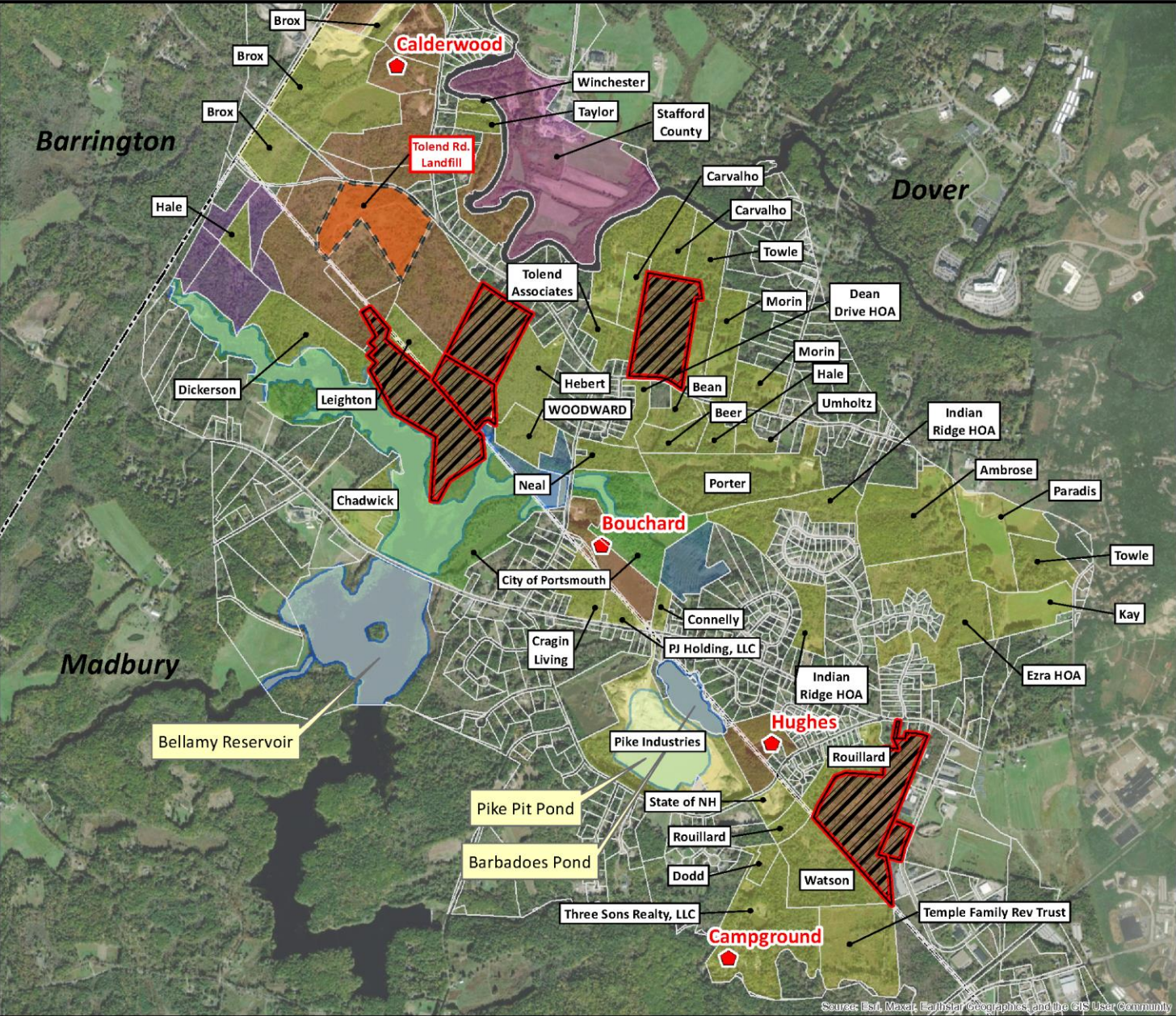
Consider using
other Production
Wells

Stop Pumping

New Source Exploration



New Source Exploration



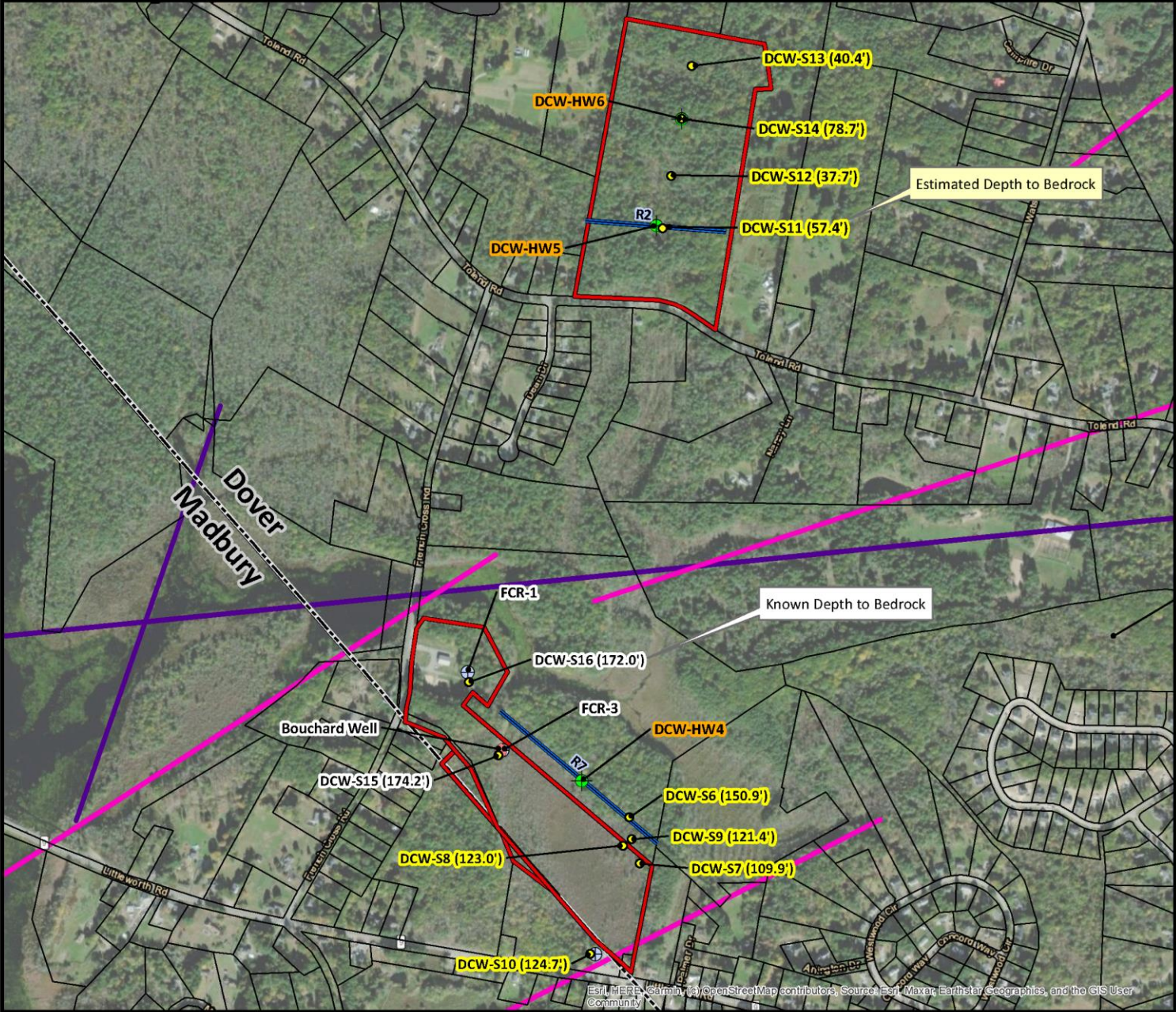


FIGURE 2

Aerial Photograph of Barbadoes Pond Aquifer

Passive Seismic Data Collection Locations
Bouchard Well (French Cross)
Barbadoes Pond Aquifer
Dover, New Hampshire

Legend

- Proposed Well Location
 - Passive Seismic Data Collection Point
 - Electrical Resistivity Survey Line
- Location Type
- Existing Production Well - Unconsolidated
 - Existing Monitoring Well - Unconsolidated
 - Fracture-Supported Coincident Lineaments
 - Coincident Lineaments

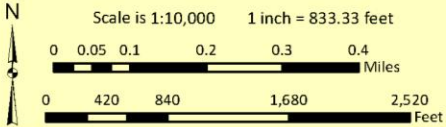


FIGURE 2

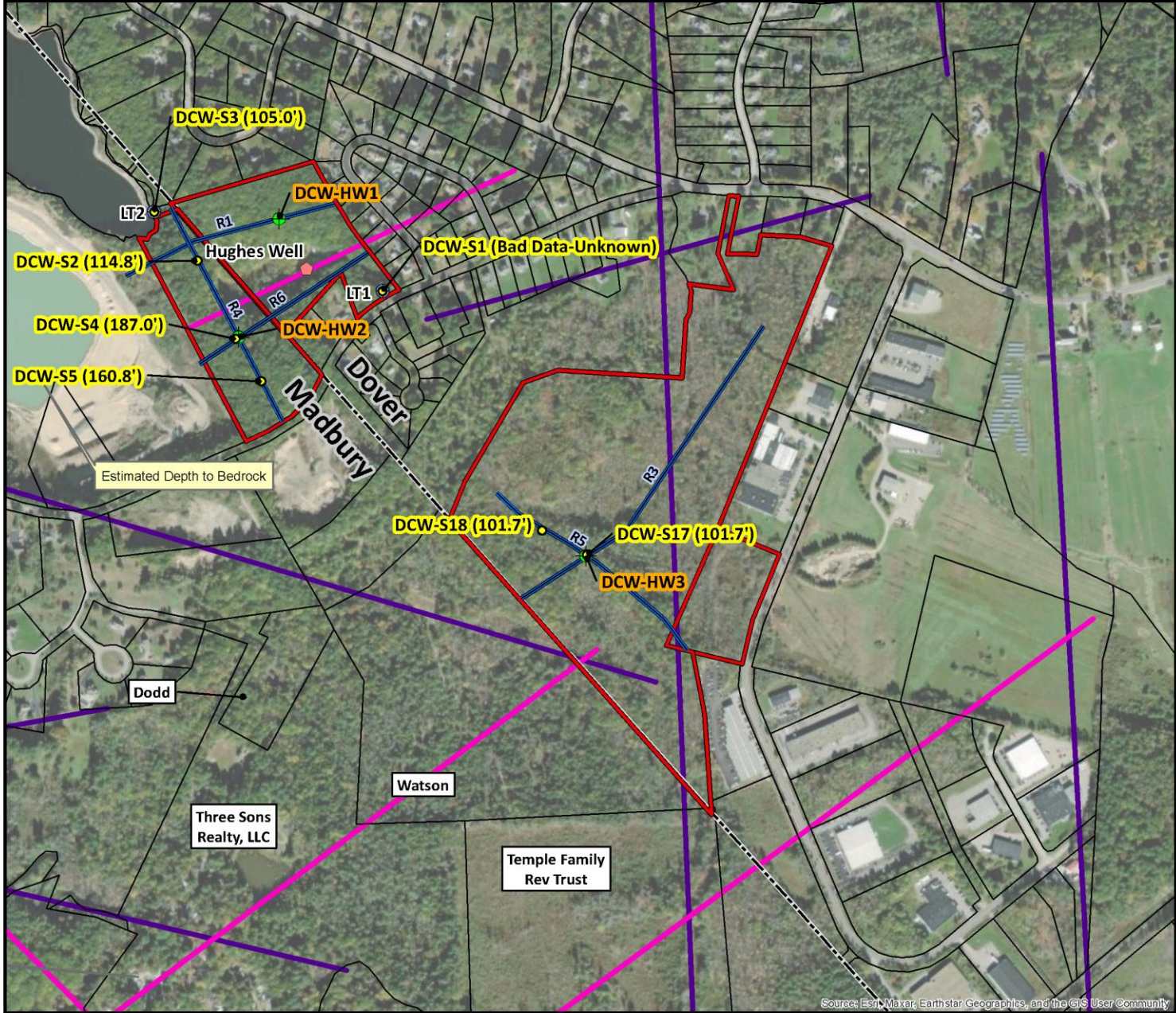
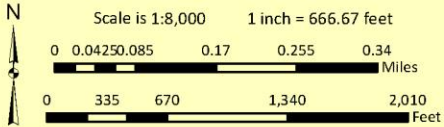


FIGURE 1
Aerial Photograph of Barbadoes Pond Aquifer

Passive Seismic Data Collection Locations
Bouchard (French Cross) and Hughes Wells
Barbadoes Pond Aquifer
Dover, New Hampshire

Legend

- Staked Well Location
 - Passive Seismic Data Collection Point
 - Electrical Resistivity Survey Line
- Location Type**
- Existing Production Well - Unconsolidated
 - Monitoring Well - Unconsolidated
 - Fracture-Supported Coincident Lineaments
 - Coincident Lineaments



New Source Exploration

