Presentation Outline

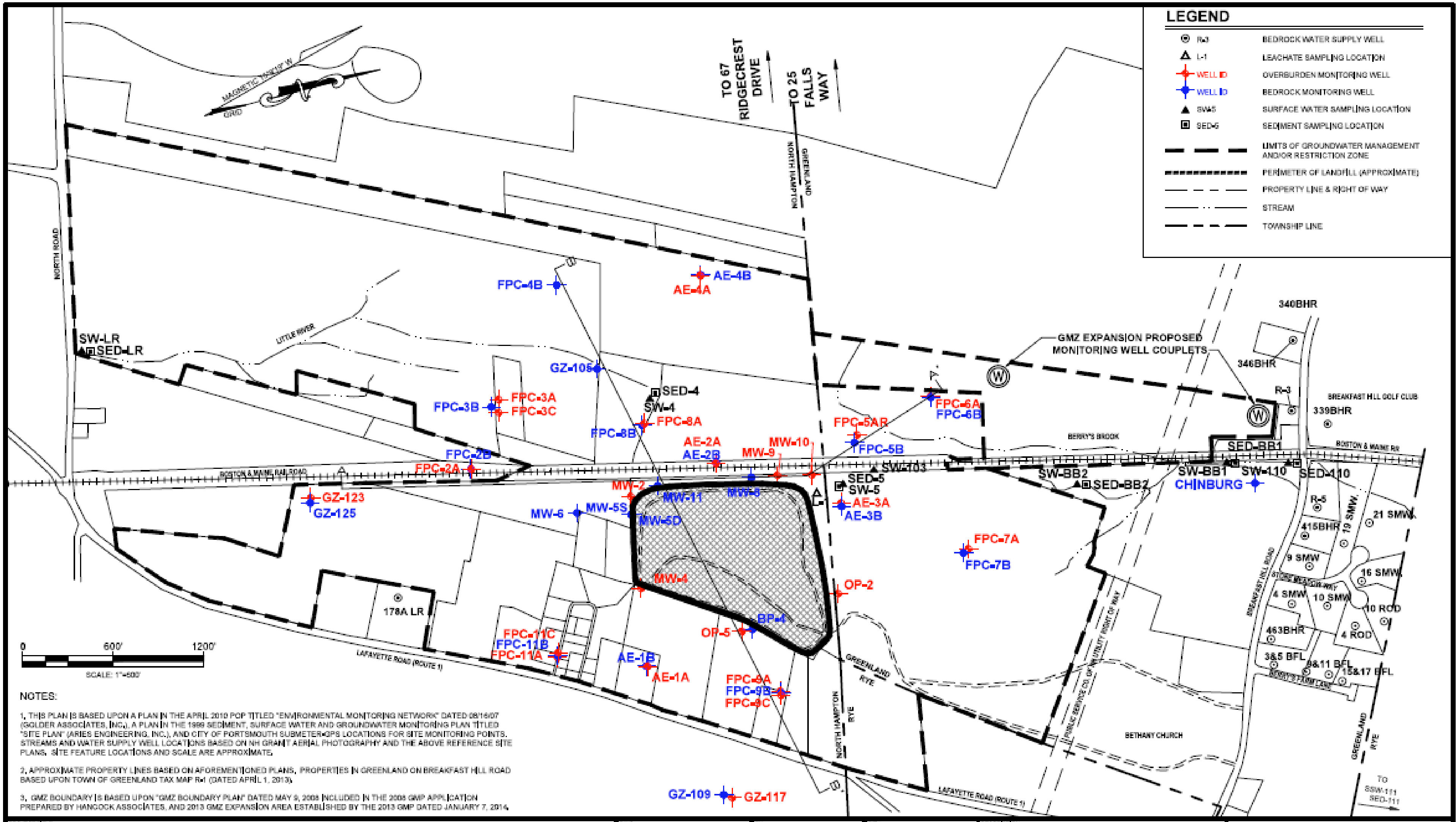
1. Site Background & Current Status
   Skip Hull, USEPA/ Drew Hoffman, NHDES

2. Project Updates
   CLG, CES

3. Questions

Coakley Landfill Area

Coakley Landfill Site Plan



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Background 1972 to 1994

1972 - 1985
Waste & Incinerator Ash Received

1979 - 1983
Impacts to Private Wells Identified

1983
Listed on NPL

May 1989
Feasibility Study (FS) Issued

June 1990
Record of Decision

March 1991
ESD Issued Modifying Cap Design

May 1992
CD Between US, NH and Defendants (OU1)

June 1990 Record of Decision

- ROD issued to address source control (SC) only (OU1)
- No remedy selected for management of migration (MM) due to limited data for characterizing off-site migration
- Subsequent ROD would be issued for MM (OU2)
- Selected SC-4 as preferred remedy: Capping/ On-Site Groundwater Treatment
- ROD proposed that off-site groundwater monitoring network would be expanded as part of implementation of SC remedy
- March 1991 ESD modified landfill cap design

May 1992 Consent Decree

- US, NH and defendants enter into CD

- Detailed agreement for the implementation of remedy for OU1 as specified in June 1990 ROD (SC-4), as modified by 1991 ESD

- Scope of Work specified componants of the remedy including:
    - consolidation of contaminated wetland sediments
    - capping of landfill
    - treatment of groundwater
    - long-term monitoring

Background 1994 to 2015

May 1994
FS for OU2

September 1994
ROD for OU2

1998
Landfill Capping Completed

January 1999
CD Between US, NH and Defendants (OU2)

September 1999
ESD Issued Eliminating P&T From OU1 Remedy

September 2007
ESD OU2

2008
GMP Issued

August 2015
ESD OU1 and OU2

September 1994 Record of Decision

- Based on data collected since 1990 ROD, 4 remedies were evaluated for MM ranging from No Action to GW Treatment
- Selected MM-2 as remedy for OU2:
  - institutional controls (such as deed restrictions, GMZ) to prevent use of contaminated groundwater
  - natural attenuation for the contaminated groundwater plume
  - groundwater monitoring
- The key element of the remedy is the ability of the groundwater contamination to naturally attenuate
- Did not include PFAS or 1,4-dioxane

January 1999 Consent Decree

- US, NH and defendants enter into CD

- Detailed agreement for the implementation of remedy for OU2 as specified in September 1994 ROD (MM-2)

- MM-2 remedy includes institutional controls, natural attenuation and groundwater monitoring

September 1999 Explanation of Significant Differences

- Modified the remedy for OU1 to eliminate onsite groundwater treatment from the SC-4 alternative selected
- Groundwater data collected to date demonstrated significant decline in levels of COCs in groundwater
- Groundwater treatment (P&T) determined to no longer be necessary in order to achieve cleanup goals
- ESD did not modify remedy for OU2

1,4 – Dioxane Timeline

- 1,4-Dioxane
  - 2008 – NHDES established GW sampling requirements
  - 2009 – 1,4-dioxane discovered at Coakley
  - 2015 – Incorporated as site COC through ESD
  - CLG sampling for 1,4-dioxane twice per year at expanded monitoring well network
  - No private wells exceed AGQS for 1,4-dioxane (3.0 ppb)

PFAS Timeline

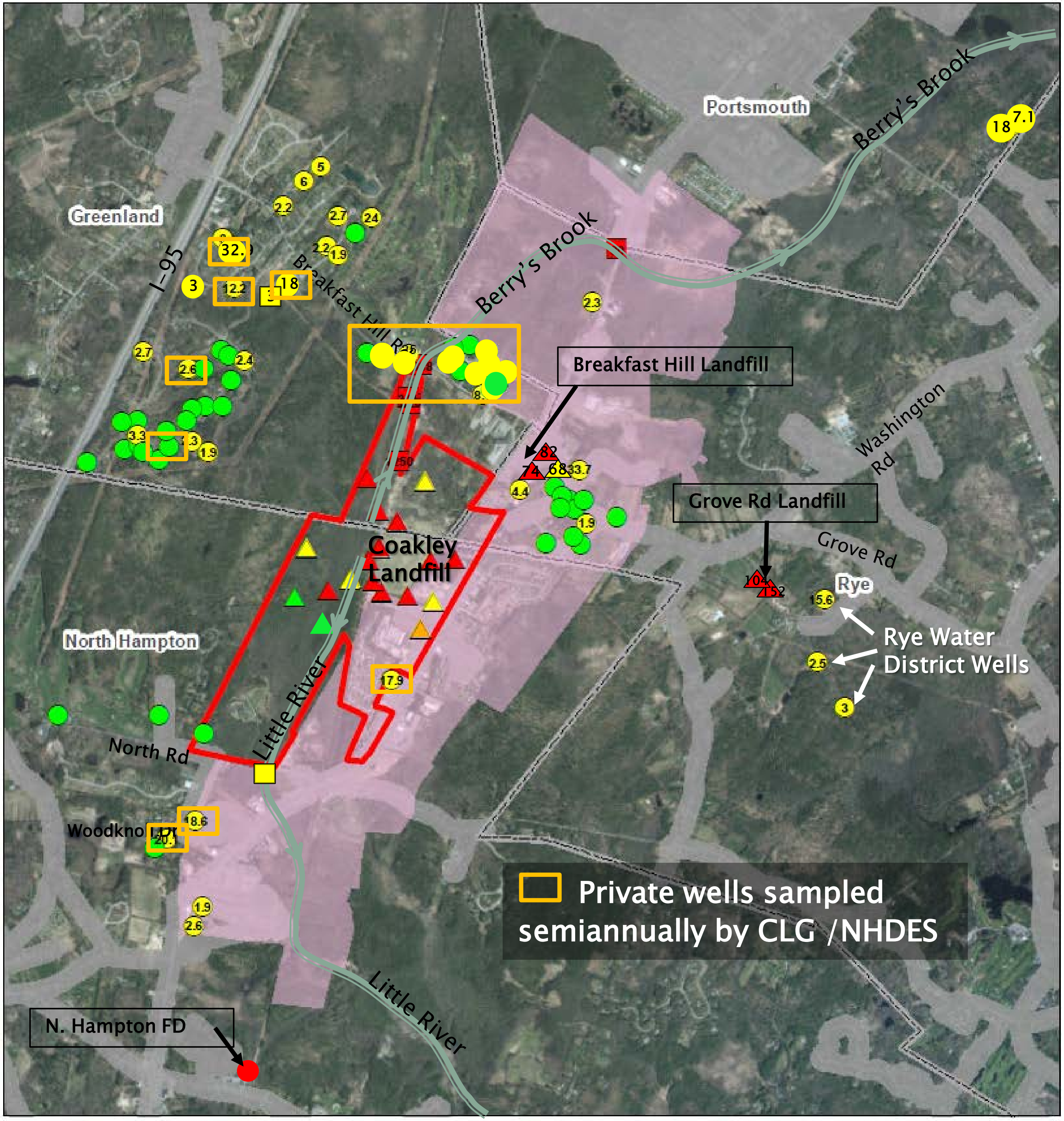
- PFAS (per- and polyfluoroalkyl substances)
  - 2014 – Discovered at Pease AFB (Haven Well closure)

  - 2016 - present
    - Discovered near Saint Gobain (Merrimack/ Litchfield)
    - May – EPA released revised Drinking Water Health Advisory
    - June – NHDES emergency rule-making to adopt HA as AGQS
    - June/July – CLG sampled PFASs at Coakley (HA/AGQS exceeded)
    - NHDES initiates private water supply sampling for PFAS and expands to the larger Seacoast area
    - October – NHDES formally adopts AGQS for PFOA & PFOS
    - CLG sampling Coakley MWs, sediment & surface water and area private wells for PFAS 2 times per year

NHDES Sampling Efforts
Private Wells

- MTBE able to expedite private well sampling
- NHDES trained personnel & contract laboratories
- 84 Private wells & 5 surface water locations
- All private wells sampled remain below EPA-Health Advisory/NH-AGQS for PFAS

COAKLEY AREA PFAS INVESTIGATION & PRIVATE WELL SAMPLING PROGRAM



Private wells sampled semiannually by CLG /NHDES

🟥 Coakley Landfill GMZ (Approximate)

PFOA + PFOS (PPT)

Supply Well	Monitoring Well	Surface Water	
🔴	▲	🟥	≥70
🟠	▲	🟧	40 - <70
🟡	▲	🟨	<40
🟢	▲	🟩	ND

▨ Postcards Mailed

▨ Water Distribution

☐ Political Boundary

Approximately 1 mile

New Hampshire Department of Environmental Services

PFAS INVESTIGATION
Updated: March 23, 2018

Please note that the data presented is under constant revision as new sites or facilities are added. The data 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.

★ Existing Remedial Site with PFAS Detections

▭ Political Boundary

🟩 Public Water Distribution

▭ Landfill

TOTAL PFAS

Supply Well	Monitoring Well	Surface Water	
●	▲	■	≥400
●	▲	■	70 - <400
●	▲	■	45 - <70
●	▲	■	10 - <45
●	▲	■	< 10

⊙ Analytical Result Pending

Feet
0 2,100 4,200 8,400

1 in = 4,400 feet

N
W E
S

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Map By: Derek Bennett 271-8520

Surface Water

- Risk-based Screening Levels (SLs) were calculated for incidental ingestion of surface water and sediment assuming exposure durations of 120 (conservative) and 45 days/yr (realistic) for PFOA, PFOS and PFBS
  - PFOA & PFOS
    - SW 120 day SL = 760 ng/L 45 day SL = 2,030 ng/L
    - SED 120 day SL = 0.369 mg/kg 45 day SL = 0.98 mg/kg
  - PFBS
    - SW 120 day SL = 760,000 ng/L 45 day SL = 2,030,000 ng/L
    - SED 120 SL = 369 mg/kg 45 day SL = 980 mg/kg

Surface Water

- Sampling of surface water ongoing – Results compared against surface water SLs, not AGQS

- Surface water samples at SW-5 and SW-103 > more conservative 120 day SL (760 ng/L):
    - SW-5 PFOS = 1,120 ng/L
    - SW-103 PFOS = 993 ng/L

- All surface water results < more realistic 45 day SL (2,030 ng/L)

- Leachate seep L-1 results down more than 80% (PFOS PFOA combined) April – Sept 2017

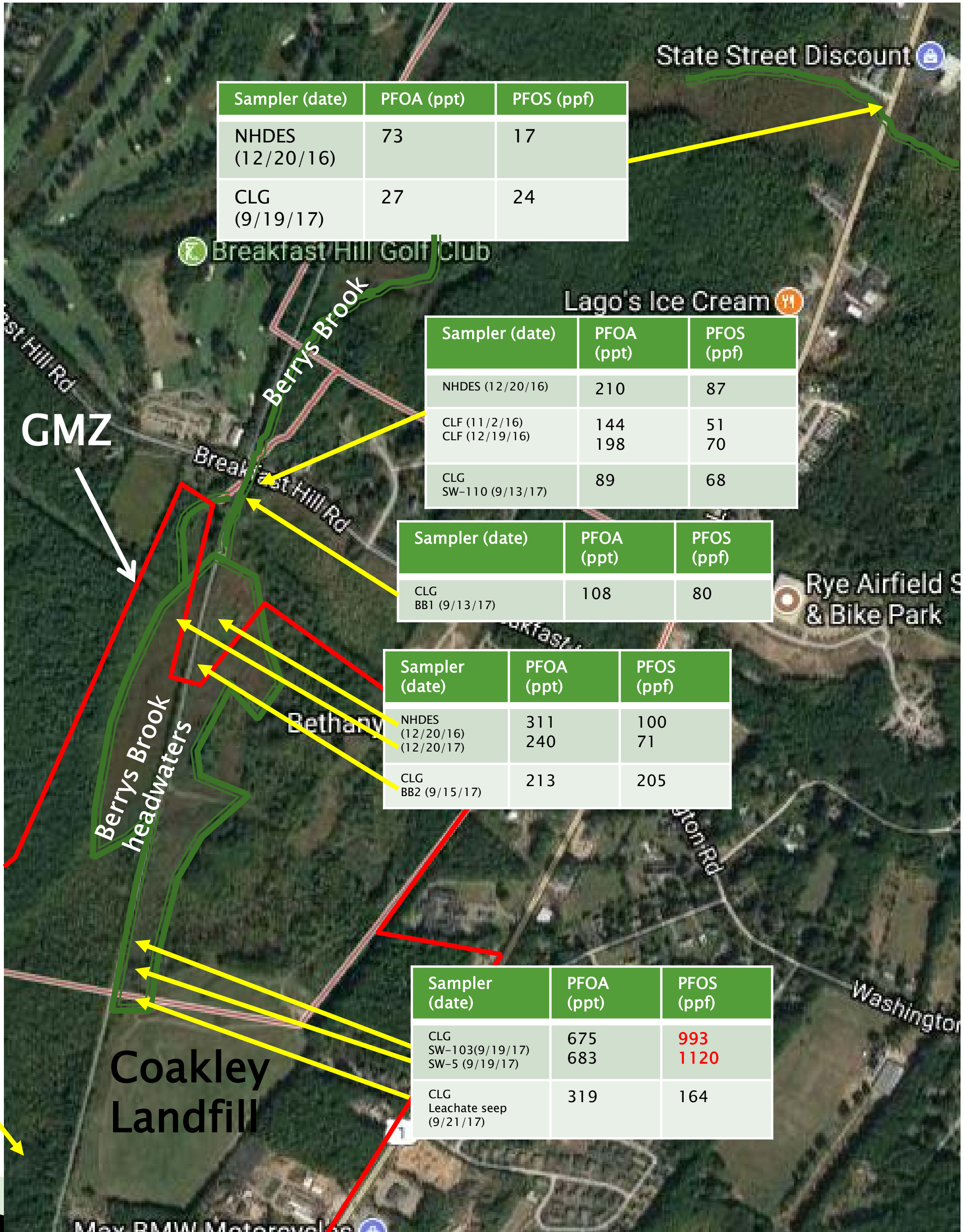
- No PFBS results above SLs

Berrys Brook Surface Water Sampling Results for PFOA & PFOS

September 2017 results
Locations approximate

Site-Specific SW Screening Levels	PFOA (ppt)	PFOS (ppf)
45 days/year (child)	2,030	2,030
120 days/year (child)	760	760

Sampler (date)	PFOA (ppt)	PFOS (ppf)
CLG SW-4 (9/17/17)	145	42



Sampler (date)	PFOA (ppt)	PFOS (ppf)
NHDES (12/20/16)	73	17
CLG (9/19/17)	27	24

Sampler (date)	PFOA (ppt)	PFOS (ppf)
NHDES (12/20/16)	210	87
CLF (11/2/16) CLF (12/19/16)	144 198	51 70
CLG SW-110 (9/13/17)	89	68

Sampler (date)	PFOA (ppt)	PFOS (ppf)
CLG BB1 (9/13/17)	108	80

Sampler (date)	PFOA (ppt)	PFOS (ppf)
NHDES (12/20/16) (12/20/17)	311 240	100 71
CLG BB2 (9/15/17)	213	205

Sampler (date)	PFOA (ppt)	PFOS (ppf)
CLG SW-103(9/19/17) SW-5 (9/19/17)	675 683	993 1120
CLG Leachate seep (9/21/17)	319	164

Maximum PFAS sample locations for each medium

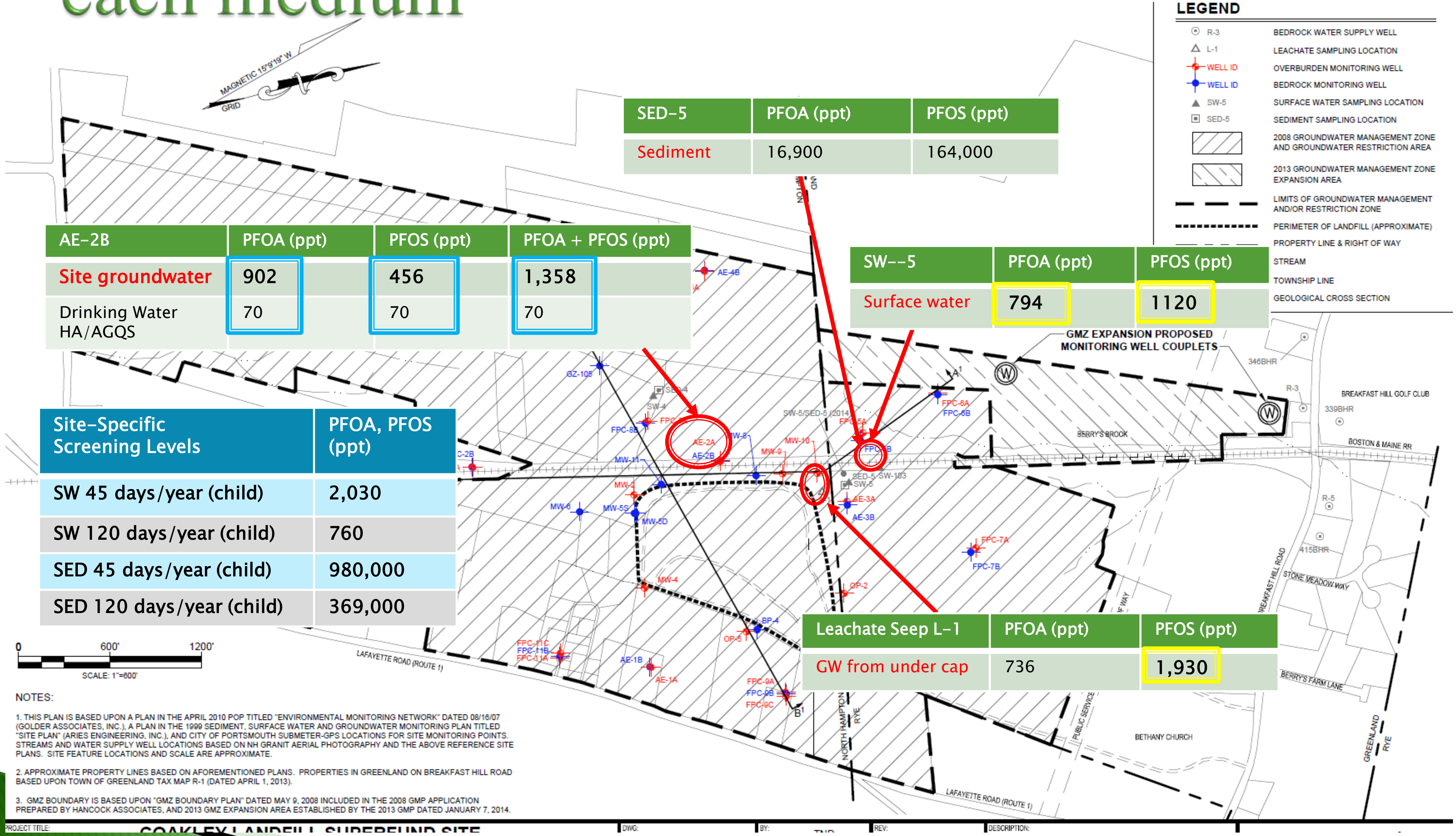
SED-5	PFOA (ppt)	PFOS (ppt)
Sediment	16,900	164,000

AE-2B	PFOA (ppt)	PFOS (ppt)	PFOA + PFOS (ppt)
Site groundwater	902	456	1,358
Drinking Water HA/AGQS	70	70	70

SW--5	PFOA (ppt)	PFOS (ppt)
Surface water	794	1120

Site-Specific Screening Levels	PFOA, PFOS (ppt)
SW 45 days/year (child)	2,030
SW 120 days/year (child)	760
SED 45 days/year (child)	980,000
SED 120 days/year (child)	369,000

Leachate Seep L-1	PFOA (ppt)	PFOS (ppt)
GW from under cap	736	1,930



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Fish Consumption SLs

- November 2017 EPA calculated risk-based SLs for standard recreational fish consumption rates for a child for PFOA, PFOS and PFBS
  - Most conservative exposure assumption for child
    - 6,000 mg/day, 350 days/year, 6 years (about 74 ounces per year)
  - SL PFOA & PFOS
    - 5.21E-03 mg/kg (0.00521 mg/kg of fish tissue consumed)
  - SL PFBS
    - 5.21 mg/kg

Overview of SLs for Recreational Ingestion of Surface Water, Sediment & Fish Tissue

Risk-Based Screening Levels

	Surface Water (ug/L)		Sediment (mg/kg)		Fish (mg/kg)
Assumptions	120 day/yr	45 day/yr	120 day/yr	45 day/yr	6 grams/day
PFOS/PFOA	0.76	2.03	0.369	0.98	0.00521
PFBS	760	2030	369	983	5.21

Ongoing and Upcoming Activities

January 2018
EPA Directs CLG to Conduct Bedrock Investigation

January 2018
2017 Annual Report Submitted to EPA and NHDES

February 2018
Chinburg Well Packer Testing Results

February 2018
EPA Directs CLG to Sample Fish Tissue

Spring-Summer 2018
Fish Tissue Sampling

Spring 2018
Initiate Bedrock Investigation

May 2018
Spring 2018 Semi-Annual Sampling

June 2018
Deep Bedrock Well Installation

Ongoing Work

- February 2018 – CLG submits data from geophysical testing and sampling of Chinburg well
    - All samples ND for 1,4-dioxane and PFOA, PFOS
    - Geophysical data can be used for bedrock investigation
- May 2018 – Site-Wide GW/SW/SED sampling
- May 2018 – Residential well sampling

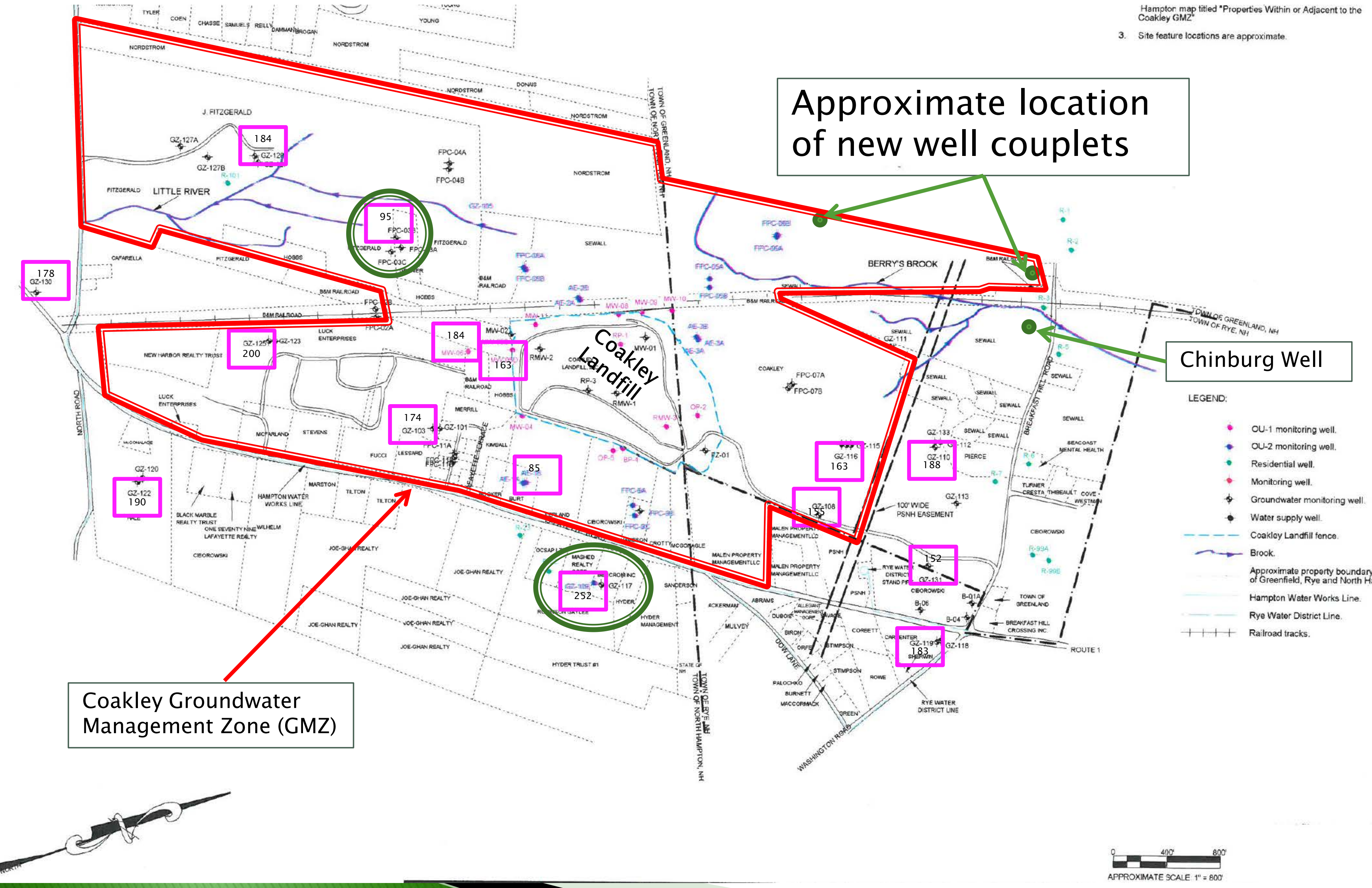
Deep Bedrock Investigation

- January 2018 – EPA directs CLG to initiate bedrock investigation
    - Investigation to determine extent of contaminant migration in bedrock
    - Investigating bedrock is an iterative process
    - Workplan submitted March 21, 2018
    - Technical meeting held March 30, 2018
    - Final workplan under development

Deep Bedrock Investigation

- Investigation will include:
  - Geophysical surveying of existing bedrock boreholes and surface features
  - Sampling of groundwater in bedrock
  - Installation of new bedrock wells
    - Geophysics
    - Sampling
  - Update bedrock mapping and determine extent of contaminant migration

DEEP BEDROCK EXPLORATION PLAN



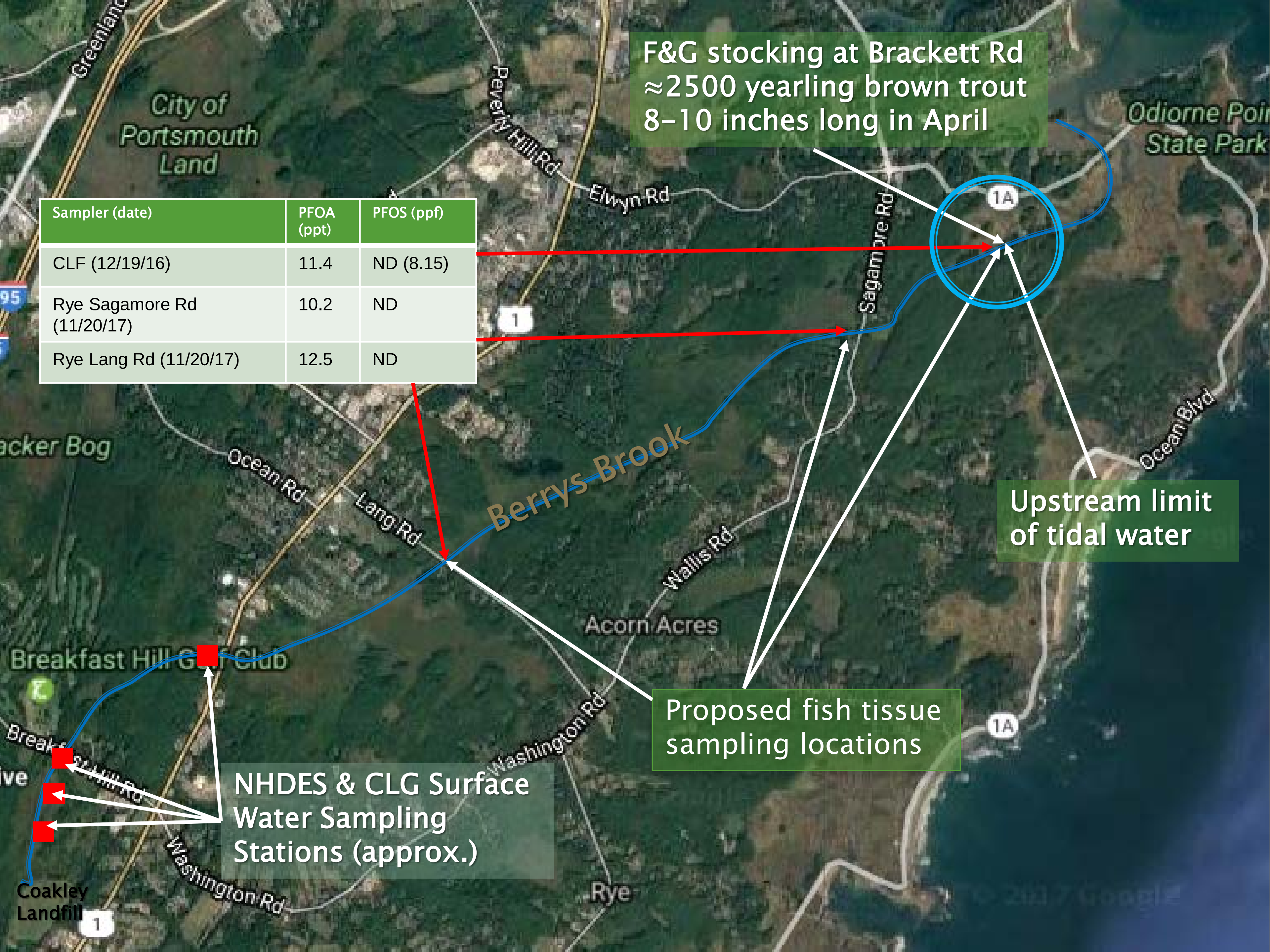
Approximate location of new well couplets

Chinburg Well

Coakley Groundwater Management Zone (GMZ)

Fish Tissue Sampling

- February 2018 – EPA directs CLG to develop fish tissue sampling and analysis program
- Proposal submitted March 8, 2018
- CLG working with EPA, NHDES & NH F&G to finalize sampling program
- NH F&G stock brown trout in Berrys Brook estuary area ≈ 5 miles downstream in spring & fall
- NH F&G advisory for catch & release – “abundance of caution”
- CLG sample fish tissue & compare results to site-specific SLs
- Sampling of warmwater, resident species present in the freshwater areas of Berrys Brook
- Sampling of brown trout from estuary area of Berrys Brook
- Survivability, exposure duration and catchability are factors for sampling brown trout
- Sampling to be initiated late spring/ summer 2018



Sampler (date)	PFOA (ppt)	PFOS (ppf)
CLF (12/19/16)	11.4	ND (8.15)
Rye Sagamore Rd (11/20/17)	10.2	ND
Rye Lang Rd (11/20/17)	12.5	ND

F&G stocking at Brackett Rd
≈2500 yearling brown trout
8-10 inches long in April

Upstream limit of tidal water

Proposed fish tissue sampling locations

NHDES & CLG Surface Water Sampling Stations (approx.)

Berrys Brook Estuary at Brackett Road Bridge

Coakley Landfill Contact Information

www.epa.gov/superfund/coakley

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

NEW HAMPSHIRE
DEPARTMENT OF
Environmental
Services

What Does That Number Mean?

Supplemental Information for Ecology's Water Quality Policy Forum

February 8, 2013

Risk level terminology that you will hear...

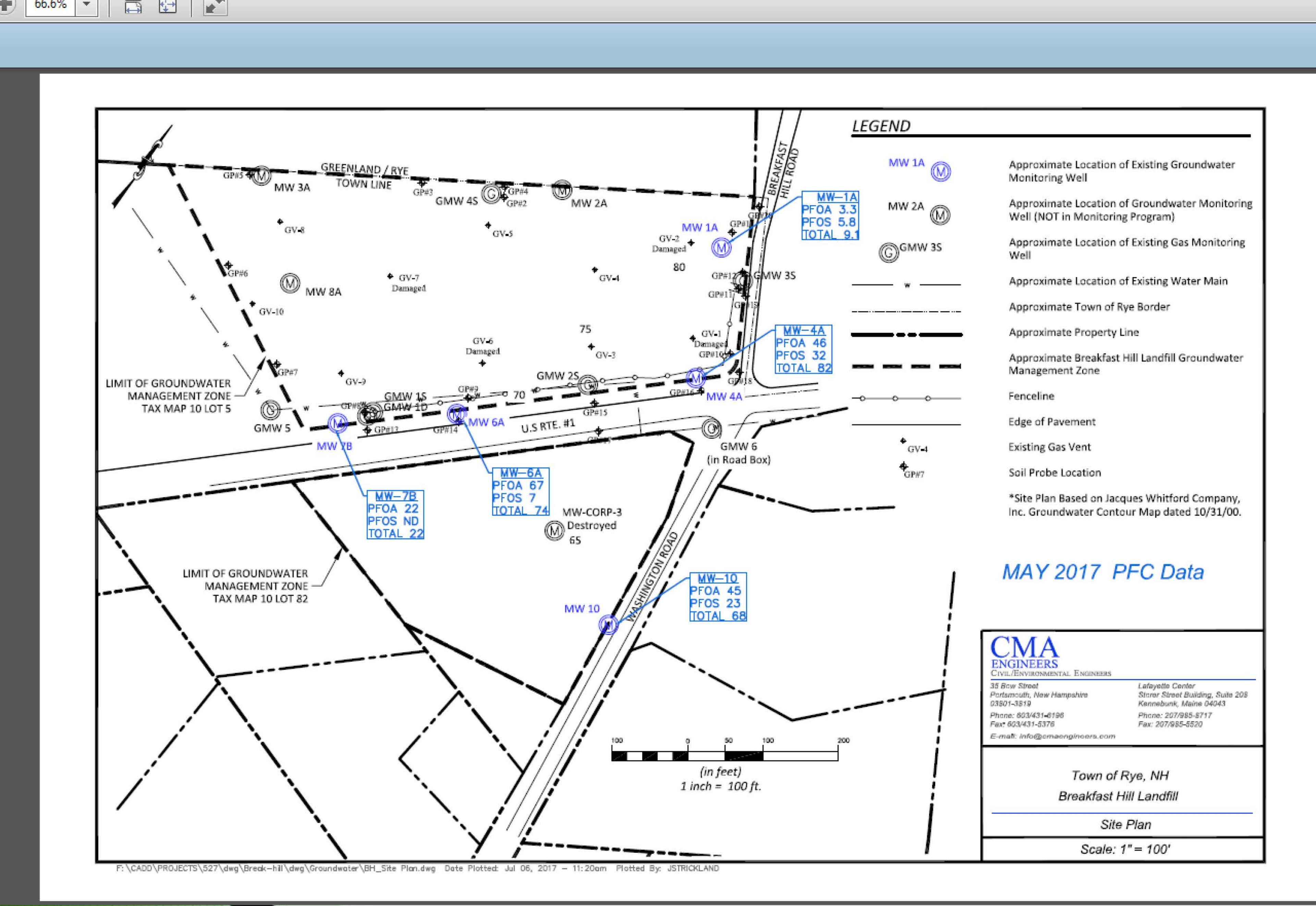
Numeric	How to say it...	What it means, under specified exposure assumptions	What are the exposure assumptions that are included in Washington's current human health-based criteria (the 1992 National Toxics Rule criteria)?
10^{-6}	Ten-to- the-minus-sixth	...risk of one additional occurrence of cancer, in one million people...	**70 years** of daily exposure to **6.5 g/day** of fish and shellfish, and **2 liters/day** of untreated surface waters, by a **154 lb.** person.
10^{-5}	Ten-to- the-minus-fifth	...risk of one additional occurrence of cancer, in one hundred thousand people...	
10^{-4}	Ten-to- the-minus-fourth	...risk of one additional occurrence of cancer, in ten thousand people...	

Increasing protection

Landfill Statistics

- Approximately 300 closed landfills
- Only eight have a liner

11/10/2016



MW-1A
PFOA 3.3
PFOS 5.8
TOTAL 9.1

MW-4A
PFOA 46
PFOS 32
TOTAL 82

MW-6A
PFOA 67
PFOS 7
TOTAL 74

MW-7B
PFOA 22
PFOS ND
TOTAL 22

MW-10
PFOA 45
PFOS 23
TOTAL 68

LEGEND

MW 1A Ⓜ	Approximate Location of Existing Groundwater Monitoring Well
MW 2A Ⓜ	Approximate Location of Groundwater Monitoring Well (NOT in Monitoring Program)
Ⓖ GMW 3S	Approximate Location of Existing Gas Monitoring Well
—— w ——	Approximate Location of Existing Water Main
— · — · —	Approximate Town of Rye Border
━ · ━	Approximate Property Line
━ ━ ━	Approximate Breakfast Hill Landfill Groundwater Management Zone
—o—o—o—	Fenceline
——	Edge of Pavement
✦ GV-4	Existing Gas Vent
✦ GP#7	Soil Probe Location

*Site Plan Based on Jacques Whitford Company, Inc. Groundwater Contour Map dated 10/31/00.

MAY 2017 PFC Data

CMA
ENGINEERS
Civil/Environmental Engineers

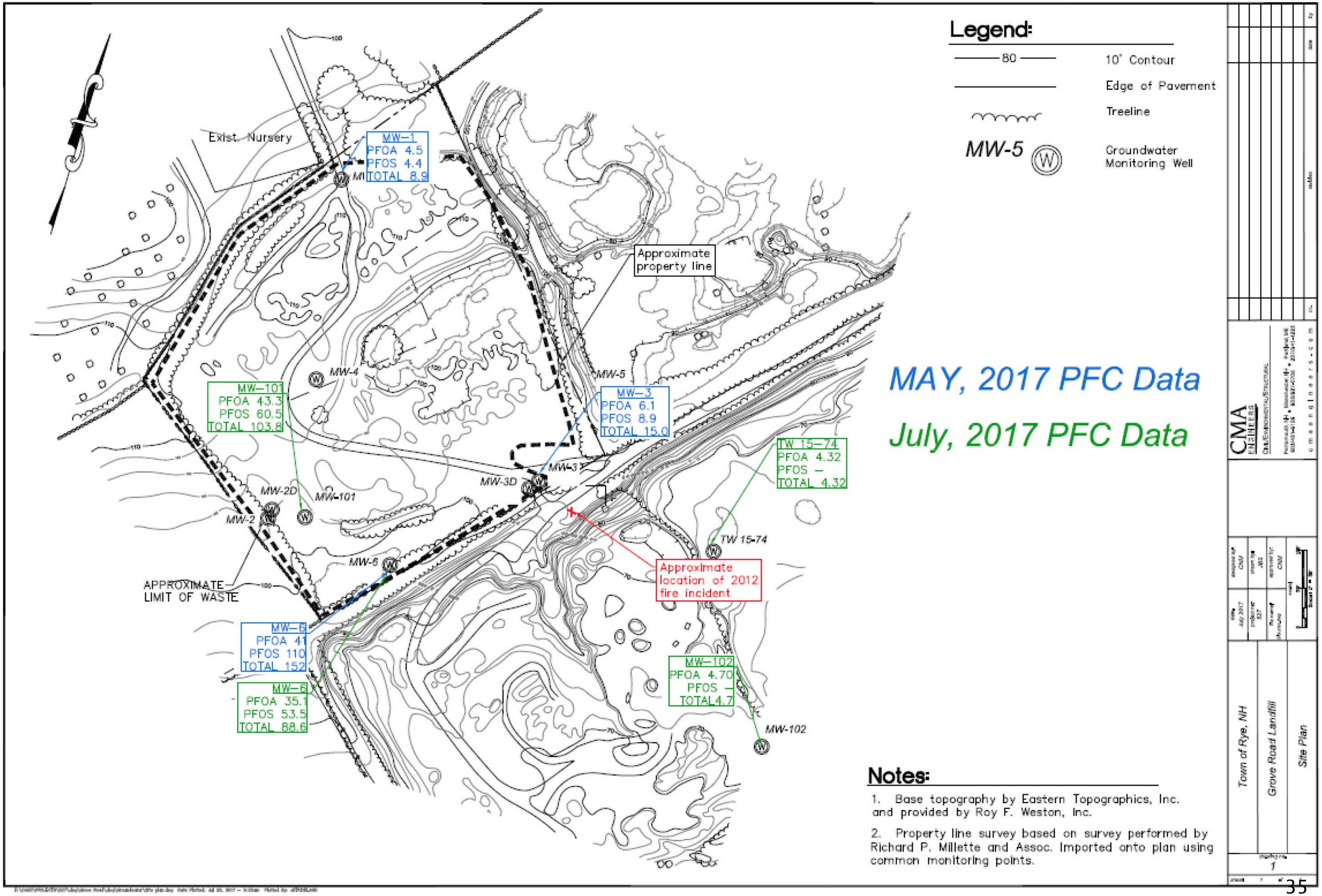
35 Bow Street
Portsmouth, New Hampshire
03801-3819
Phone: 603/431-6196
Fax: 603/431-5376
E-mail: info@cmaengineers.com

Lafayette Center
Storer Street Building, Suite 208
Kennebunk, Maine 04043
Phone: 207/985-8717
Fax: 207/985-5520

Town of Rye, NH
Breakfast Hill Landfill

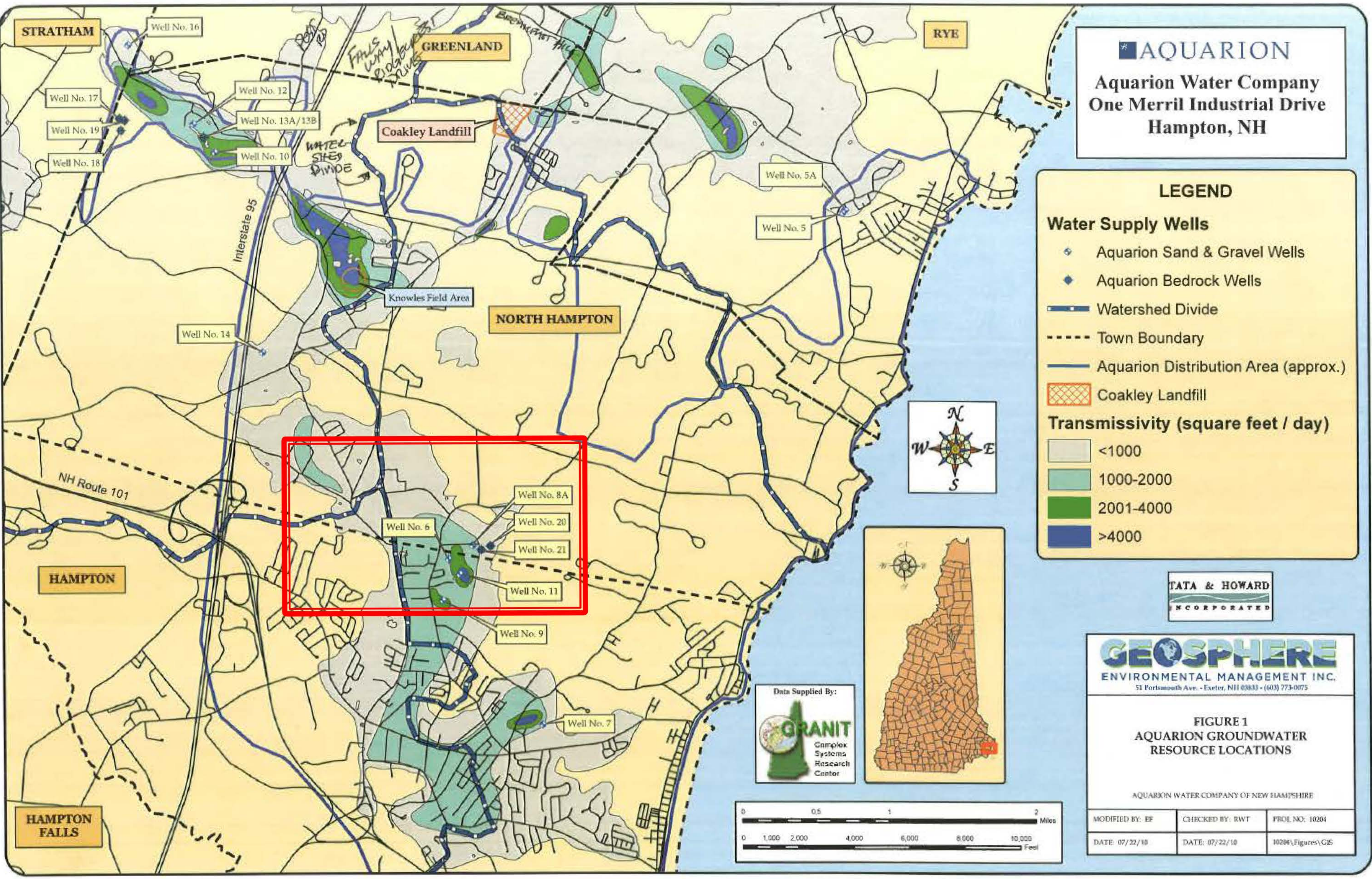
Site Plan

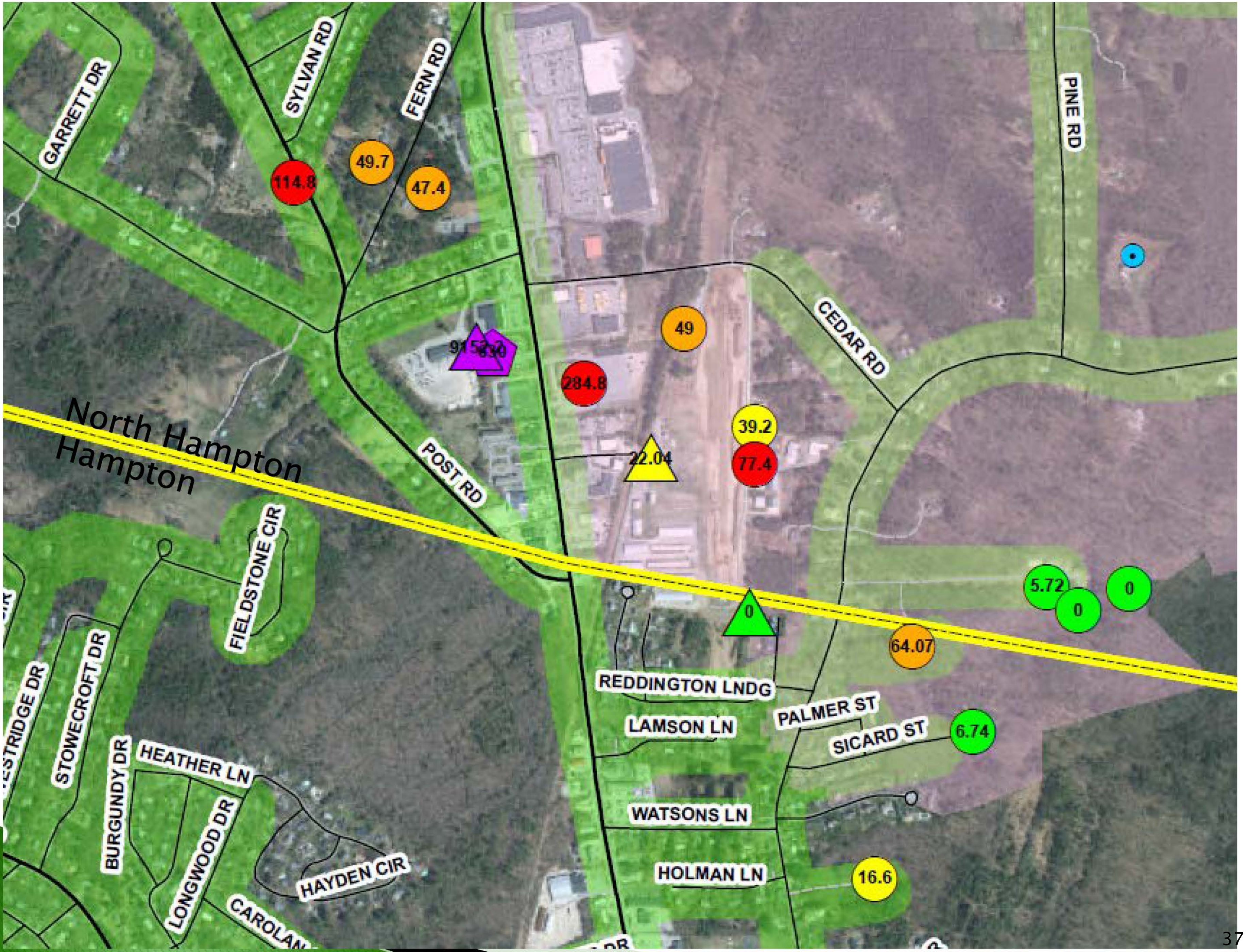
Scale: 1" = 100'



Notes:

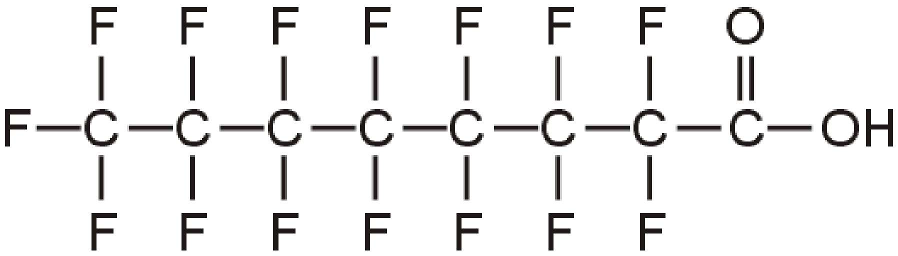
1. Base topography by Eastern Topographics, Inc. and provided by Roy F. Weston, Inc.
2. Property line survey based on survey performed by Richard P. Millette and Assoc. Imported onto plan using common monitoring points.

STRATHAM
GREENLAND
RYE
NORTH HAMPTON
HAMPTON
HAMPTON FALLS
Coakley Landfill
Knowles Field Area
Interstate 95
NH Route 101
Well No. 16
Well No. 17
Well No. 19
Well No. 18
Well No. 12
Well No. 13A/13B
Well No. 10
Well No. 14
Well No. 5A
Well No. 5
Well No. 8A
Well No. 20
Well No. 21
Well No. 6
Well No. 11
Well No. 9
Well No. 7
POST RD
FALLS WAY
DRIVE
BREAKFAST HILL
WATER SHED DIVIDE
AQUARION
Aquarion Water Company
One Merril Industrial Drive
Hampton, NH
LEGEND
Water Supply Wells
Aquarion Sand & Gravel Wells
Aquarion Bedrock Wells
Watershed Divide
Town Boundary
Aquarion Distribution Area (approx.)
Coakley Landfill
Transmissivity (square feet / day)
<1000
1000-2000
2001-4000
>4000
N
W
E
S
Data Supplied By:
GRANIT
Complex Systems Research Center
0
0.5
1
2
Miles
0
1,000
2,000
4,000
6,000
8,000
10,000
Feet
TATA & HOWARD INCORPORATED
GEOSPHERE
ENVIRONMENTAL MANAGEMENT INC.
51 Portsmouth Ave. - Exeter, NH 03833 - (603) 773-0075
FIGURE 1
AQUARION GROUNDWATER RESOURCE LOCATIONS
AQUARION WATER COMPANY OF NEW HAMPSHIRE
MODIFIED BY: EF
CHECKED BY: RWT
PROJ. NO: 10204
DATE: 07/22/10
DATE: 07/22/10
10204\Figures\GIS

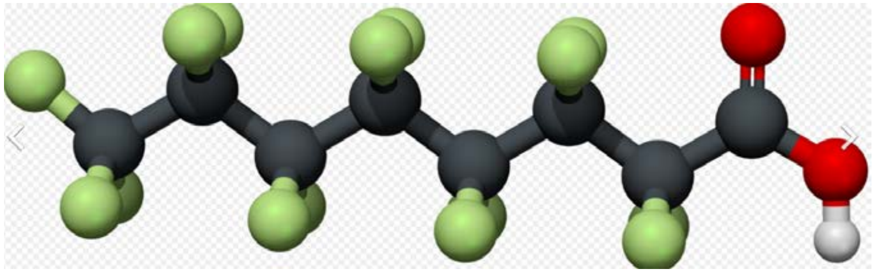

GARRETT DR
SYLVAN RD
FERN RD
PINE RD
114.8
49.7
47.4
CEDAR RD
49
9152.2
830
284.8
North Hampton
Hampton
POST RD
39.2
22.04
77.4
FIELDSTONE CIR
0
5.72
0
0
64.07
ESTRIDGE DR
STOWECROFT DR
REDDINGTON LNDG
LAMSON LN
PALMER ST
SICARD ST
6.74
BURGUNDY DR
HEATHER LN
LONGWOOD DR
WATSONS LN
HOLMAN LN
16.6
HAYDEN CIR
CAROLAN

PFOA and PFOS

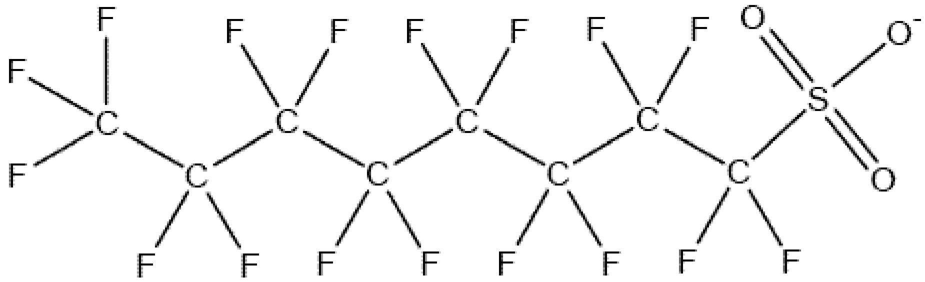
- Perflourooctanoic acid (PFOA – C8) primarily used as a surfactant in the production of other fluorochemicals, including PTFE (Teflon®), and in related manufacturing processes; often produced as its ammonium salt, ammonium perfluorooctanoate (APFO)

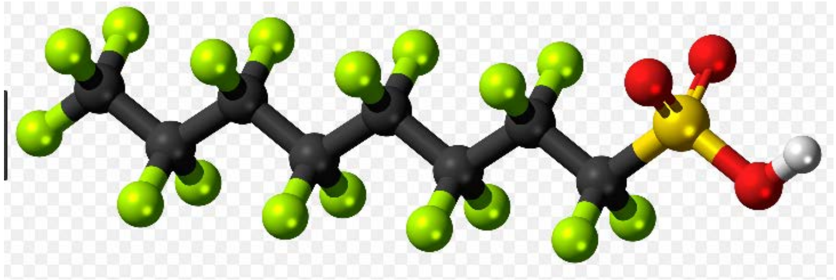


$$F-\overset{F}{\underset{F}{C}}-\overset{F}{\underset{F}{C}}-\overset{F}{\underset{F}{C}}-\overset{F}{\underset{F}{C}}-\overset{F}{\underset{F}{C}}-\overset{F}{\underset{F}{C}}-\overset{F}{\underset{F}{C}}-\overset{O}{\overset{\|}{C}}-OH$$



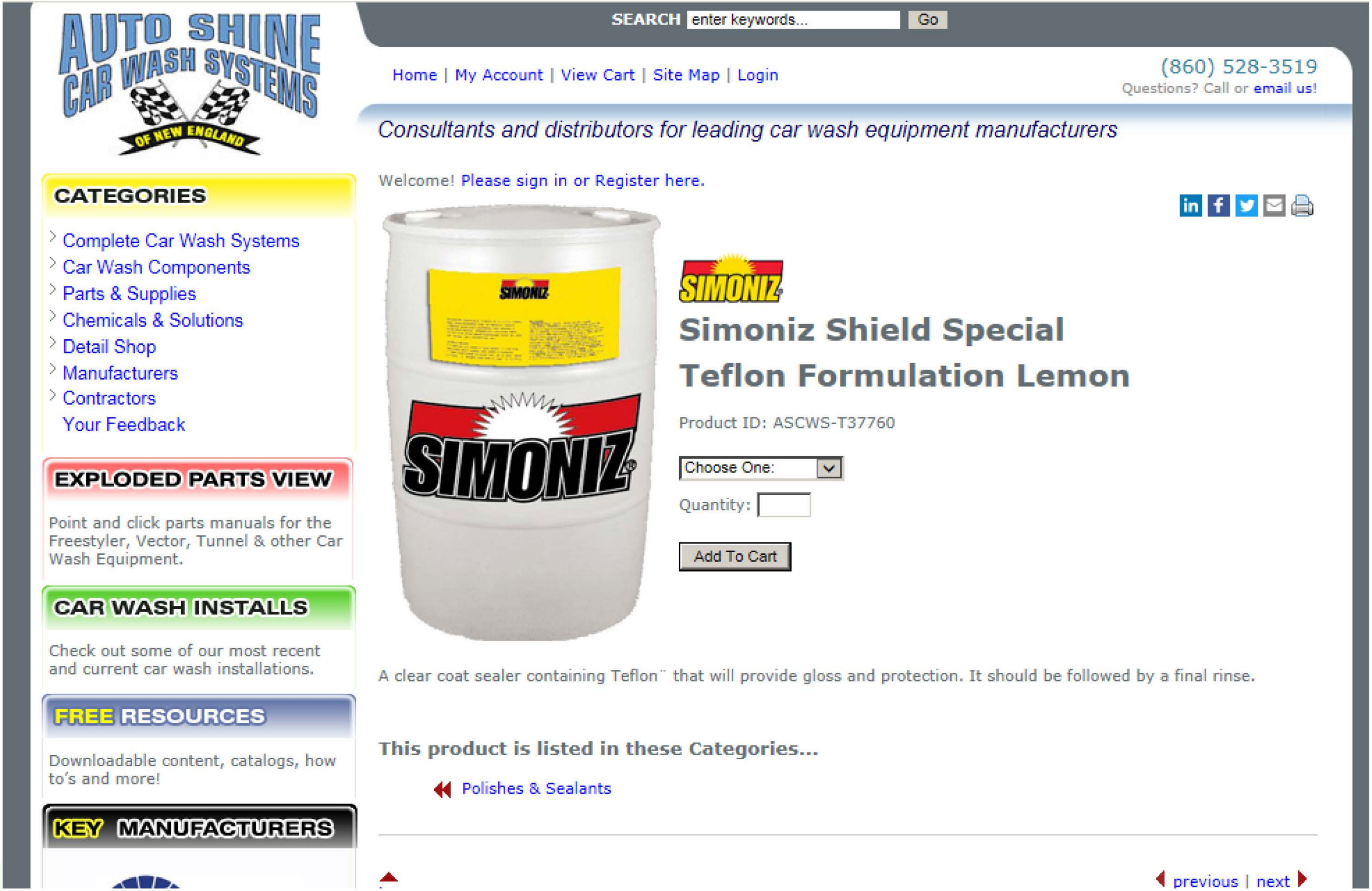
- Perfluorooctane sulfonate (PFOS) has variety of uses including surface treatments, paper coatings, firefighting foam





Expansive Use of PFAS/PFCs

Commercial Products	**Industrial Uses**
Cookware (Teflon®, Nonstick) Fast Food Containers Candy Wrappers Microwave Popcorn Bags Personal Care Products (Shampoo, Dental Floss) Cosmetics (Nail Polish, Eye Makeup) **Car wash treatment products** Paints and Varnishes Stain Resistant Carpet Stain Resistant Chemicals (Scotchgard®) Water Resistant Apparel (Gore-Tex®) Cleaning Products Electronics Ski Wax	Photo Imaging Metal Plating Semiconductor Coatings Aviation Hydraulic Fluids Medical Devices Firefighting Aqueous Film-Forming Foam Insect Baits Printer and Copy Machine Parts Chemically Driven Oil Production Textiles, Upholstery, Apparel and Carpets Paper and Packaging Rubber and Plastics



AUTO SHINE CAR WASH SYSTEMS OF NEW ENGLAND

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- Detail Shop
- Manufacturers
- Contractors
- Your Feedback

EXPLODED PARTS VIEW

Point and click parts manuals for the Freestyler, Vector, Tunnel & other Car Wash Equipment.

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Check out some of our most recent and current car wash installations.

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KEY MANUFACTURERS

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SIMONIZ

Simoniz Shield Special Teflon Formulation Lemon

Product ID: ASCWS-T37760

Choose One:

Quantity:

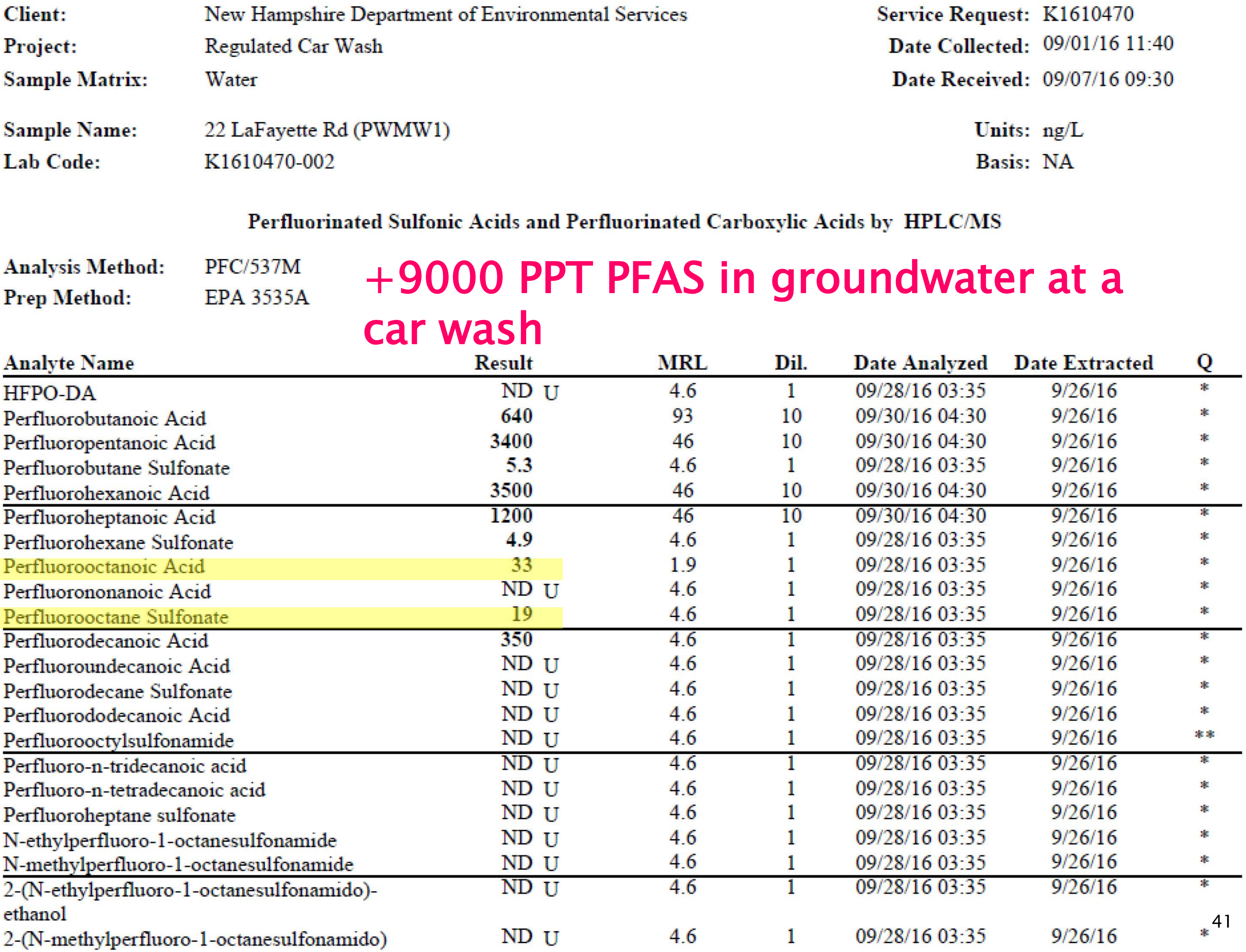
Add To Cart

A clear coat sealer containing Teflon¨ that will provide gloss and protection. It should be followed by a final rinse.

This product is listed in these Categories...

Polishes & Sealants

previous | next



Client: New Hampshire Department of Environmental Services
Service Request: K1610470
Project: Regulated Car Wash
Date Collected: 09/01/16 11:40
Sample Matrix: Water
Date Received: 09/07/16 09:30

Sample Name: 22 LaFayette Rd (PWMW1)
Units: ng/L
Lab Code: K1610470-002
Basis: NA

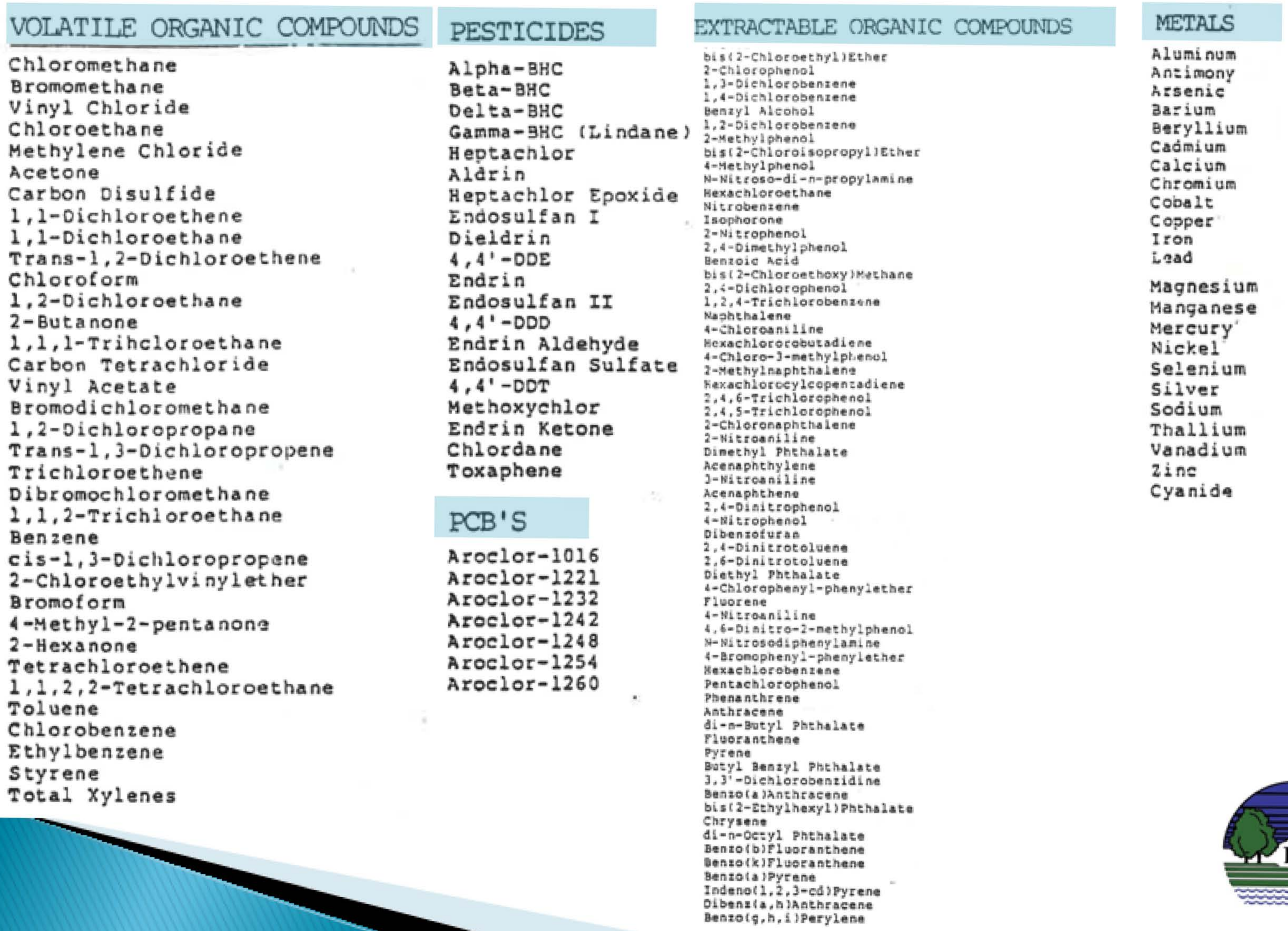
Perfluorinated Sulfonic Acids and Perfluorinated Carboxylic Acids by HPLC/MS

Analysis Method: PFC/537M
Prep Method: EPA 3535A

+9000 PPT PFAS in groundwater at a car wash

Analyte Name	Result		MRL	Dil.	Date Analyzed	Date Extracted	Q
HFPO-DA	ND	U	4.6	1	09/28/16 03:35	9/26/16	*
Perfluorobutanoic Acid	**640**		93	10	09/30/16 04:30	9/26/16	*
Perfluoropentanoic Acid	**3400**		46	10	09/30/16 04:30	9/26/16	*
Perfluorobutane Sulfonate	**5.3**		4.6	1	09/28/16 03:35	9/26/16	*
Perfluorohexanoic Acid	**3500**		46	10	09/30/16 04:30	9/26/16	*
Perfluoroheptanoic Acid	**1200**		46	10	09/30/16 04:30	9/26/16	*
Perfluorohexane Sulfonate	**4.9**		4.6	1	09/28/16 03:35	9/26/16	*
Perfluorooctanoic Acid	**33**		1.9	1	09/28/16 03:35	9/26/16	*
Perfluorononanoic Acid	ND	U	4.6	1	09/28/16 03:35	9/26/16	*
Perfluorooctane Sulfonate	**19**		4.6	1	09/28/16 03:35	9/26/16	*
Perfluorodecanoic Acid	**350**		4.6	1	09/28/16 03:35	9/26/16	*
Perfluoroundecanoic Acid	ND	U	4.6	1	09/28/16 03:35	9/26/16	*
Perfluorodecane Sulfonate	ND	U	4.6	1	09/28/16 03:35	9/26/16	*
Perfluorododecanoic Acid	ND	U	4.6	1	09/28/16 03:35	9/26/16	*
Perfluorooctylsulfonamide	ND	U	4.6	1	09/28/16 03:35	9/26/16	**
Perfluoro-n-tridecanoic acid	ND	U	4.6	1	09/28/16 03:35	9/26/16	*
Perfluoro-n-tetradecanoic acid	ND	U	4.6	1	09/28/16 03:35	9/26/16	*
Perfluoroheptane sulfonate	ND	U	4.6	1	09/28/16 03:35	9/26/16	*
N-ethylperfluoro-1-octanesulfonamide	ND	U	4.6	1	09/28/16 03:35	9/26/16	*
N-methylperfluoro-1-octanesulfonamide	ND	U	4.6	1	09/28/16 03:35	9/26/16	*
2-(N-ethylperfluoro-1-octanesulfonamido)-ethanol	ND	U	4.6	1	09/28/16 03:35	9/26/16	*
2-(N-methylperfluoro-1-octanesulfonamido)	ND	U	4.6	1	09/28/16 03:35	9/26/16	*

Hazardous Substances Analyzed



VOLATILE ORGANIC COMPOUNDS

Chloromethane
Bromomethane
Vinyl Chloride
Chloroethane
Methylene Chloride
Acetone
Carbon Disulfide
1,1-Dichloroethene
1,1-Dichloroethane
Trans-1,2-Dichloroethene
Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trihcloroethane
Carbon Tetrachloride
Vinyl Acetate
Bromodichloromethane
1,2-Dichloropropane
Trans-1,3-Dichloropropene
Trichloroethene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
cis-1,3-Dichloropropene
2-Chloroethylvinylether
Bromoform
4-Methyl-2-pentanone
2-Hexanone
Tetrachloroethene
1,1,2,2-Tetrachloroethane
Toluene
Chlorobenzene
Ethylbenzene
Styrene
Total Xylenes

PESTICIDES

Alpha-BHC
Beta-BHC
Delta-BHC
Gamma-BHC (Lindane)
Heptachlor
Aldrin
Heptachlor Epoxide
Endosulfan I
Dieldrin
4,4'-DDE
Endrin
Endosulfan II
4,4'-DDD
Endrin Aldehyde
Endosulfan Sulfate
4,4'-DDT
Methoxychlor
Endrin Ketone
Chlordane
Toxaphene

PCB'S

Aroclor-1016
Aroclor-1221
Aroclor-1232
Aroclor-1242
Aroclor-1248
Aroclor-1254
Aroclor-1260

EXTRACTABLE ORGANIC COMPOUNDS

bis(2-Chloroethyl)Ether
2-Chlorophenol
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Benzyl Alcohol
1,2-Dichlorobenzene
2-Methylphenol
bis(2-Chloroisopropyl)Ether
4-Methylphenol
N-Nitroso-di-n-propylamine
Hexachloroethane
Nitrobenzene
Isophorone
2-Nitrophenol
2,4-Dimethylphenol
Benzoic Acid
bis(2-Chloroethoxy)Methane
2,4-Dichlorophenol
1,2,4-Trichlorobenzene
Naphthalene
4-Chloroaniline
Hexachlororobutadiene
4-Chloro-3-methylphenol
2-Methylnaphthalene
Hexachlorocylcopentadiene
2,4,6-Trichlorophenol
2,4,5-Trichlorophenol
2-Chloronaphthalene
2-Nitroaniline
Dimethyl Phthalate
Acenaphthylene
3-Nitroaniline
Acenaphthene
2,4-Dinitrophenol
4-Nitrophenol
Dibenzofuran
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Diethyl Phthalate
4-Chlorophenyl-phenylether
Fluorene
4-Nitroaniline
4,6-Dinitro-2-methylphenol
N-Nitrosodiphenylamine
4-Bromophenyl-phenylether
Hexachlorobenzene
Pentachlorophenol
Phenanthrene
Anthracene
di-n-Butyl Phthalate
Fluoranthene
Pyrene
Butyl Benzyl Phthalate
3,3'-Dichlorobenzidine
Benzo(a)Anthracene
bis(2-Ethylhexyl)Phthalate
Chrysene
di-n-Octyl Phthalate
Benzo(b)Fluoranthene
Benzo(k)Fluoranthene
Benzo(a)Pyrene
Indeno(1,2,3-cd)Pyrene
Dibenz(a,h)Anthracene
Benzo(g,h,i)Perylene

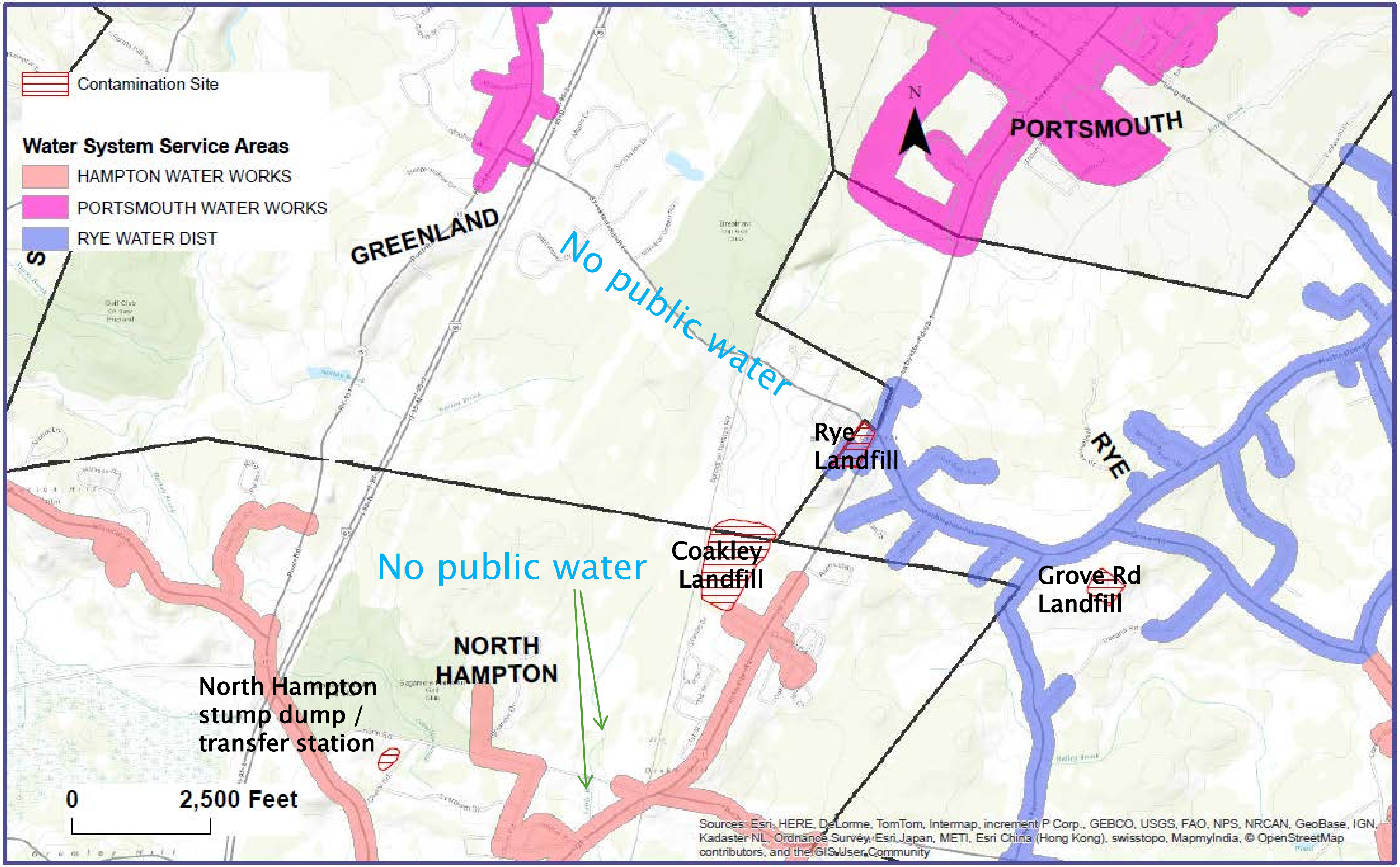
METALS

Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Selenium
Silver
Sodium
Thallium
Vanadium
Zinc
Cyanide

Contaminants of Concern Identified at Coakley Landfill

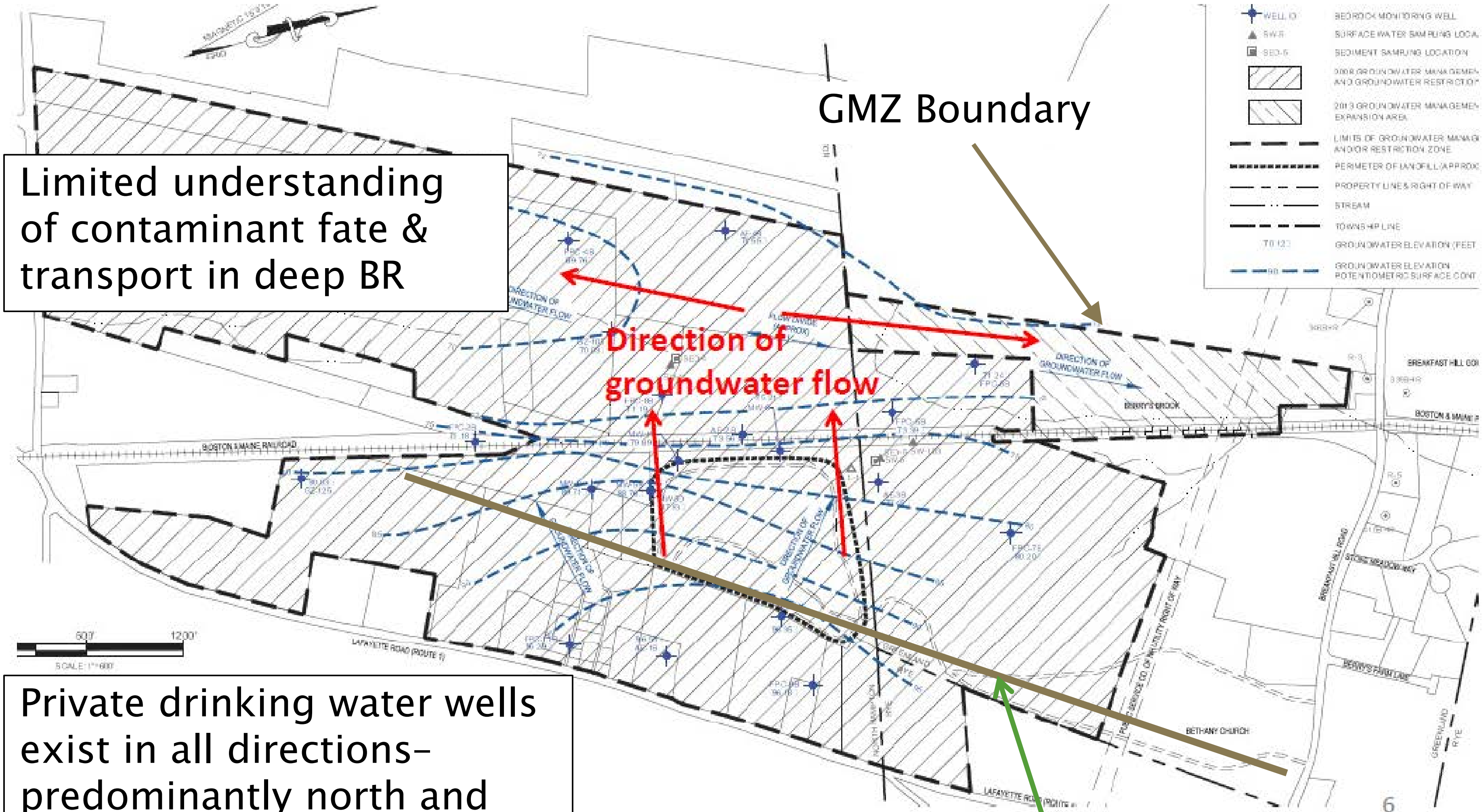
Carcinogenic	Non-carcinogenic
Benzene	2-Butanone (MEK)
Tetrachloroethene	Phenol
Arsenic	Diethyl phthalate
1,4-Dioxane (added 2015)	Chlorobenzene
	Trans-1,2-dichloroethene
	Chromium
	Nickel

Areas with Public Water



Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Conceptual Understanding of OB & Shallow BR Groundwater Flow



GMZ Boundary

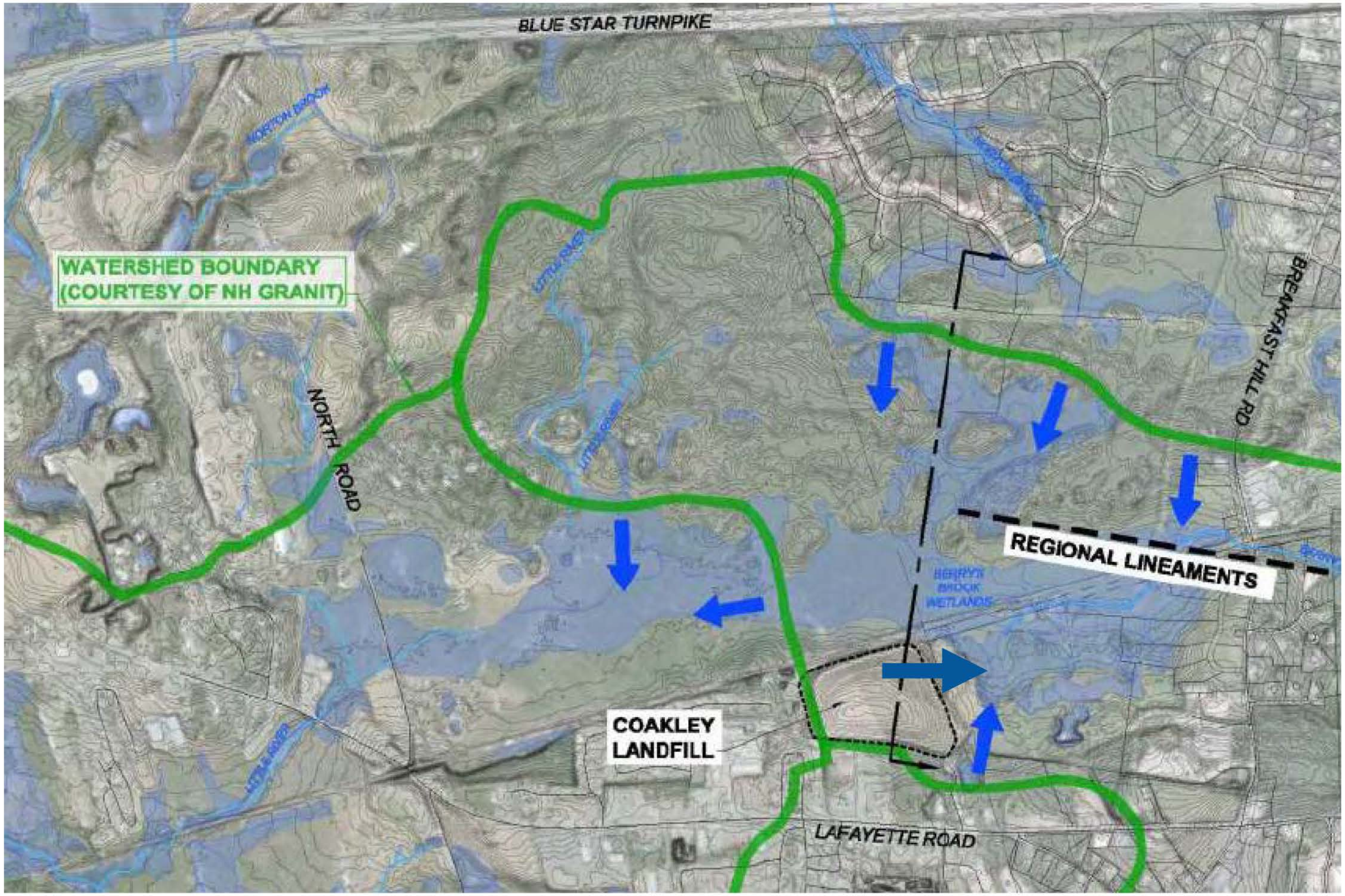
Direction of groundwater flow

Limited understanding of contaminant fate & transport in deep BR

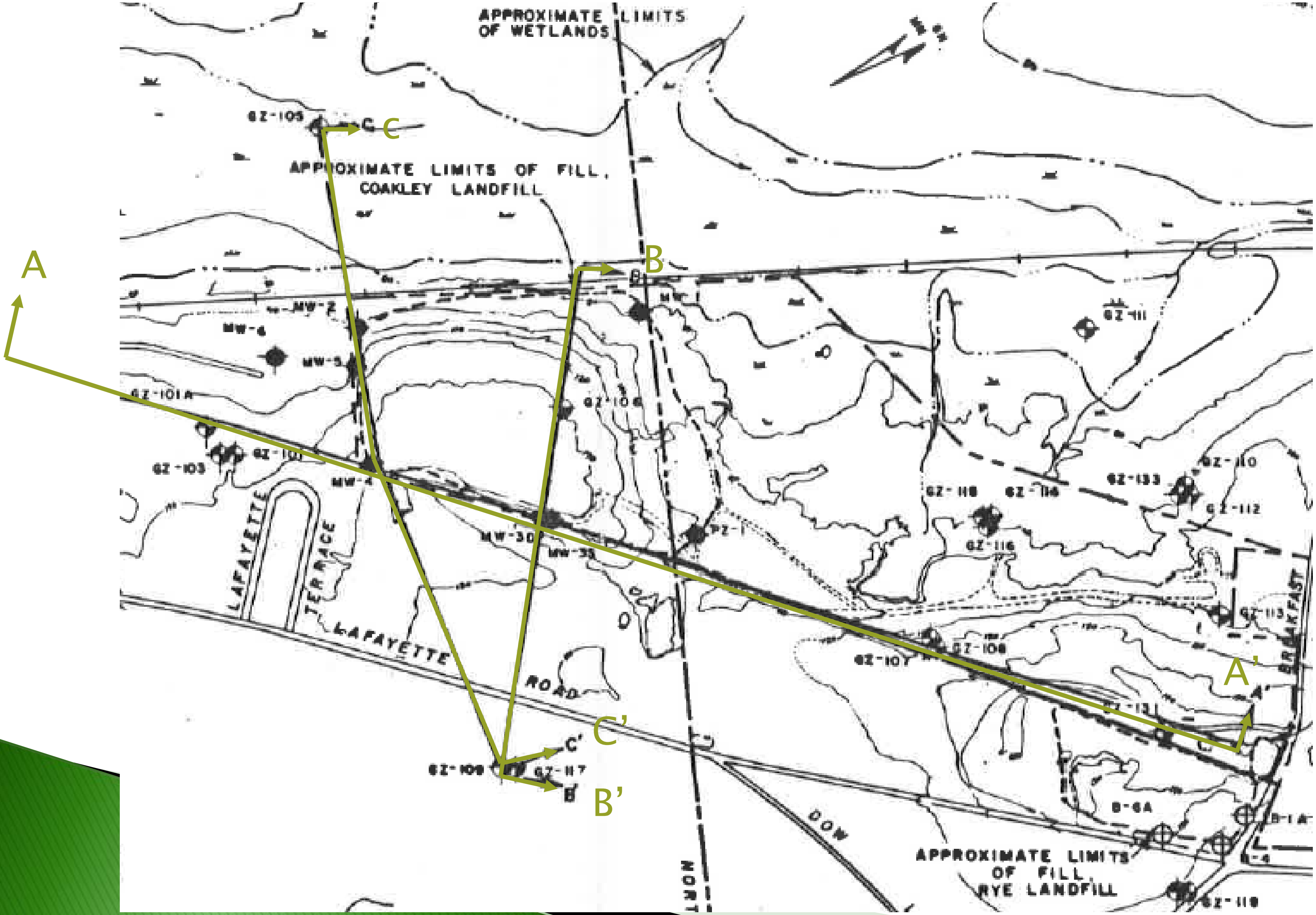
Private drinking water wells exist in all directions– predominantly north and west (Greenland)

Bedrock Ridge (flow divide)

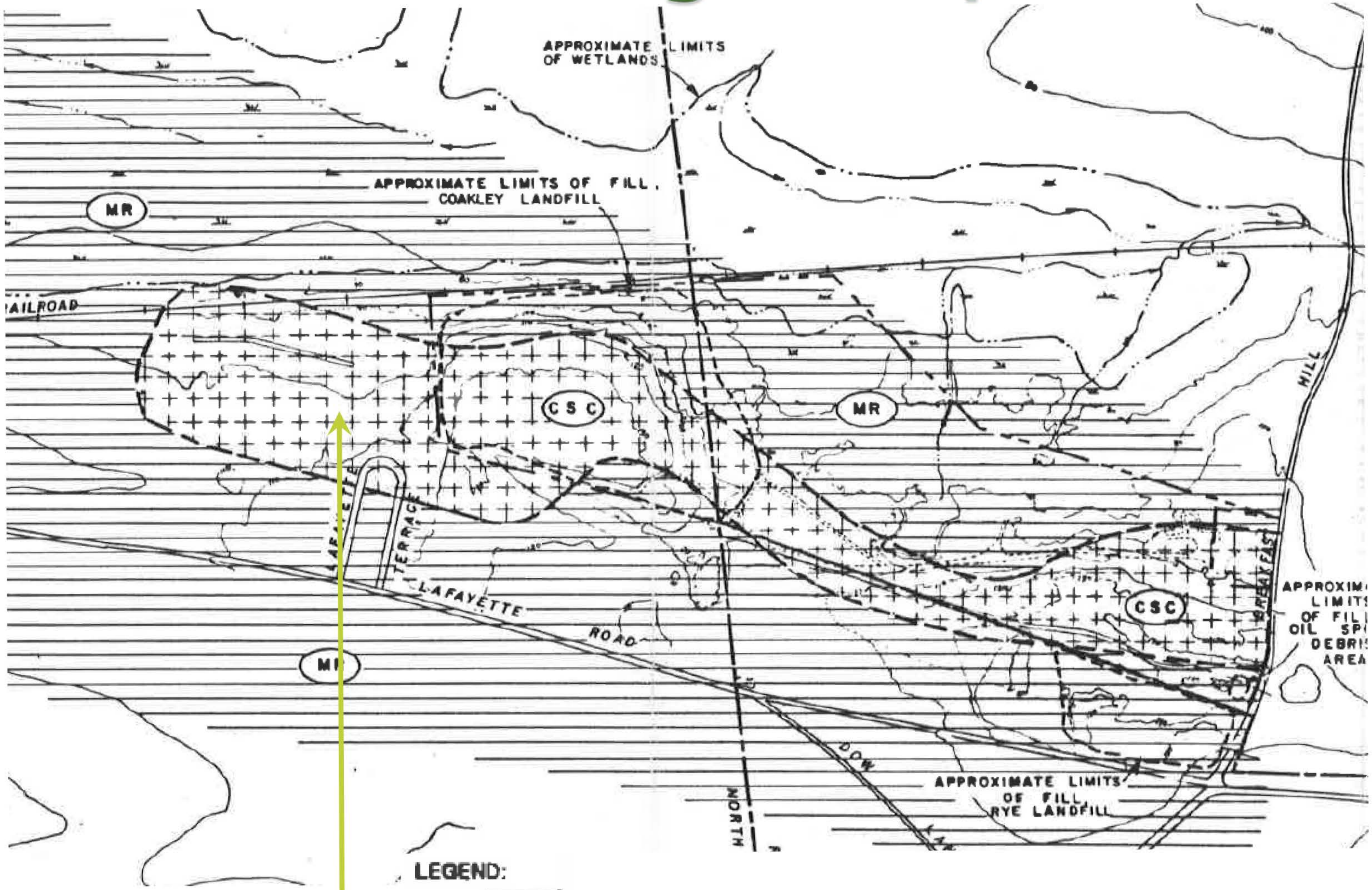
Watershed Boundaries



1988 RI Figure 6
Cross-Section Orientation



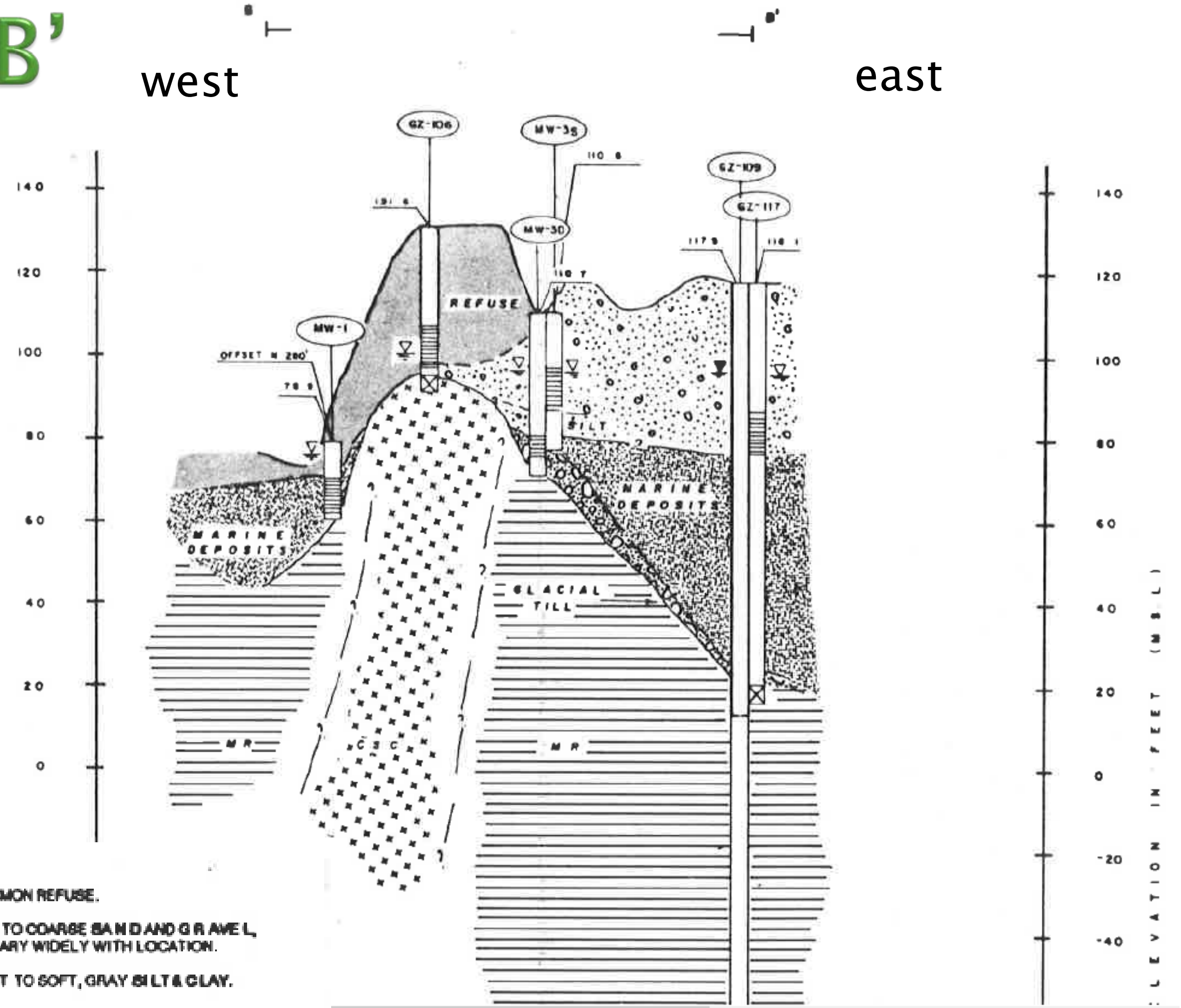
Bedrock Geologic Map ('88 RI)



LEGEND:

MR	**METAMORPHIC ROCKS:** GENERALLY CONSIST OF SOFT TO HARD PHYLLITE, META-GRAYWACKE, QUARTZITE, AMPHIBOLITE, AND SCHIST. THESE ROCKS LIKELY CORRELATE WITH THE RYE GNEISS (LYONS ET AL., 1986).
+++ CBC +++	**CENTRAL SILICIC COMPLEX:** GENERALLY CONSIST OF MODERATELY HARD TO HARD MUSCOVITE-BIOTITE GRANITE, QUARTZ-FELSPAR GRANITE MYLONTE GNEISS, AND VEIN QUARTZ. COMPLEX LIKELY CORRELATES WITH THE BREAKFAST HILL GRANITE AND THE BREAKFAST HILL MEMBER OF THE RYE GNEISS (LYONS ET AL., 1986).

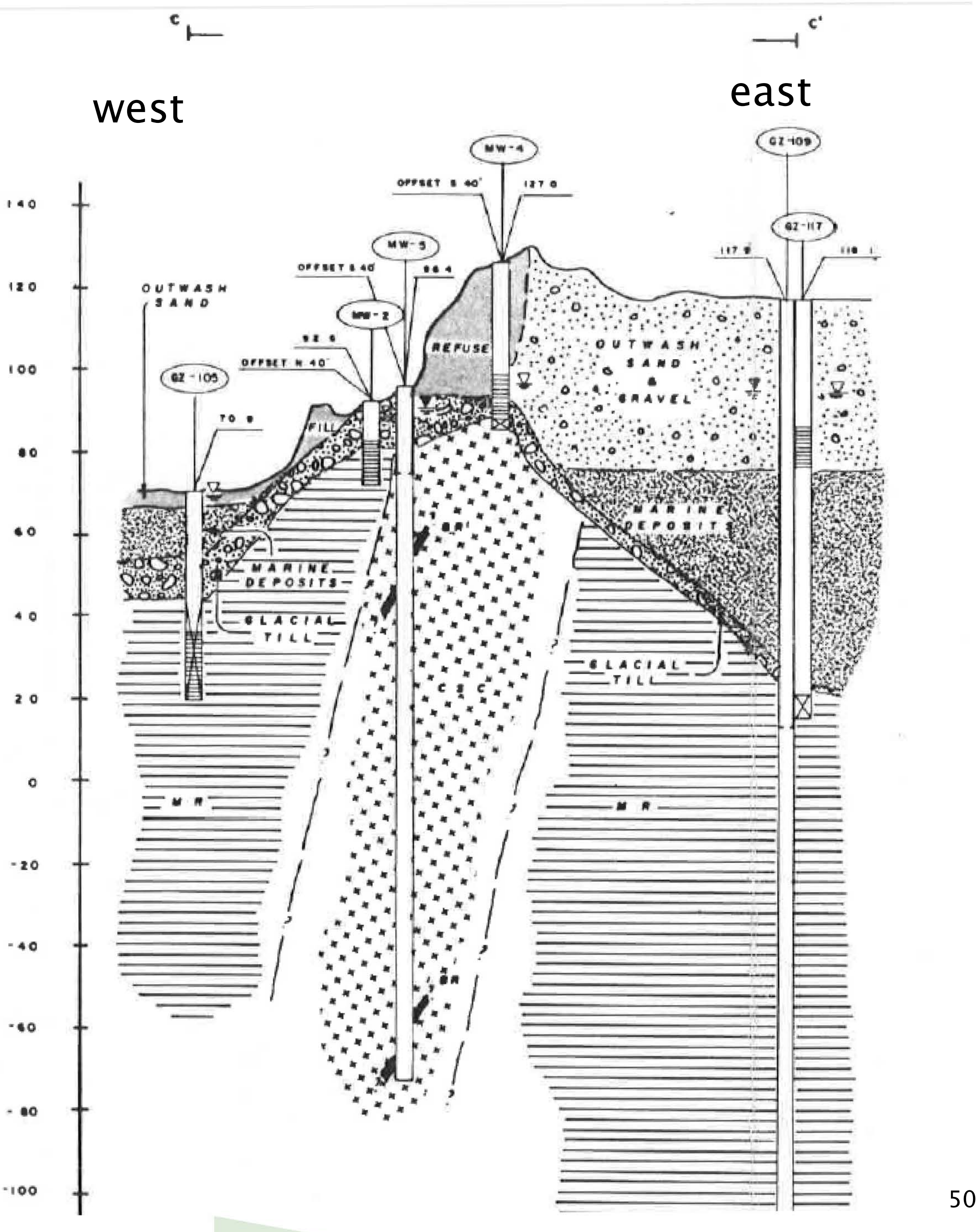
Section B–B’



UNIT DESCRIPTION:

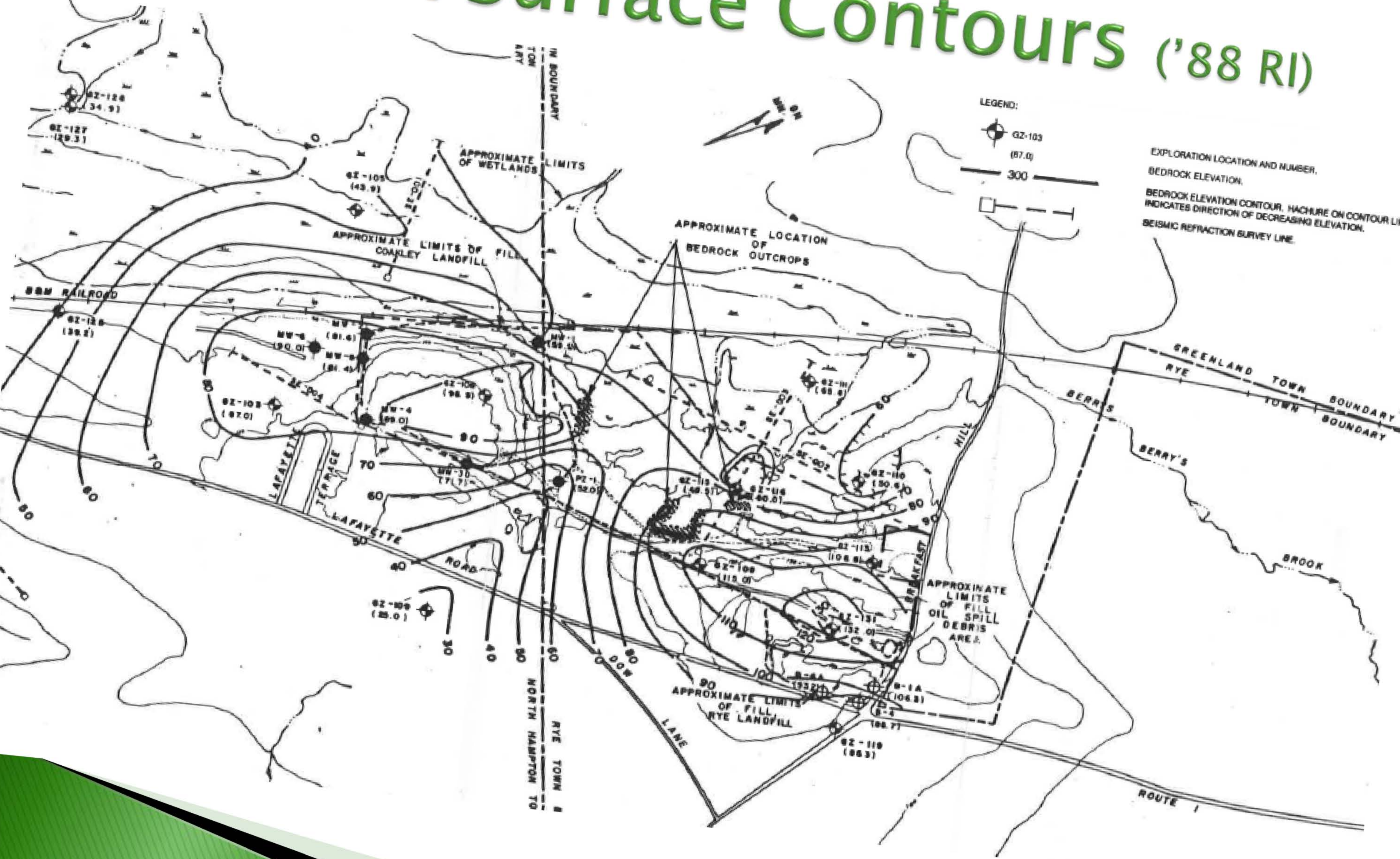
▩	**REFUSE**: PLASTIC, WOOD, METAL, PAPER, AND OTHER COMMON REFUSE.
⁘	**ICE CONTACT SAND AND GRAVEL**: DENSE, BROWN, FINE TO COARSE SAND AND GRAVEL, TRACE SILT. PROPORTIONS OF SAND AND GRAVEL VARY WIDELY WITH LOCATION.
▩	**MARINE DEPOSITS**: MEDIUM DENSE, GRAY CLAY & SILT TO SOFT, GRAY SILT & CLAY. LOCALLY STRATIFIED WITH FINE SAND.
▩	**GLACIAL TILL**: VERY DENSE, BROWN, FINE TO COARSE SAND, SOME FINE TO COARSE GRAVEL, LITTLE SILT.
☰	**BEDROCK M R**: SOFT TO HARD PHYLLITE, META-GRAYWACKE, QUARTZITE, AMPHIBOLITE, AND SCHIST.
⁘	**BEDROCK CSC**: MODERATELY HARD TO HARD MUSCOVITE-BIOTITE GRANITE, QUARTZ-FELDSPAR GRANITE MYLONITE GNEISS, AND VAIN QUARTZ.
■	**BEDROCK BR**: MODERATELY HARD TO HARD BASALT DIKES.

Section C–C'



UNIT	DESCRIPTION:
■	**REFUSE**: PLASTIC, WOOD, METAL, PAPER, AND OTHER COMMON REFUSE.
⁘	**ICE CONTACT SAND AND GRAVEL**: DENSE, BROWN, FINE TO COARSE SA TRACE SILT. PROPORTIONS OF SAND AND GRAVEL VARY WIDELY W
▩	**MARINE DEPOSITS**: MEDIUM DENSE, GRAY CLAY & SILT TO SOFT, GR LOCALLY STRATIFIED WITH FINE SAND.
▩	**GLACIAL TILL**: VERY DENSE, BROWN, FINE TO COARSE SAND, SOME FIN LITTLE SILT.
☰	**BEDROCK M R**: SOFT TO HARD PHYLLITE, META-GRAYWACKE, QUARTZI SCHIST.
⁜	**BEDROCK CSC**: MODERATELY HARD TO HARD MUSCOVITE-BIOTITE GRA GRANITE MYLONITE GNEISS, AND VAIN QUARTZ.
■	**BEDROCK BR**: MODERATELY HARD TO HARD BASALT DIKES.

Bedrock Surface Contours ('88 RI)



Watershed Boundaries