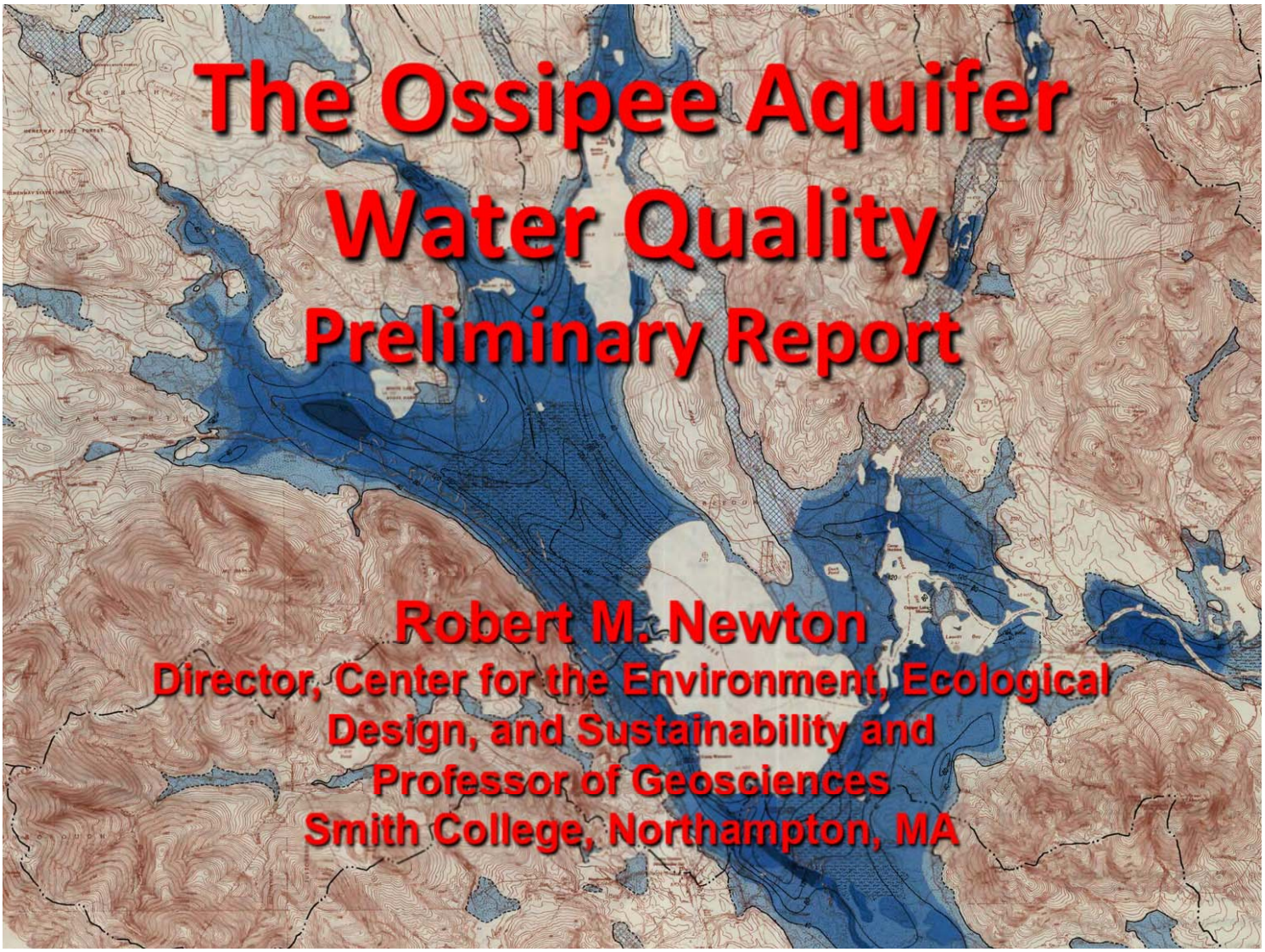
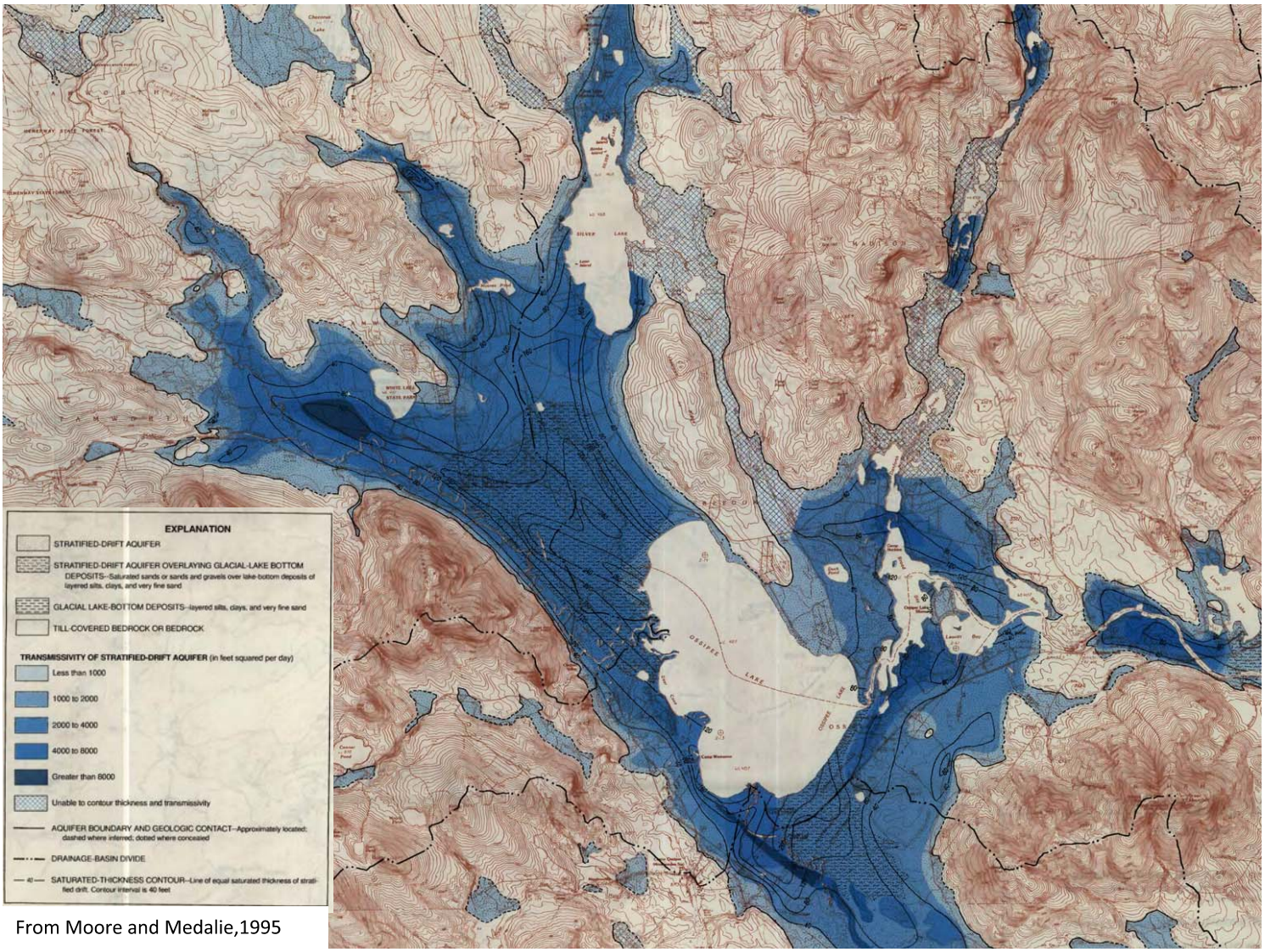


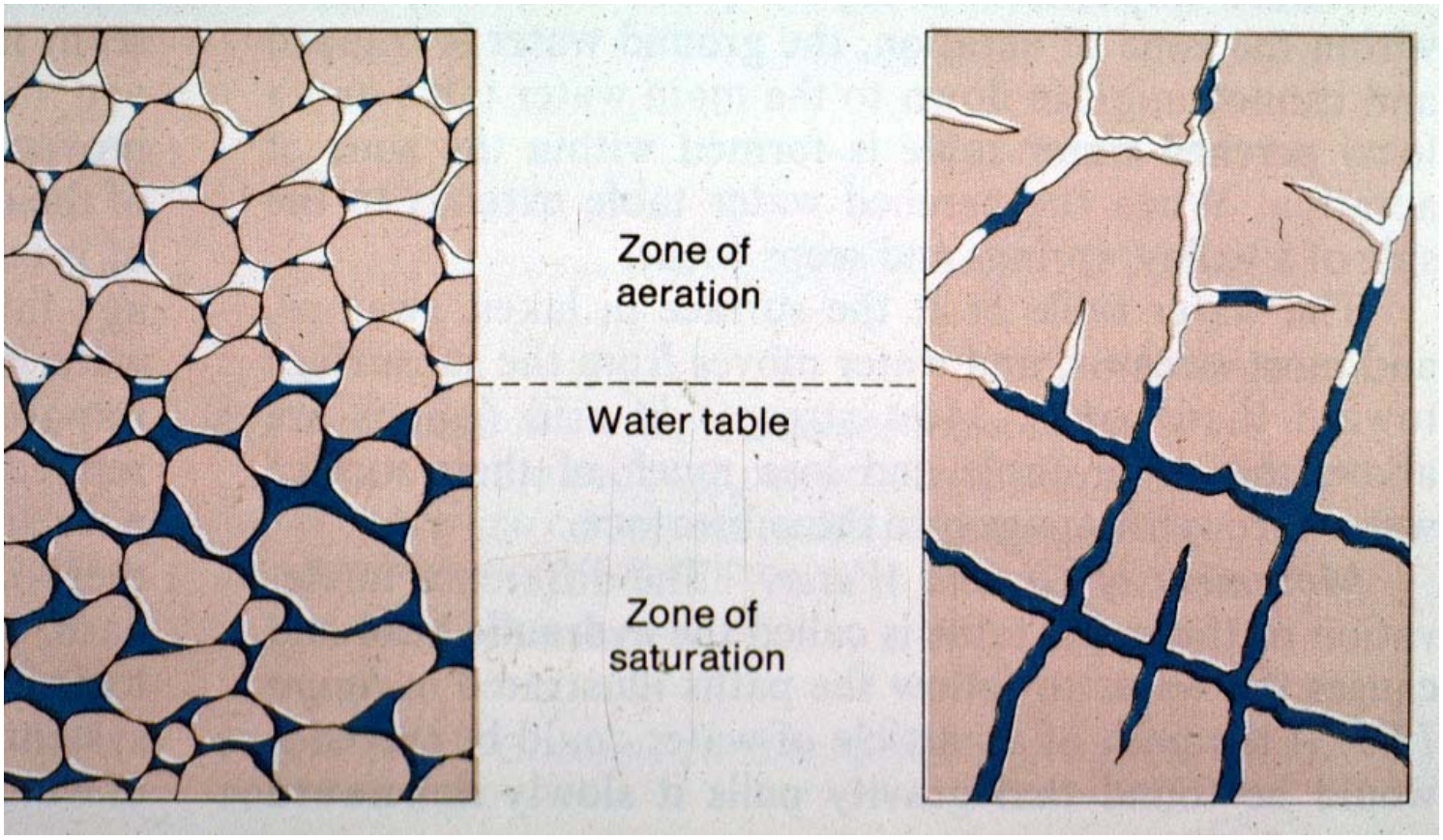
The Ossipee Aquifer Water Quality

Preliminary Report

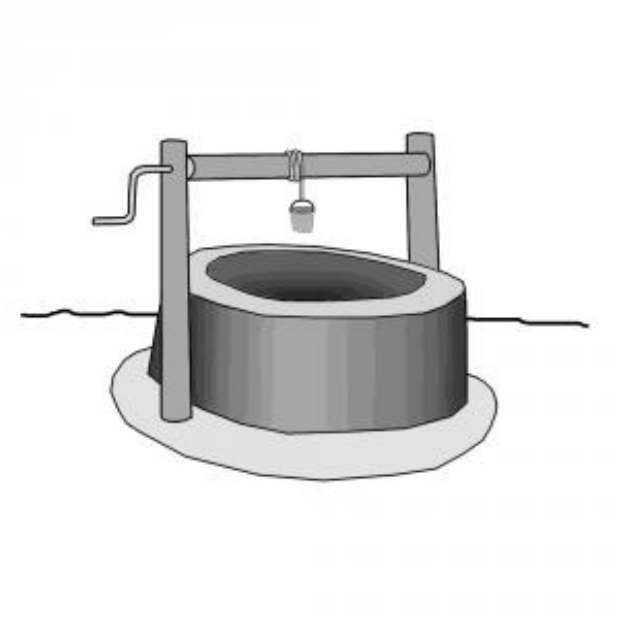
Robert M. Newton
Director, Center for the Environment, Ecological Design, and Sustainability and
Professor of Geosciences
Smith College, Northampton, MA



From Moore and Medalie,1995

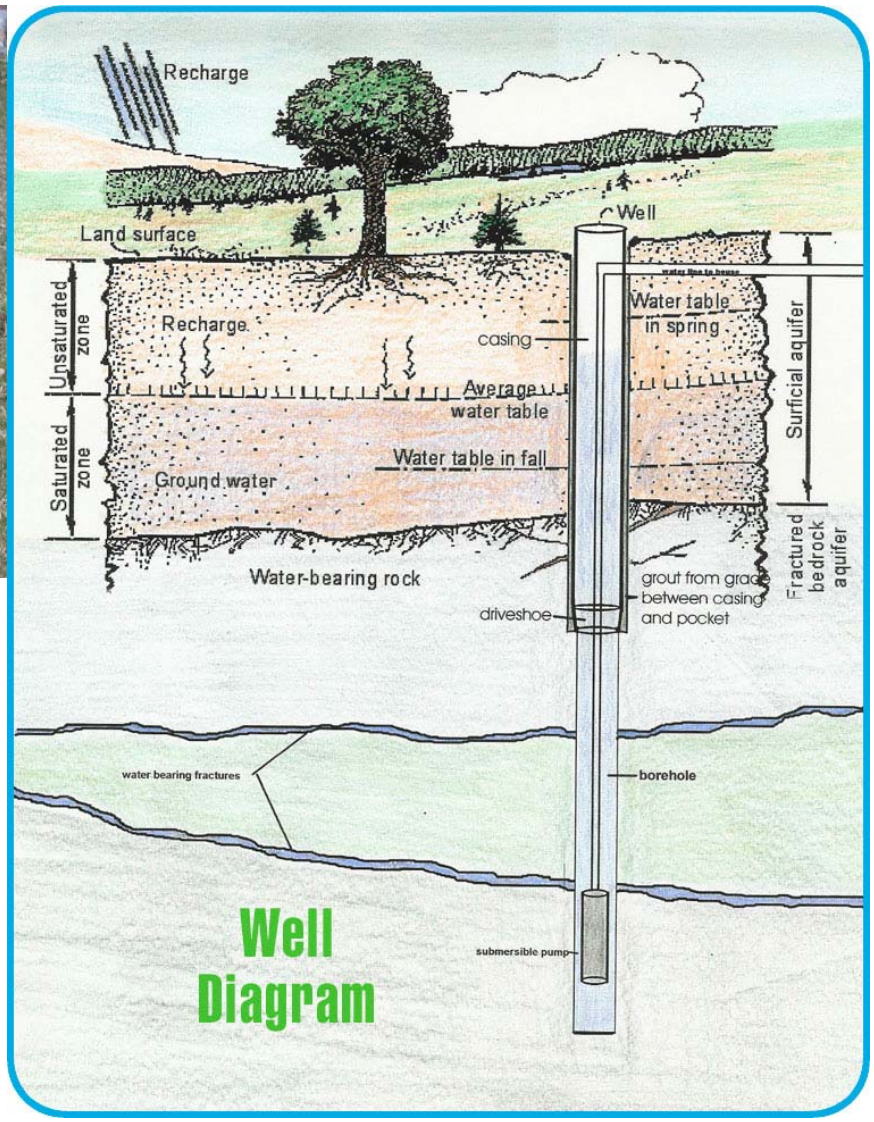

Zone of
aeration
Water table
Zone of
saturation

Well Types



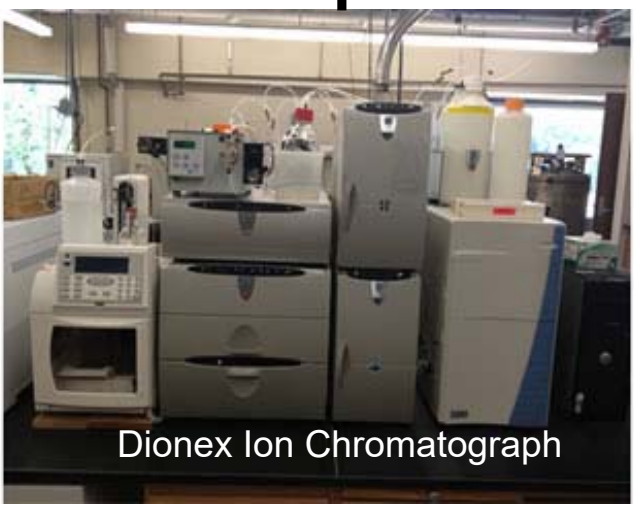

DEPTH 140


GREENS
HOME OF
G WELL

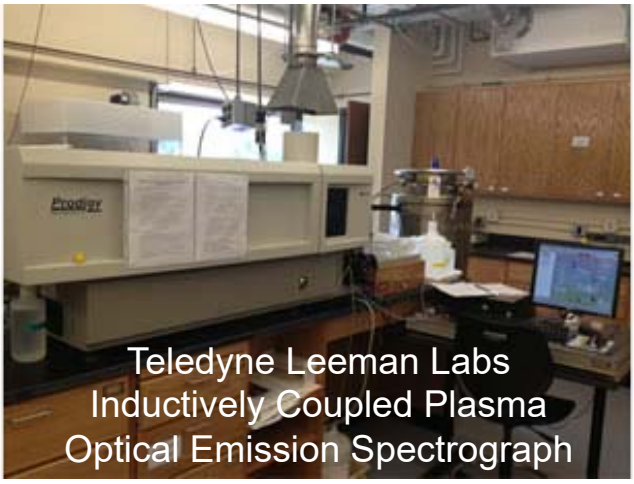

Recharge
Land surface
Well
Unsaturated zone
Saturated zone
Recharge
casing
Water table in spring
Average water table
Water table in fall
Ground water
Surficial aquifer
Fractured bedrock aquifer
Water-bearing rock
grout from grade between casing and pocket
driveshoe
water bearing fractures
borehole
submersible pump
Well Diagram


NORTHINGTON

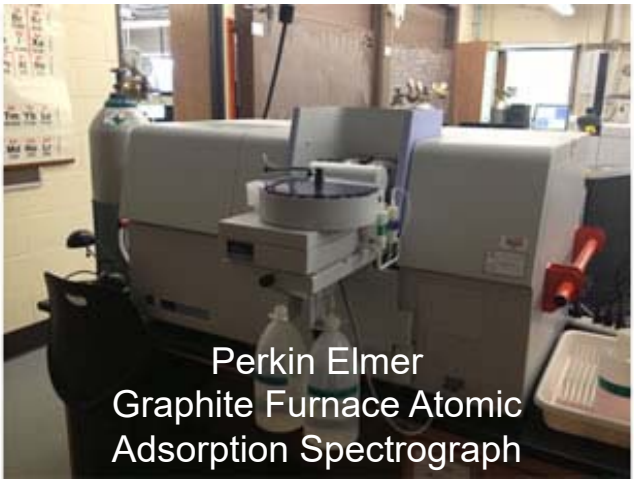
Center for Aqueous Biogeochemistry Research



Dionex Ion Chromatograph



Teledyne Leeman Labs
Inductively Coupled Plasma
Optical Emission Spectrograph



Perkin Elmer
Graphite Furnace Atomic
Adsorption Spectrograph

Agilent
Gas Chromatograph/Mass
Spectrometer

Results Summary

- 15% impacted by road salt
- 5% have initial lead values above MCL
- 25% exceed copper MCL
- Although no VOC above MCL, 10% detectable

Measured Parameters

- pH, alkalinity, specific conductance
- Ca, Mg, Na, K, $SiO_{2\ aq}$
- F, Cl, NO3, SO4
- Arsenic, lead, copper, zinc, aluminum, iron, manganese
- Stable Water Isotopes (delta ^{18}O and delta ^{2}H)
- Volatile Organic Compounds (VOC)

Water Hardness

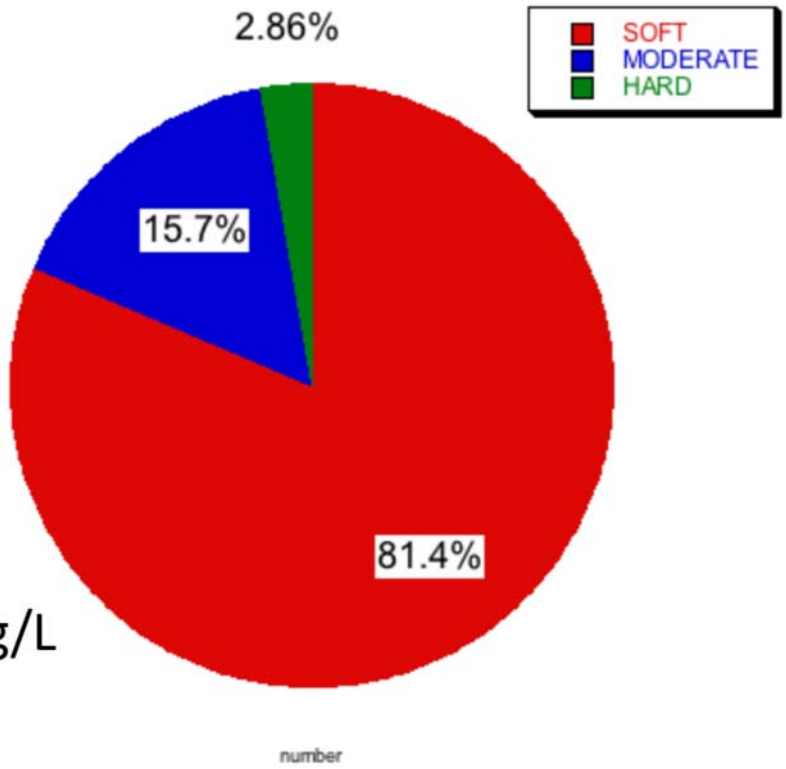
70 samples

Number

- Soft = 57
- Moderate = 11
- Hard = 2

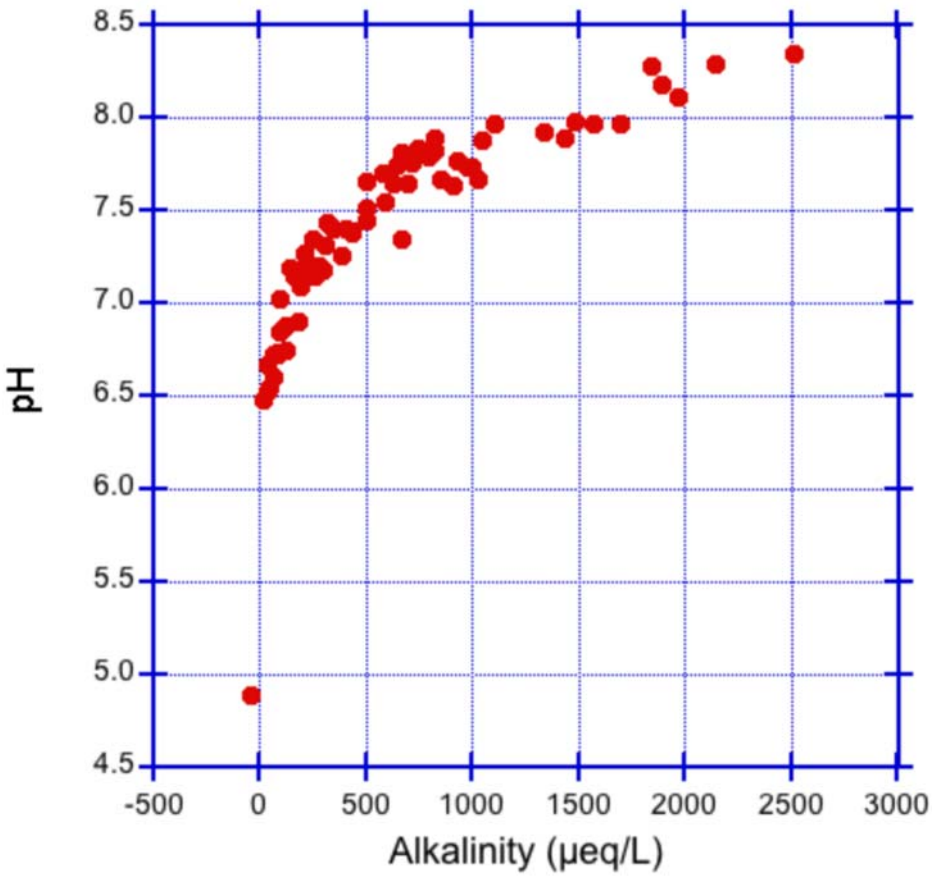
Average Hardness

- Soft = 24.16mg/L
- Moderate = 84.41 mg/L
- Hard = 150.6 mg/L



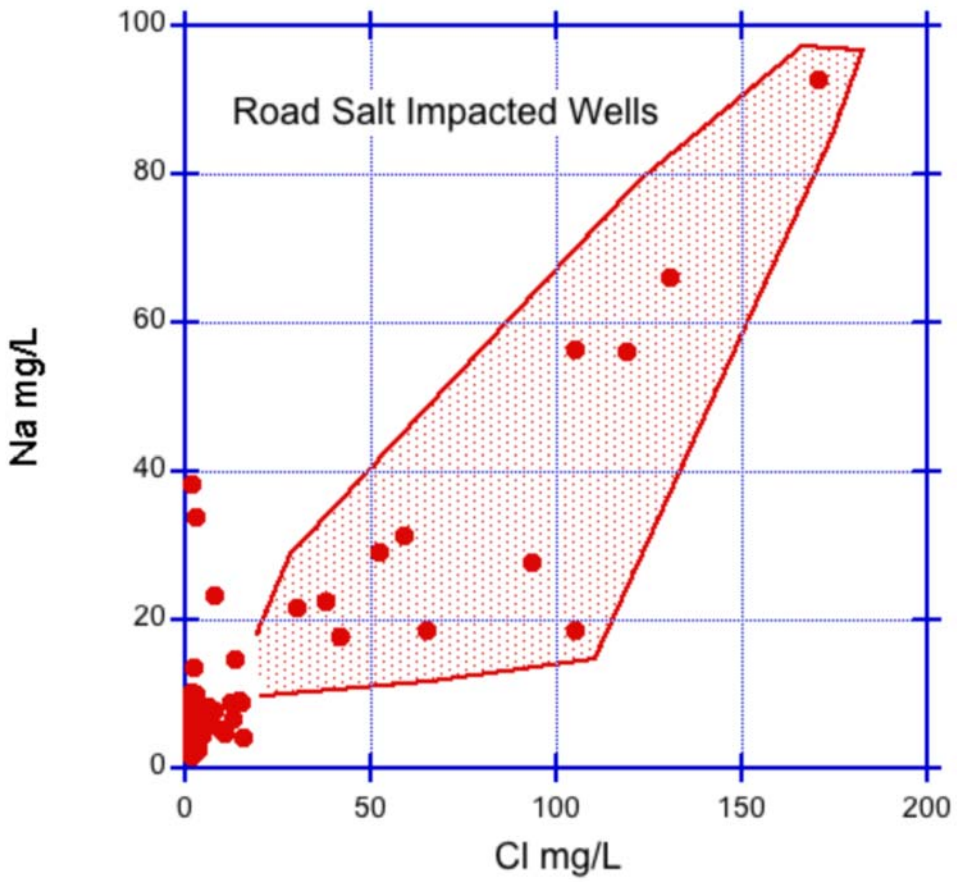
pH and Alkalinity

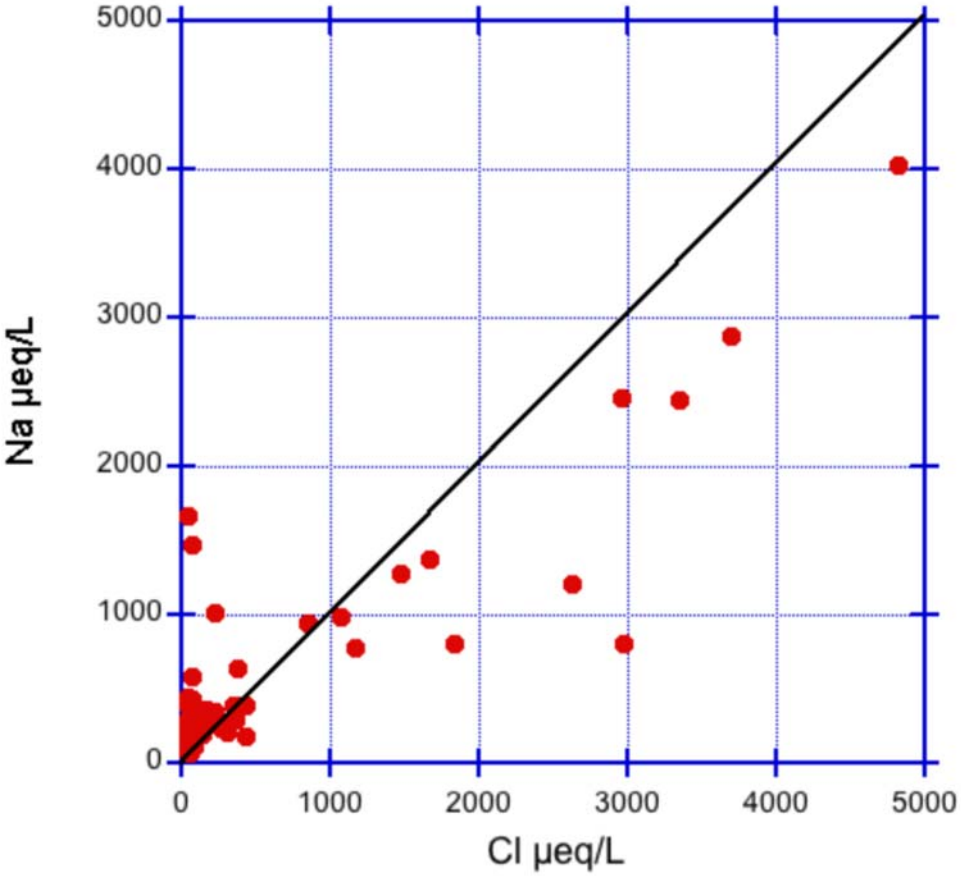
- pH varies from 4.89 to 8.34
- Alkalinity from -42µeq/L to 2,550µeq/L (127.5mg/L as $CaCO_3$)
- Acidity associated with shallow driven or dug wells.
- Higher alkalinity associated with calcite bearing bedrock (metamorphic rocks)
- Lead problems associated with lower pH and alkalinity groundwaters


pH
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
-500
0
500
1000
1500
2000
2500
3000
Alkalinity (µeq/L)

Road Salt Impacts

- Mean SODIUM =12.5 mg/L : max 92.8mg/L
- 12 samples above SODIUM 20mg/L recommendation
- Mean CHLORIDE = 17.1mg/L : max 171mg/L (MCL=250mg/L)
- Approximately 12 samples impacted by road salt.


Road Salt Impacted Wells
Na mg/L
Cl mg/L
0
20
40
60
80
100
0
50
100
150
200


5000
4000
3000
2000
1000
0
Na µeq/L
0
1000
2000
3000
4000
5000
Cl µeq/L

Lead

- 5 samples exceeded the 15ppb lead MCL from first flush samples (average conc = 18.54ppb)
- No second flush samples exceeded standard

First Sample	Second Sample
14.68	2.26
18.85	0.57
27.60	1.89
15.32	1.35
16.23	2.12

Copper

- 18 samples exceeded the 1.3ppm copper MCL from first flush samples
- Average copper concentration of those 18 samples = 3.38ppm

Flouride

- No samples exceeded the 4ppm MCL
- Average concentration = 1.01ppm
- Range 0.17 – 2.99ppm

Volatile Organic Compounds

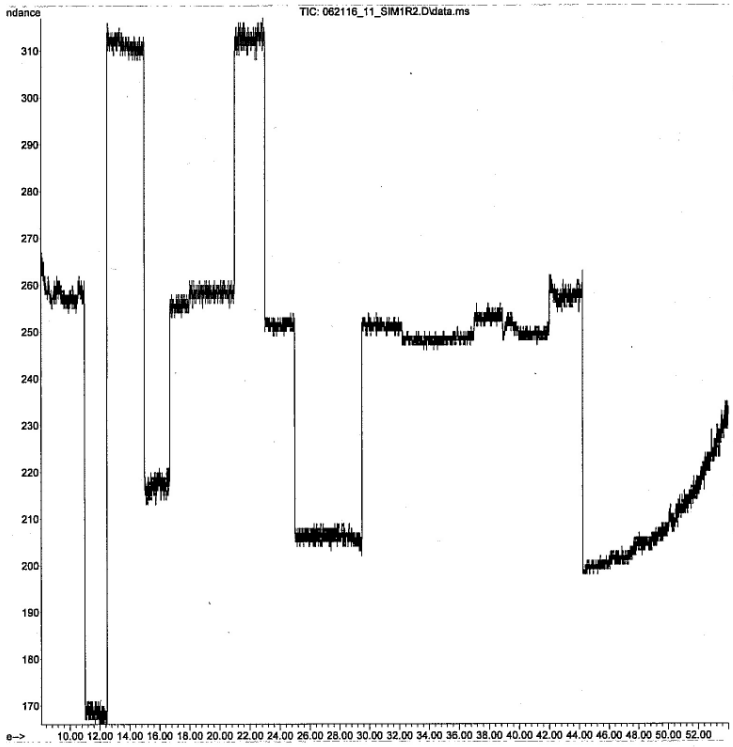
- No samples exceeded the MCLs
- Disinfection byproducts
- BTEX - Benzene, Toluene, Ethylbenzene, Xylene
- MBTE
- 8 of 73 samples detected VOC (10%)

Area Percent Report

Data Path : C:\msdchem\2\DATA\
Data File : 062116_11_SIM1R2.D
Acq On : 21 Jun 2016 21:11
Operator :
Sample : 11
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration Parameters: autoint1.e
Integrator: ChemStation

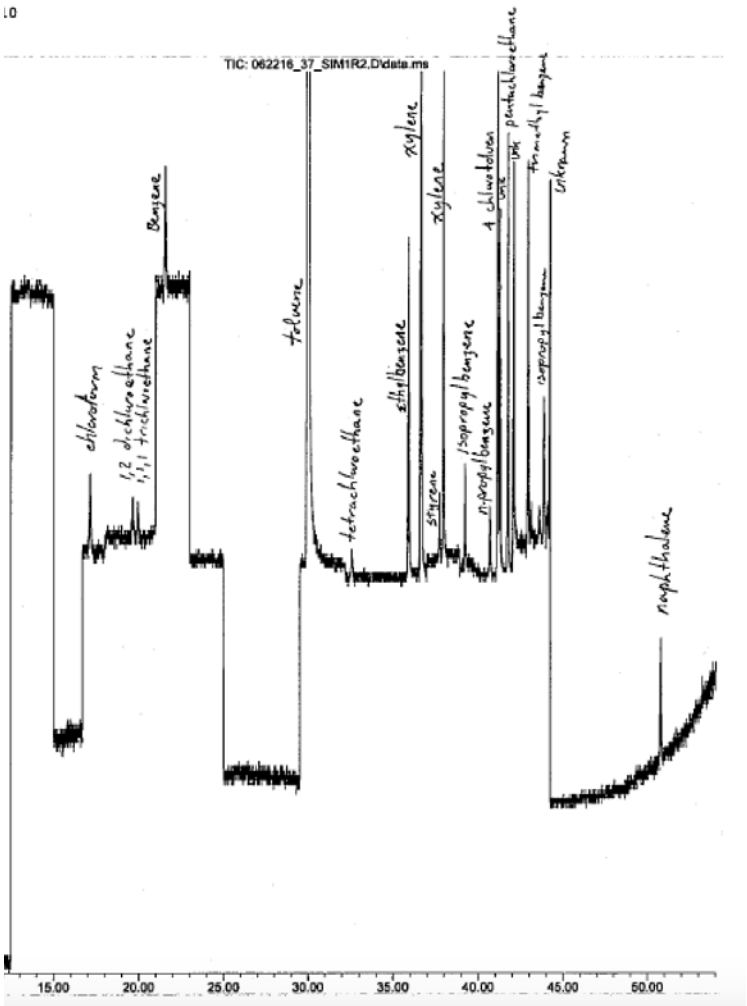
Method : C:\MSDCHEM\2\METHODS\VRX_VOC060216R2_SIM_R2.M
Title :

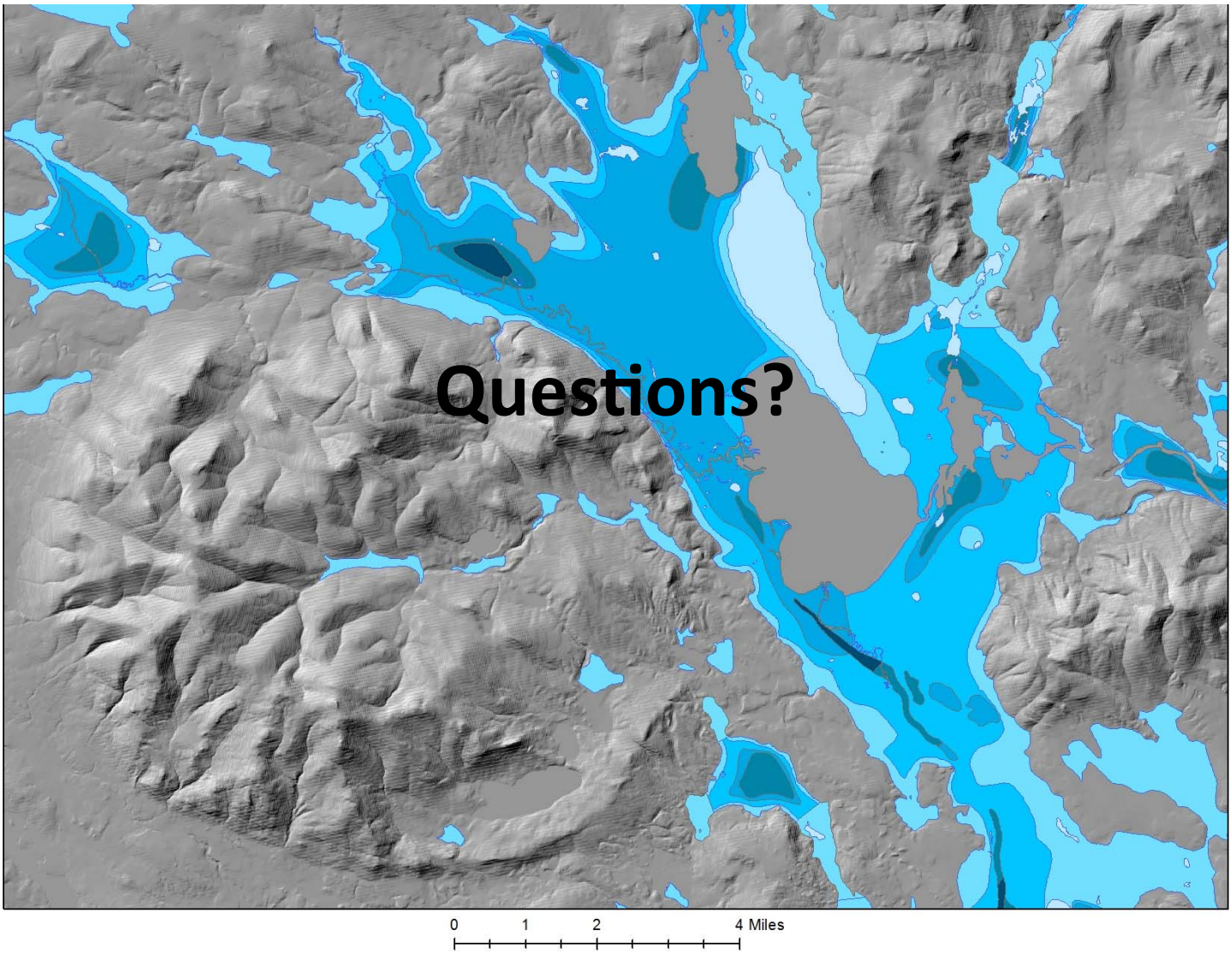


X_VOC060216R2_SIM_R2.M Tue Jun 21 22:05:22 2016 Page: 2

:\msdchem\2\data\062216_37_SIM1R2.D

2 Jun 2016 23:55 using AcqMethod VRX_VOC060216R2_SIM_R2.M
GCMS and HS
17
10




Questions?
0
1
2
4 Miles