

# Water Resources Management Division's Groundwater Resources Section –

An Overview

WRMD Divisional Meeting March 30, 2017



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Department of Environment & Conservation What is Groundwater?



Source: Environment Canada



#### What is Groundwater? (con't)

#### Aquifers and wells



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#### Basics of Groundwater Where is groundwater found?



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Department of Environment & Conservation

Source: Environment Canada



#### Basics of Groundwater (con't)

Fractures can be highly variable due to different bedrock geology



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#### Basics of Groundwater (con't)



#### Geology in Newfoundland is <u>very</u> complex

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#### Wells drilled in the same development can have different yields



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# A well installed too close to a neighboring well can dewater fractures



WELLS "A" AND "B" PUMPING

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### Groundwater and Wetlands



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#### How can groundwater pumping affect streams?



Not to Scale

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### Groundwater in Newfoundland and Labrador

- Source of drinking water to nearly 40% of the population
- More than 27,000 drilled wells and at least that many dug wells in the province
- Used in every community and cottage area
- Preferred water supply in rural areas sometimes the ONLY water supply in rural areas

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- Source of water for growth in NE Avalon
- Over 300 public wells in the province servicing over 90 communities

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### Mandate

- Responsible for the conservation, development, control, improvement, and proper utilization of the groundwater resources of the province
- Oversee Sections 39-42, 53-63 of the Water Resources Act

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## Goals and Objectives

- Ensure the protection of public health through proper well construction and maintenance.
- Regulatory clarity for groundwater drillers, system operators and others.
- Develop partnerships and promote stewardship.

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# **Drilled Wells**

- AKA "Artesian" wells
- Well Drilling Regulations (2003)
  - Establishes licencing and drilling standards
  - ensures all drillers and their wells meet construction standards to protect health

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**Drilled Well** 



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# Dug Wells

- Currently not under ENV mandate.
- Can only estimate number more than 20,000 province-wide.
- Groundwater Section still addresses inquiries about dug wells by public.

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## Dug Wells (con't)







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### The Groundwater Section – Who We Are:

- Manager
  - Dorothea Hanchar, M.Sc., P.Geo.
- Environmental Scientist
  - Angela Buchanan, M.Sc., G.I.T.

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Department of Environment & Climate Change "Good things come in small packages"



### What We Do

- Wellhead protection and source water protection
- Permits and licencing (nondomestic well permits; development activity permits; drillers licences)
- Source water sampling for Drinking Water program
- Technical reviews (ILUC, Crown Lands referrals, Environmental Assessments)
  - Numerous EA projects require Groundwater Section review - i.e. mining projects, industrial sites, etc.
- Technical support for the Department (Drinking Water Program, Pollution Prevention, Water Quality Section, etc.)
- Briefings to Minister/Executive
  on Groundwater issues
- Letters/Memos/Information Notes
- Technical support/advice to other government departments, municipalities, academia, and public on hydrogeology, groundwater issues

- Review aquifer test results for PWSW, other non-domestic wells, Level II groundwater assessments
- Groundwater Assessment studies for unserviced subdivisions
  - Review and recommendations
- Update Guidelines (e.g. aquifer tests, well sealing)
- Policy Directives
  - Geothermal, Wellhead Protection areas
- Projects
  - Sea-water intrusion; Private Well water quality
- Complaints/Investigations
  /Information Requests
  - ~100 per year
  - Inspections performed as required
  - Both drilled and dug wells
- Outreach and Communication Conference presentations; Town Hall meetings; talks to MUN/MI/schools; 22

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### Groundwater in the News

#### The Telegram

#### Poison in the water

Ashley Fitzpatrick Published on January 24, 2015

> For years — decades — people living throughout New World Island have poisoned themselves without knowing it.



Christy Janes Published on March 04, 2015

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### Arsenic

- Naturally occurring in rocks, soil.
- Not very soluble in "natural waters"
  - the pH of the water has to be above 8 for any leaching to be observed for arsenic (T. Cheng, 2014).
  - More common (naturally) in groundwater.
  - Surface water leaching from tailings ponds; agricultural practices; other anthropogenic causes.



# Arsenic (con't)

- Arsenic contamination primarily is a groundwater problem although some surface waters also are affected.
- In groundwater, only inorganic arsenic species in the form of arsenite (As (III)) and arsenate (As(V)) are significant.
- As (III) harder to treat than As(V)



#### Areas of Potential Arsenic Concentration in Well Water



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**Figure 8.** Location of groundwater-quality samples in the Gander Bay area. Results of the analyses indicate that most of the groundwater samples exceed the Guidelines for Canadian Drinking Water Quality of 0.01 mg/L. Legend as in Figure 4.

**Groundwater Probability Map** Newfoundland Labrador Mineral Occurrence Probability Kriging As (mg/L)  $\bigcirc$ Antimony 0.00 - 0.10 Arsenic 0.10 - 0.20 Bery  $\bigcirc$ 0.20 - 0.30 Copper 0.30 - 0.40 Gold  $\bigcirc$ 0.40 - 0.50 ron 0.50 - 0.60 Lead 0.60 - 0.70 Zinc 0.70 - 0.80 Twillingat 0.80 - 0.90 0.90 - 1.00 Lumsden Kiometres

Figure 18. Arsenic probability map–Mineral Occurrence.

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#### Water woes in Torbay: Homeowner's well runs dry, blames nearby construction

CBC News Posted: Sep 16, 2015 5:33 PM NT | Last Updated: Sep 16, 2015 7:26 PM NT



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Water woes in Torbay 1:44

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#### Re: Sheep paddock in former garage adjacent to a Public Water Supply Well

It has come to the attention of the Department of Environment and Conservation, Water Resources Management Division, that you have converted a garage on your property to house sheep. This structure is less than fifteen feet from the public water supply well for the Town of Colliers, and falls within the designated Wellhead Protected Water Supply area (WPWSA) for this well. Keeping sheep is not an approved activity to be accommodated within a WPWSA.

Please make arrangements to remove the sheep as soon as possible. Failure to do so may result in further action from this department.

If you have any questions regarding this issue, please contact me at 709-729-2539.

Sincerely, Dozo theo-Hanced

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Låbrador

Department of Environment and Climate Change Water Resources Management Division Drinking Water Program

#### For Wellhead

#### Protection Areas, too!



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# Challenges

- Staffing (more work than we can manage)
- Develop policies and guidelines
  - To address specific knowledge shortfalls
- Strengthen community stewardship
  - Work with communities which rely on groundwater
  - Communications plan
  - Public Relations blitz
- Knowledge Gaps
  - Private well water quality
  - Observation Well Network
  - Aquifer mapping
  - Salt-water intrusion threats
  - Climate Change Issues

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Savage Chickens

by Doug Savage

BETYOU THINK THIS NO, IT'S Carol as Dur Salage GLASS IS HALF EMPTY, HALF BUT I BET FULL THERE'S ARSENIC DON'T YOU? IN IT www.savagechickens.com

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