

WORKSHOP

Knowledge Transfer and Exchange on Nanaimo Lowland Groundwater

Nanaimo, British Columbia



RESULTS BOOK

March 2018



This knowledge transfer workshop pertained to the results of the Nanaimo Lowland Groundwater Study, and has been made possible through funding from the Geological Survey of Canada (GSC). It is the result of a collaborative effort between the Quebec Groundwater Network (Réseau québécois sur les eaux souterraines; RQES), the GSC, the Regional District of Nanaimo (RDN), the BC Ministry of Forests, Lands, and Natural Resource Operations (FLNRO), the BC Ministry of Environment and Climate Change Strategy (MoE), and the Université du Québec à Trois-Rivières (UQTR) Landscape Ecology and Planning Chair.

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The RQES is pleased to present the results of the workshop, Knowledge Transfer and Exchange on Nanaimo Lowland Groundwater, which took place on February 28 and March 1st , 2018, in the facilities of Vancouver Island University in Nanaimo. This book presents the results of the activities carried out during the workshop.

We would like to thank all of the participants who, through their interest and involvement, have made this workshop conducive to exchange and collaboration between the various stakeholders.

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Workshop program

Objective

The workshop aimed to present and contextualize new hydrogeological information produced by the GSC Nanaimo Lowland Groundwater Study, and to explore how it can support land-use planning issues. More specifically, it aims to:

- Highlight the main findings of the Nanaimo Lowland Groundwater Study
- Improve participants' understanding of hydrogeological concepts and aquifer characteristics in the region
- Enable participants to read maps and use the GIS data produced by the Nanaimo Lowlands Groundwater Study
- Evaluate the usefulness of hydrogeological information in decision-making

AGENDA

DAY 1 - FEBRUARY 28TH

8:30 - 10:00 am

Presentations of hydrogeological characteristics in the Nanaimo Lowlands (formal presentations)

Coffee Break

10:15 am - 12:15 pm

Learning how to understand the information generated by the GSC study (workbook exercises in subgroups)

LUNCH

1:30- 3:30 pm

Discovering and using the data in ArcGIS (ArcGIS exercises in a GIS lab in partners)

3:30-4:30 pm

Brainstorming the hydrogeological information needed to address groundwater protection and management issues (part 1) (workbook exercises in small groups)

DAY 2 - MARCH 1ST

8:30-9:45 am

Brainstorming the hydrogeological information needed to address groundwater protection and management issues (part 2) (discussion in subgroups and formal presentation)

Coffee Break

10:00 am - 12:15 pm

Geoprocessing steps and sharing results (ArcGIS exercises in partners and group discussion)

LUNCH

1:30 - 2:30 pm

Evaluating the usefulness of hydrogeological information in decision-making (individual exercise)

2:30 - 3:30 pm

Identifying ideas of how to improve the usefulness of hydrogeological information (subgroup exercises)

3:30 - 4:00 pm

Closing discussion

Participants

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Magee	Lynn	Regional Drinking Water Coordinator	Island Health	Lynne.Magee@viha.ca
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Facilitators

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Part 1

UNDERSTANDING HYDROGEOLOGICAL INFORMATION



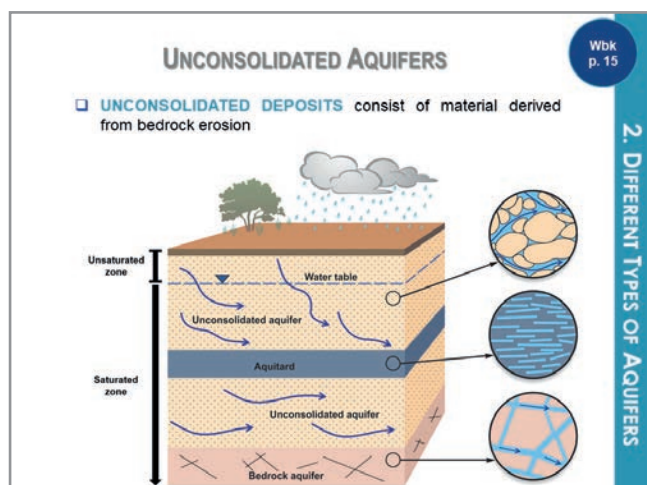


Fundamentals of hydrogeology

Yohann Tremblay

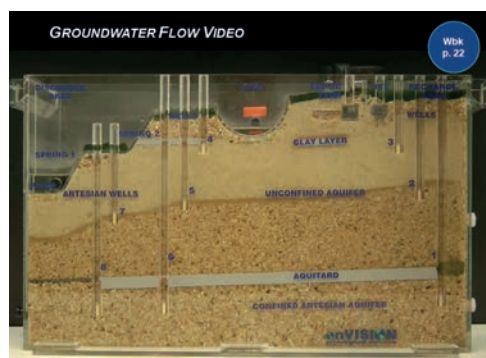
Réseau québécois sur les eaux souterraines (RQES)

[Click here for the presentation](#)

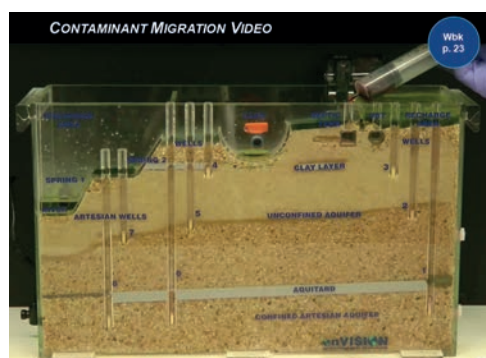


Hydrogeologic model

[Click here for the video \(groundwater flow\)](#)



[Click here for the video \(groundwater contamination\)](#)





Highlights of the Nanaimo Lowland Groundwater Study

Daniel Paradis

Geological Survey of Canada (GSC)

[Click here for the presentation](#)



Regional District of Nanaimo Groundwater Initiatives

Julie Pisani

Regional District of Nanaimo (RDN)

[Click here for the presentation](#)



Part 2

DISCOVERING AND USING GEOSPATIAL HYDROGEOLOGICAL DATA



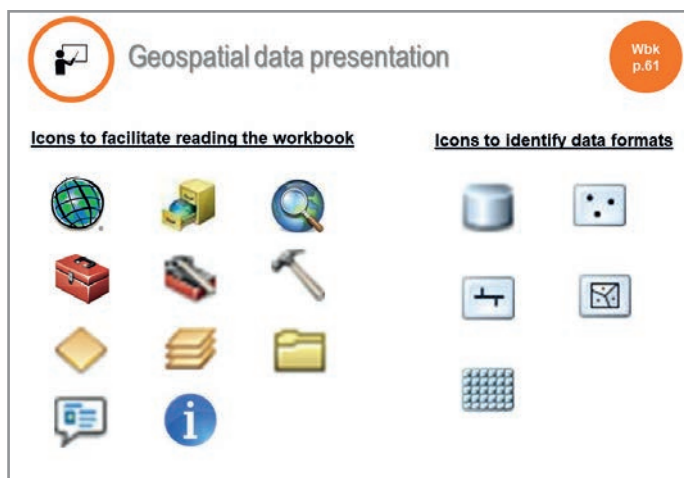


Geospatial data presentation

Yohann Tremblay

Réseau québécois sur les eaux souterraines (RQES)

[Click here for the presentation](#)





Interpreting the available data to understand the hydrogeology of my territory of interest

This activity was carried out in order to discover and use the geospatial hydrogeological data produced by the Nanaimo Lowland Groundwater Study. In a GIS Lab, participants worked in pairs on ArcGIS software. They visualized maps and interpreted them by answering questions in the workbook.

At the end, participants discussed and shared the hydrogeological information of their territory of interest with the group.



Part 3

SUPPORTING LAND-USE PLANNING AND WATER MANAGEMENT DECISIONS WITH HYDROGEOLOGICAL INFORMATION





Brainstorm useful hydrogeological concepts for groundwater protection

In subgroups, participants brainstormed on one of the following two questions pertaining to groundwater protection and management in the region :

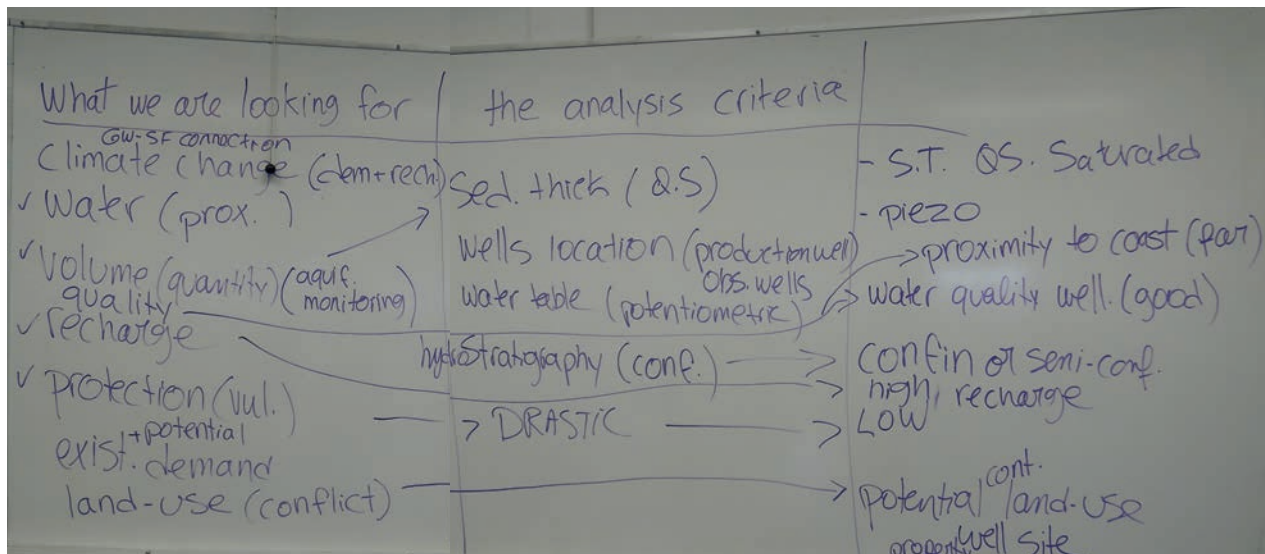
Question 1: Which area(s) appear(s) to be best-suited for the installation of a new community groundwater supply in the Quadra Sand Aquifer ?

Question 2: Which area(s) should take priority for groundwater recharge protection in the Quadra Sand Aquifer ?

The objective of this activity was to deliberate on the analysis pathway that you could apply to respond to the given question. Here are the related questions that were considered :

- According to you, what are we looking for?
- What are the aquifer characteristics we should seek?
- What are the analysis criteria?
- What hydrogeological information should we use?

Brainstorming results for question 1: Which area(s) appear(s) to be best-suited for the installation of a new community groundwater supply in the Quadra Sand Aquifer ?





Using hydrogeological data for groundwater protection and management in my territory of interest

This objective of this activity was to appreciate how groundwater geodata can be used in groundwater protection and management.

Participants worked in pairs in the computer lab, using ArcGIS software to apply the geotreatment procedure described in the participant workbook. Then, participants shared their results with all workshop participants, and discussed their map with the groundwater experts.



Part 4

USEFULNESS OF HYDROGEOLOGICAL INFORMATION FOR SUSTAINABLE WATER MANAGEMENT





Current uses of hydrogeological information

The objective here was to identify and prioritize challenges (i.e., problems to solve) with respect to the protection and management of groundwater in the region. To do so, participants worked in subgroups and identified their current uses of hydrogeological information, evaluated its usefulness, strengths and weakness in their decision-making and finally, identified ideas on how to improve the usefulness of hydrogeological information.

Considering their professional roles and responsibilities related to water management or land-use planning, participants had to think of the hydrogeologic information they use or might use to answer the following questions:

- For which decisions or actions do I use hydrogeological information?
- What hydrogeological information do I use or might I use?

USES OF HYDROGEOLOGICAL INFORMATION IN OUR DECISIONS		
ORGANIZATION	WHAT USES OR DECISIONS ?	HYDROGEOLOGICAL INFORMATION USED AND USABLE
Island Health	• Subdivision referrals • Review onsite sewage disposal systems • Source approval - water systems • Source protection	• Soils depths/changes over depths, depth to water table, aquifer materials, vulnerability, quantity, define areas requiring protection/location of wells
FLNRORD	• Groundwater protection regulation compliance and enforcement	• Well records in well database • Aquifer classification and mapping
FLNRORD	• Using the hydrogeolayers to characterize groundwater conditions within a water service area	• Bedrock geology • Surficial geology • Sediment thickness • Hydrostratigraphic unit distribution
FLNRORD	• Impacts of saltwater/ intrusion impacts	• Examine the correlation between rates and modification of high saltwater intrusion to a geological area of interest
FLNRORD	• Water allocation. Need to determine sources (i.e., which aquifer, quantity (i.e., is there enough water?), any significant impacts to other users, and hydrologic connectivity to surface water	• Well reports • Aquifer mapping (type, subtype, thickness) • Confinement/ vulnerability
RDN	• Aquifer Protection DPA	• Aquifer vulnerability (DRASTIC) • Hydraulic head (i.e. direction of GW flow) • Missing water quality data • Depth of aquifer units 3D • Water table surface (piezometric mapping)
RDN	• New well locations	• Quality data • Depth to water table unit of elevation



Evaluating the usefulness of hydrogeological information in decision-making

In subgroups, participants evaluated the usefulness (relevance, credibility, and legitimacy) of the hydrogeologic information to their decision-making. The evaluation was based on the seven key requirements listed below.

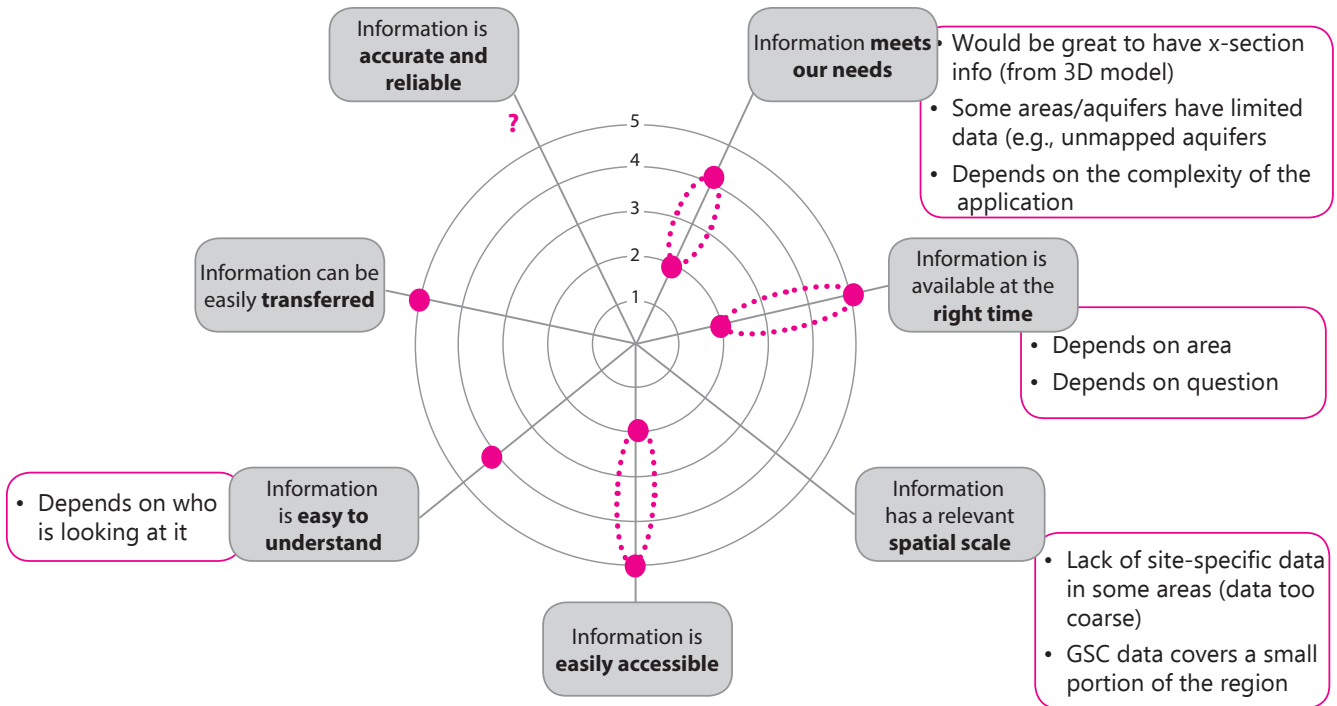
In the templates provided (p.24-26), participants rated usefulness requirements on a scale from 1 to 5 (1= Strongly disagree and 5= Strongly agree) and wrote comments in the boxes to justify the evaluation of each requirement.

Seven key requirements:

1. The information **meets our needs**. It fills in missing information needed for our decisions. It is directly related to our needs.
Score 5 – e.g., I have the right kind and amount of information to make my decision; none is lacking; the content is appropriate.
2. The information is available at the **right time**. It comes in response to a current request.
Score 5 – e.g., I have all the information needed to make my decision; none is missing; none are still in the process of being obtained or produced.
3. Information is produced on a **spatial scale** relevant to the given decision-making. The scale is adequate for the decision I must make.
Score 5 – e.g., I have to make a decision at the municipal level; the information is detailed enough for me to do.
4. The information is **easily accessible**. I know exactly where to get the information and it is in an appropriate format.
Score 5 – e.g., I do not waste time accessing information; I know where it is, how to acquire it, and how to consult it; It is in a format that I can easily use (e.g., GIS).
5. The information is **easy to understand**.
Score 5 – e.g., I easily understand the information that is available and required for my decision-making, and am able to use it.
6. The information appropriately includes or excludes confidential data, and can be easily **transferred** to other users.
Score 5 – e.g., In the information I use for my decisions, there are no issues related to data privacy.
7. I consider this data to be **accurate and reliable**. I trust the information.
Score 5 – E.g., I have full confidence in the quality of the information I use; I never question its validity.

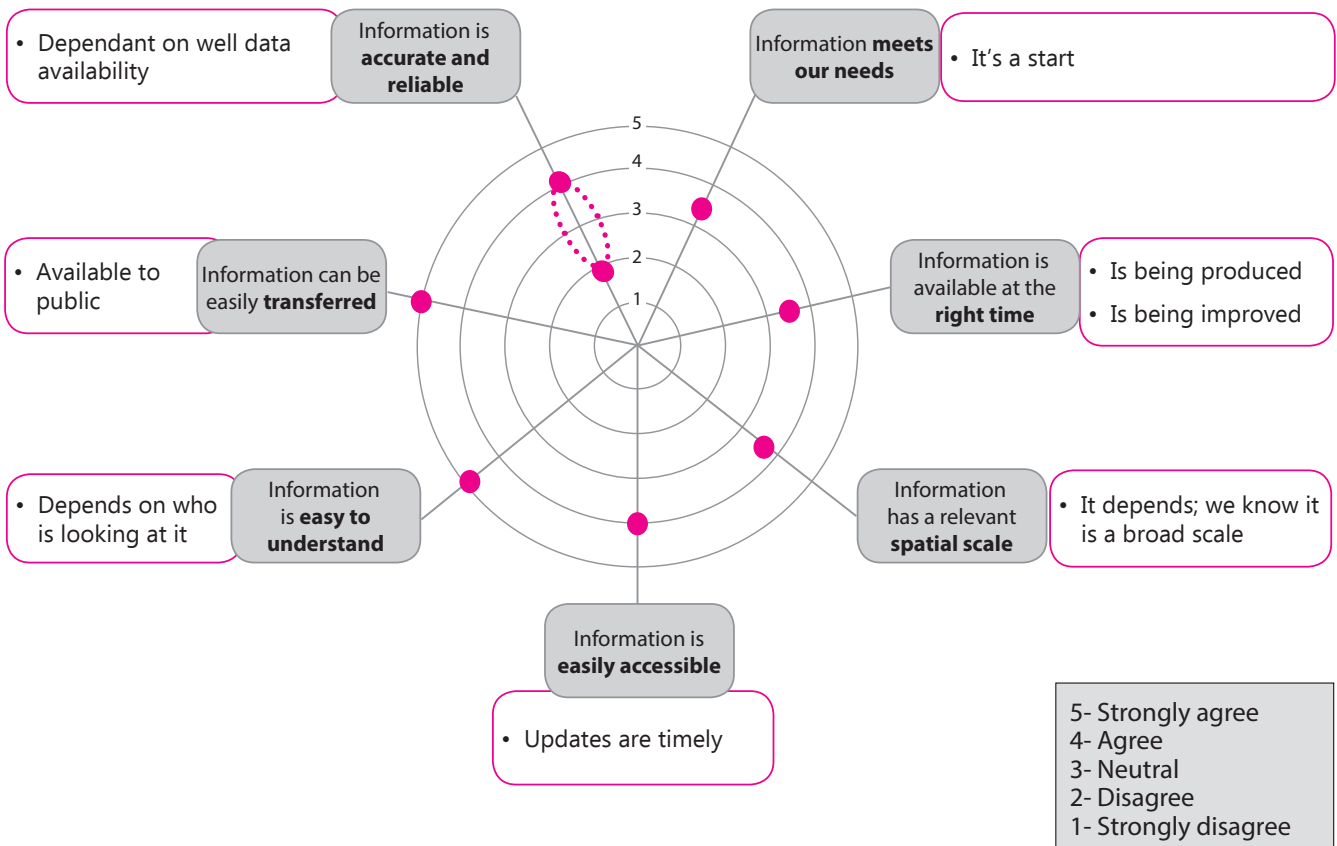
Organization: **FLNRO**

Decision #: **Groundwater licencing**



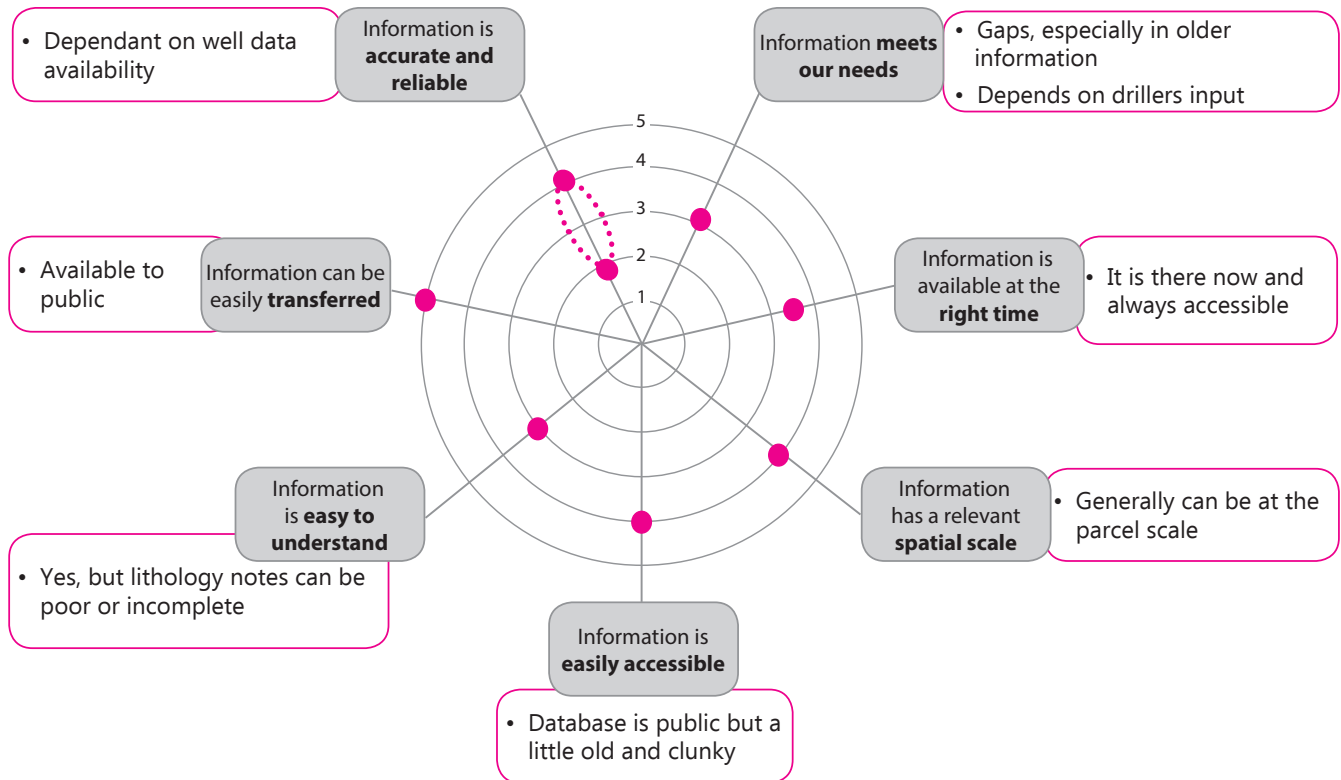
Organization: **FLNRO**

Decision #: **BC aquifer mapping**



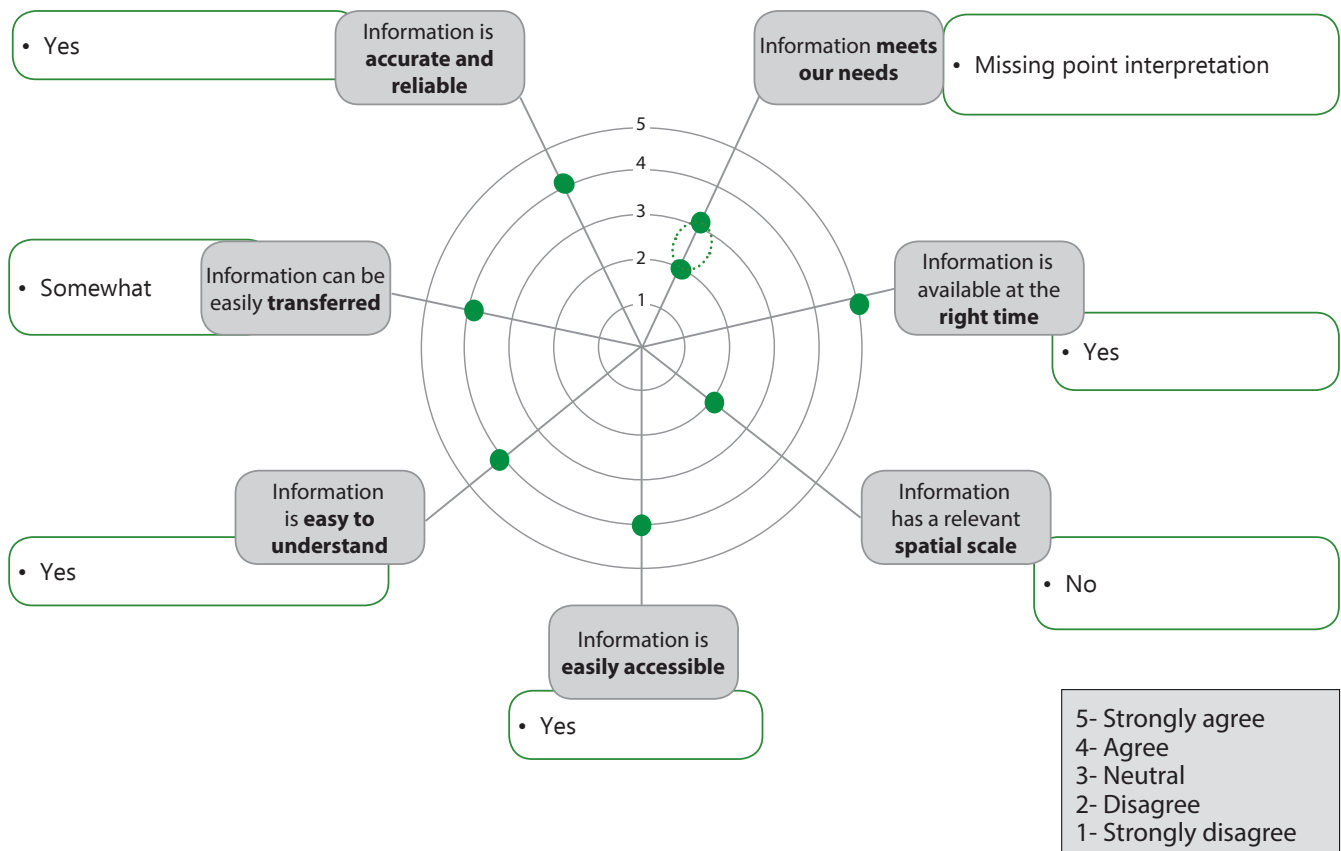
Organization: **FLNRO**

Decision #: **Well records**



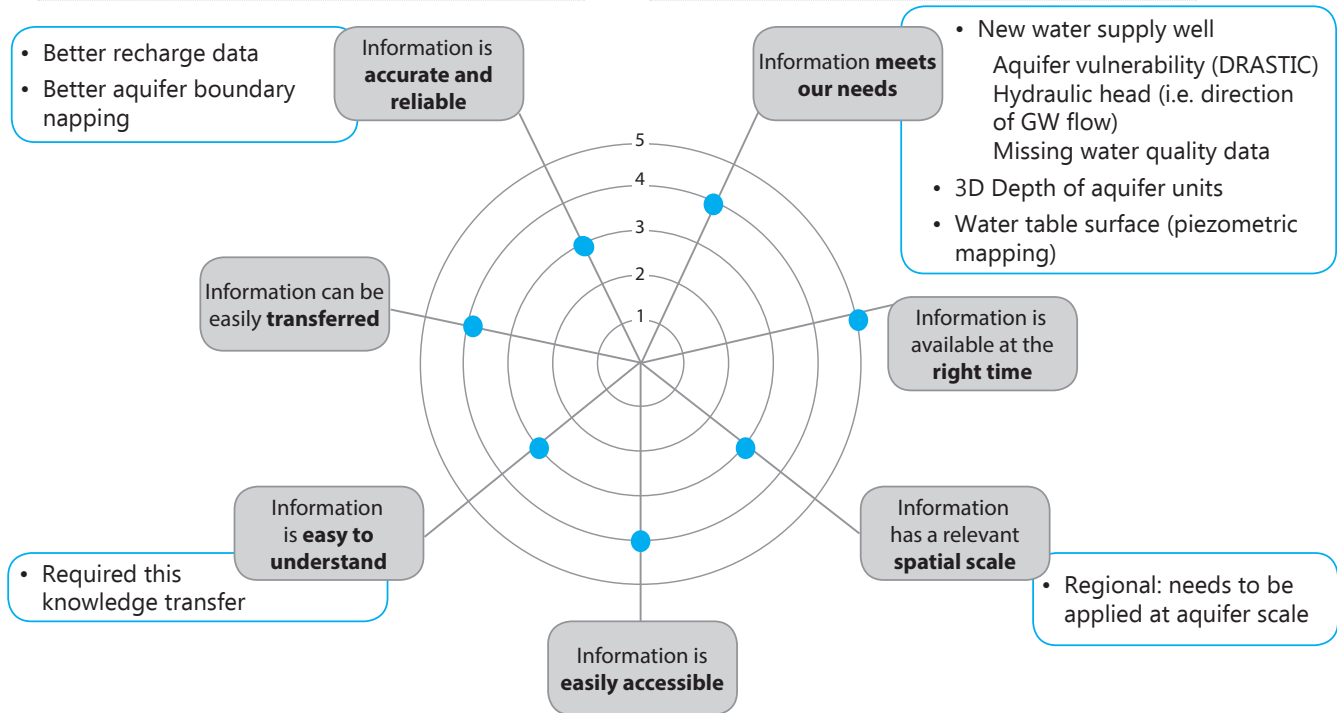
Organization: **ENV/FLNRO/RDN**

Decision #: **Adaptative Management**



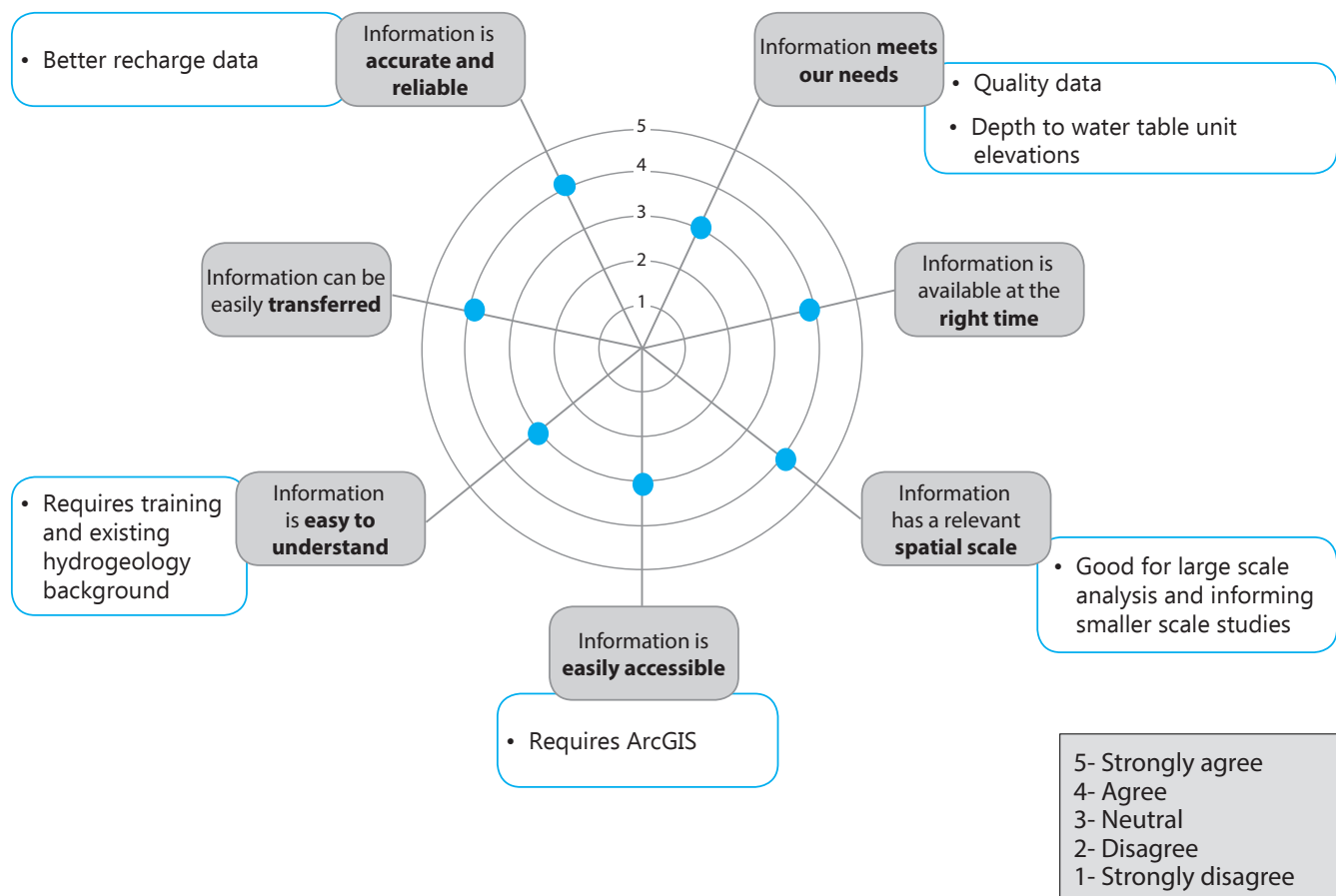
Organization: **RDN**

Decision #: **Aquifer Protection DPA**



Organization: **RDN**

Decision #: **New well locations**





Strengths and weaknesses of the hydrogeological information

In order to obtain an overview of the strengths and weaknesses of the hydrogeological information, each group of participants put a red sticker for each score of 1 or 2 and a green sticker for each score of 4 or 5 for each of the seven key requirements.

The table below shows the resulting strengths and weakness of the hydrogeological information as perceived by the participants.



STRENGTHS AND WEAKNESSES OF THE HYDROGEOLOGICAL INFORMATION

	ENV	FLNRO	RDN	Health Authority	VIU
Information meets our needs	●●	●●●●		●	●●
Information is available at the right time	●●	●●	●●	●	●
Information has a relevant spatial scale	●●	●●●●	●●		●
Information is easily accessible	●●	●	●	●	●
Information is easy to understand	●●	●	●		●
Information can be easily transferred	●●	●●	●	●	●
Information is accurate and reliable	●●●●	●	●		●●



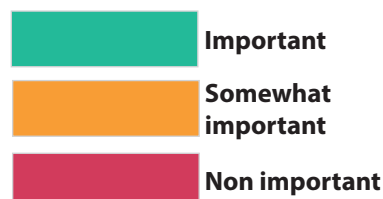
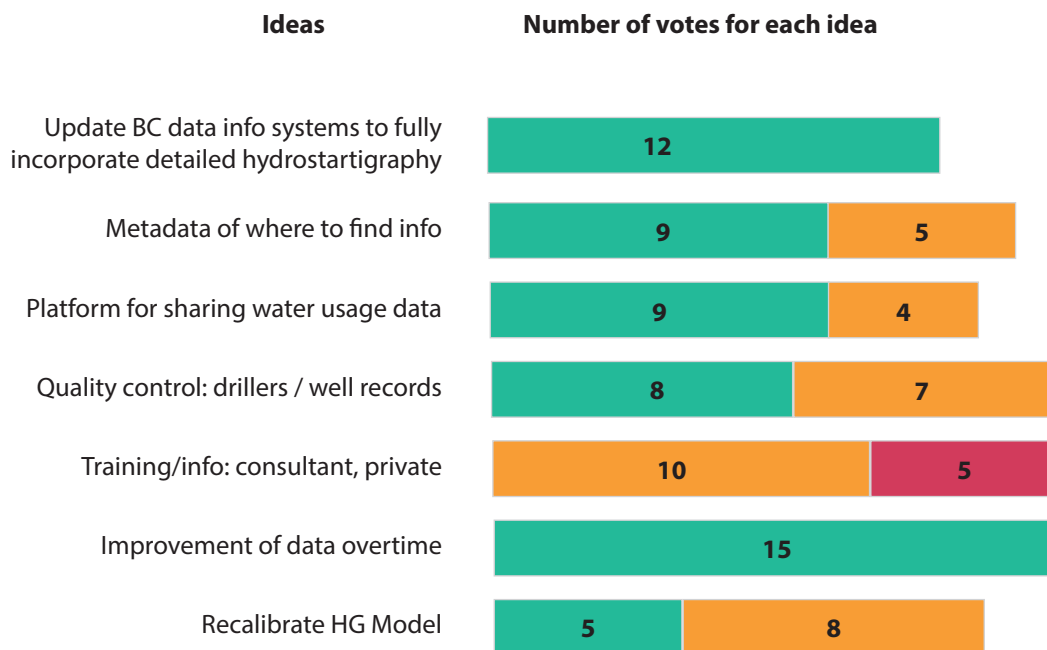
Ideas on how to improve the usefulness of hydrogeological information in your decision-making

After participants evaluated the usefulness of the information for their decision-making, and identified its strengths and weaknesses, they worked in subgroups on what could be done to improve the usefulness of hydrogeological information for decision-making by considering the following questions:

- Is there a need for new information? What additional information is needed?
- Is there a need for an information exchange platform?
- Is there a need for training on the use of information?

Ideas were identified and participants proceeded to vote for each:

«Is this idea an **important need**, a **somewhat important need**, or an **unimportant need** with regards to improving the usefulness of hydrogeological information?»





Contributors to the Nanaimo Lowland Groundwater Study :



Logistics :

