

Waterloo Engineering Competition June 2009 Consulting Engineering Problem Statement

References

For Competition Details and Marking Scheme, Deliverables, and Permissible Tools please refer to http://wec.uwaterloo.ca/consulting_engineering.html

Background

"World population growth, which is projected to increase to 8.45 billion people by the year 2025, by itself would trigger 40% of the population residing in countries facing some degree of water resource-based vulnerability (WRV). Combined with food self-sufficiency, industrial growth, and climate change, by the year 2025, some 5.1 billion (60% of the total world population) would live in regions potentially experiencing moderate to extreme WRV. The study suggests that the regions that are at great risk are those already facing some degree of WRV; the climate change would most likely accentuate the already worsening situation in many regions, while improve it in regions that are not projected to be vulnerable."

That is a quote from a journal article written in 1998 by a researcher at the University of Saskatchewan (source: <http://www.springerlink.com/content/r742323131p03434/>).

Motivation

The Region of Waterloo is also facing water issues. The purpose of this competition is to assist your client, the Region of Waterloo, which has some extremely large open-ended questions:

What are these issues?

What are the root causes?

Who do they impact?

How much water does the Region use? Where does it come from?

How much water does it need?

Are the current water protection methods sufficient?

Are the current water conservation methods sufficient?

What could be the effects of global warming?

These are, however, merely motivation to your group to assist in solving a pressing question that has been given to you...

Problem Statement

The Region of Waterloo has retained your group (feel free to give yourself a company name) to answer this question: ***"How would you evaluate the Region's groundwater monitoring well network? Outline the steps to evaluate and make recommendations for improvement of the network."***

The Region actually does have consultants working on this very question. There is obviously a HUGE amount of personalization that you are able to give to your solution; that's on purpose. Note that even the wording of the problem statement can be interpreted in multiple ways ("how would you...")

Some Guidance

Go here: http://wec.uwaterloo.ca/consulting_engineering.html to see how you will be judged ("Marking Scheme") and what you're supposed to be doing ("Deliverables")!

It is highly recommended (as the marking scheme shows) to use a structured engineering design method to form the outline of the report and presentation. One good source to review is the Waterloo Cases in Design Engineering's "[Engineering Design Method](#)".

One of the most important parts of your work will be identifying **what** the "groundwater monitoring well network" is, **why** it is important, and **why** it is important enough that your group is spending so much time on it!

Some questions (phrased from the Region's perspective) that can get you started (but that do not necessarily have to be answered word-for-word; they are just meant to help you address the problem statement):

- What are monitoring wells for?
- Do we have enough in our program? Too many?
- Do nearby contaminated sites present issues?
- Are the wells providing useful data?
- Regulations require well owners to maintain monitoring wells. Can we abandon wells if they are not needed? Are some wells too old? Are there existing wells that are not being used that can be added to the program?

Here's a link to the Region's Water Protection web page:

<http://www.region.waterloo.on.ca/web/region.nsf/8ef02c0fded0c82a85256e590071a3ce/14331246b59f1cc2852573250059cb14!OpenDocument>

A report that might be useful is on the Region of Waterloo's website and is called the "Water Supply Strategy Report" (2007). (There are many documents available on the Region's website).

If you want to spend the majority of your time, report and presentation focusing on getting the most important questions answered, that's great. If you'd rather discuss what information would be most useful to your group (e.g. something you can't find on the internet but you're quite sure the Region has) or the implications of a closely-related side topic, that's fine too.

This is the essence of engineering! Solve a real-world problem using math and science with a minimum cost but adequate solution.

Have fun!