ME 351 Winter 2024 Project
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Request for Proposal:
Construction of a Water Main from Lake Ontario to E5

Description

The ME 351 Teaching Staff is seeking project proposals for the design and construction of a fresh water supply main so that E5 can have direct access to the refreshing waters of Lake Ontario. A narrow corridor of land along a 62.5 km long route from E5 to Lake Ontario has been purchased. **Your team's goal is to design a cost-effective water main system and summarize your analysis in a short report.**

Information Provided

The fresh water demands of E5 require a flow rate of **0.05 m^3/s.**
This RFP includes the following information to aid your design:

1. A .csv file containing the elevation profile of the proposed water main route. While this .csv file contains all elevation information you need for the project, an optional .kmz file for viewing in Google Earth, Google Maps, ArcGIS, etc. is also provided.
2. .csv files containing locations of major railway, road, and water body crossings along the route. A slide deck highlighting all major railway, road, and water body crossings that are along the proposed route is also included.
3. A slide deck outlining your choices for system components, including pipe, valves, and pump stations. All components in your system must come from this slide deck.
4. A slide deck outlining estimated unit costs for various system components.
5. A slide deck summarizing code requirements and constraints that your design must satisfy.

Rules

1. Maximum group size of 4 people. **You must work with at least 1 other person.**
2. **Project proposal is due April 4 2024, 11:59 PM Eastern Time.** Submission will be through LEARN. One submission per group is sufficient. No late submissions will be accepted.
3. The following bonus marks will be awarded to the top three groups:
   (a) **15%**: Lowest total cost while meeting all design requirements.
   (b) **10%**: Second lowest total cost while meeting all design requirements.
   (c) **5%**: Third lowest total cost while meeting all design requirements.

   The top three groups will be announced on the class page. The bonus marks cannot bring your score above 100%.
4. This is an open-ended project. You may use whatever software or calculation techniques you wish. We recommend using Excel, Python, or Matlab.

Deliverables

Your small company must submit a project proposal that includes the following sections:

1. Title page with company name and team members
2. Project description (1 paragraph)
3. Proposed design, including
   (a) All assumptions made, and all equations used (2 pages maximum)
   (b) A table or list summarizing all relevant design and code requirements (no discussion required)
   (c) A table summarizing key flow properties, including flow rate, flow velocity, Reynolds number, and friction factor (no discussion required)
   (d) A design pressure plot (no discussion required), which shows the following overlaid on one plot:
      - the pressure along the water main.
      - the locations of the minimum and maximum pressure in your water main.
      - horizontal lines showing the pressure range required by code. *Hint: your design pressure must always falls within these lines.*
      - the elevation profile of the water main.
      - the locations of all pump stations.
      - the locations of all major road crossings and water bodies.
   (e) A table comparing the total major losses, total minor losses, and total gravity losses in your system. Discuss the relative contribution of these different losses, and which losses you can control in your design.
4. Cost of proposed design, including a cost estimate table with the following items:
   - pipe material/construction (unit cost, length, and total cost)
   - valves (unit cost, number, total cost)
   - crossings (unit cost, number, total cost)
   - pump stations (unit cost, number, total cost)
   - total cost estimate

   Discuss your cost estimate breakdown. What are the largest costs? To be a competitive bidder, which costs could you/did you optimize?

The proposal will be marked as per a rubric to be posted to the class page. Your group must also submit all code, spreadsheets, hand calculations, etc. that were used in your analysis. These do not have to be included in the main proposal, but they should be included in your dropbox submission.