

WATERLOO **ENGINEERING**

Consulting Engineering Design Problem

Fall 2010
Waterloo Engineering Competition
Nov 5-6

General Rules & Guidelines

1. All communication devices must be turned off.
2. Competitors will be allowed to use:
 - a. Computers, USB keys, CDs, pre-existing files etc.
 - b. Internet
 - c. Reference books

All other tools must be cleared with the competition coordinator before use. Cell phones, online communication (e.g. MSN, GoogleChat, Skype) or other communication devices are prohibited.

Violation of these rules may result in disqualification.

3. Visitors are not allowed throughout the development and build stage.
4. Keep work stations clean. Tidy up at the end.

Schedule

The schedule for Consulting Engineering is as follows:

Friday, Nov 5	6:15 p.m. – 6:30 p.m.	Check-In	WEEF Lab
	6:30 p.m. – 7:00 p.m.	Welcome/Briefing	WEEF Lab
	7:00 p.m. – 12:00 a.m.	Design	WEEF Lab
	12:00 a.m. – 12:30 a.m.	Submissions/Debriefing	WEEF Lab
Saturday, Nov 6	8:45 a.m. – 9:00 a.m.	Check-In	RCH 3 rd Floor Lobby
	9:00 a.m. – 1:30 p.m.	Presentation/Demonstration	RCH 309
	1:30 p.m. – 2:00 p.m.	Prizes and Winner Announcements	RCH 302

Volunteers will bring food and drinks around to teams between 9:00 and 10:00 p.m. Each competitor will be given one (1) can of drink. Competitors are encouraged to bring water bottles as bottled water will not be provided. There will be water fountains nearby for refills. Please remind the competition coordinators and volunteers of your dietary restrictions and/or allergies.

There will be a question period after the problem is presented during the briefing session. No questions will be answered during the development and build stage to ensure fairness in the competition.

Background Information:

The population of Waterloo Region is projected to grow at a faster rate than anticipated and the Region plans to introduce rapid transit into the transit network in 2014. The Region's current population is around 500,000 and it will grow to 729,000 by 2031 [1]. In June 2009, the Waterloo Region approved a \$1.3 billion light rail plan. The Region is made up of three main cities, Waterloo, Kitchener, and Cambridge, as well as some rural townships. Stage 1 of the approved rapid transit route consists of light rail transit running from Conestoga Mall in Waterloo to Fairview Park Mall in Kitchener and adapted bus rapid transit from Fairview Park Mall to the Ainslie Street transit terminal in Cambridge. Stage 2 consists of continuing light rail transit from Fairview Park Mall to the Ainslie Street terminal, which will follow the completion of Stage 1 as closely as possible. The approved rapid transit system will cost an estimated \$790 million. Council also allocated \$1 million annually for an initial 10-year period to implement transit supportive strategies to build transit ridership in Cambridge [2]. Light Rapid Transit (LRT) is a hub based system and can only be implemented after making changes to the current Grand River Transit (GRT) services [3].

References:

[1] http://www.techtriangle.com/regional_prosperity

[2] <http://www.kwnow.ca/newsarchives/archivedetails.cfm?id=1263>

[3] <http://rapidtransit.region.waterloo.on.ca/>

Motivation

In September 2007, the Regional Municipality of Waterloo introduced "UPASS" where students of University of Waterloo pay a fee that gives them unlimited access to the Grand River Transit services. However, it is estimated up to 80 passengers are stranded daily at the curb, by up to 25 overcrowded buses plying up to seven campus-area routes. The purpose of this competition is to assist your client, the Region of Waterloo, to ensure the implementation of a high quality regional transportation system.

Problem Statement

Your group has been hired by the Region of Waterloo to:

- a) Review the current transit system.
- b) Redesign the current transit system for immediate impact; also consider the integration of your design with the proposed LRT system when it gets implemented in the future years.

Your overall goal is to improve service quality and customer satisfaction for university students using the various public transportation options.

Your group is to prepare a report that will lay out the issues with the current system, and propose the best way forward.

Some things to consider:

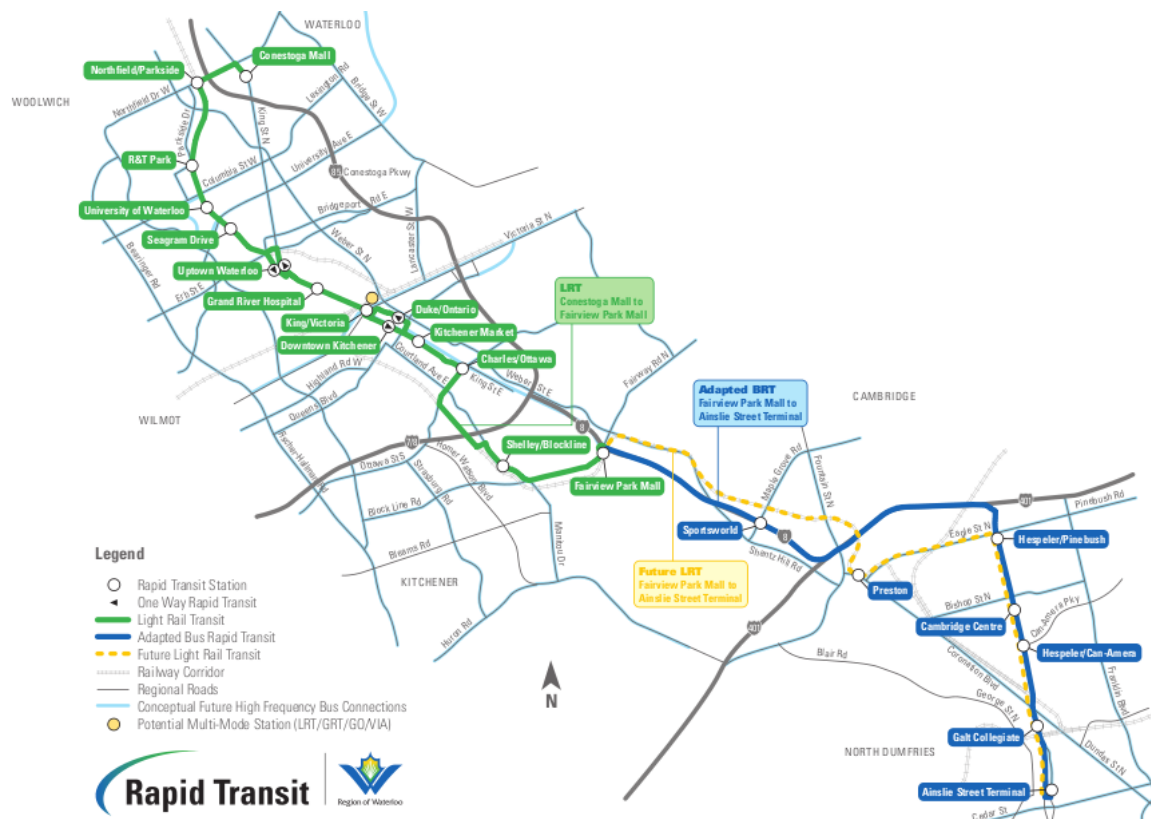
- Transportation infrastructure design alternatives
- Numerical methods of calculating service quality
- Route planning
- Interchange locations (terminals, bus stops, etc.)
- Signalling and communications
- Future residential and commercial development
- Tax increases

Deliverables:

- 1) A technical report detailing your analysis and suggested solution.
- 2) A PowerPoint Presentation, 15-20 minutes in length.

Resources

Proposed route of LRT



Map of Region of Waterloo



Waterloo Region Development Map:

<http://maps.google.ca/maps/ms?hl=en&gl=ca&ie=UTF8&oe=UTF8&msa=0&msid=114253515492687360281.00047da5134d077aa8d74&source=embed&ll=43.441952,-80.47554&spn=0.181971,0.439453&z=11>

Region of Waterloo Quick Facts

http://www.prosperitywaterloo.com/about_waterloo_region.php

Region of Waterloo 2009 Year End Population and Household Estimates

[http://www.region.waterloo.on.ca/web/region.nsf/DocID/25A26ADFBFAC05638525760B00646754/\\$file/2009_Pop.pdf?OpenElement](http://www.region.waterloo.on.ca/web/region.nsf/DocID/25A26ADFBFAC05638525760B00646754/$file/2009_Pop.pdf?OpenElement)

Region of Waterloo: Population and Employment Forecasts 2006-2029

[http://www.region.waterloo.on.ca/web/region.nsf/DocID/25A26ADFBFAC05638525760B00646754/\\$file/Population_and_Employment_Forecasts.pdf?OpenElement](http://www.region.waterloo.on.ca/web/region.nsf/DocID/25A26ADFBFAC05638525760B00646754/$file/Population_and_Employment_Forecasts.pdf?OpenElement)

[http://www.region.waterloo.on.ca/web/region.nsf/0/A288897047333422852573700060C1D7/\\$file/Bulletin_1.pdf?openelement](http://www.region.waterloo.on.ca/web/region.nsf/0/A288897047333422852573700060C1D7/$file/Bulletin_1.pdf?openelement)

Region of Waterloo Rapid Transit

<http://rapidtransit.region.waterloo.on.ca/>

http://rapidtransit.region.waterloo.on.ca/pdfs/Rapid_Transit_Initiative_with_future_bus_connections.pdf

References

For competition details and marking scheme, please refer to

http://wec.uwaterloo.ca/consulting_engineering.html.

Design Methodology:

http://design.uwaterloo.ca/students/engineering_design_process.html