

National Exams May 2010

04-Geol-B3, Site Investigation

3 hours duration

**NOTES:**

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is an OPEN BOOK EXAM.
3. Candidates may use any non-communicating calculator.
3. Questions do not have equal value. The grade for each question is given. It is suggested that the candidate proportion time based on the allocated value.
4. All questions require an answer in essay format. Clarity and organization of the written answer and any figures or sketches are important.
5. The examination has an overall value of 100 Marks: 4 questions consisting of 25 Marks each.

## Marking Scheme

**1. 25 marks total**

- (a) 5 marks
- (b) 5 marks
- (c) 5 marks
- (d) 5 marks
- (e) 5 marks

**2. 25 marks total**

- (a) 5 marks
- (b) 5 marks
- (c) 5 marks
- (d) 5 marks
- (e) 5 marks

**3. 25 marks total**

- (a) 25 marks total

**4. 25 marks total**

- (a) 5 marks
- (b) 5 marks
- (c) 5 marks
- (d) 5 marks
- (e) 5 marks

Value

**25 Marks**

**Question #1**

As an Engineer at an Engineering firm, your boss decides that you are the ideal candidate for a road construction project they have within a Northern Region in Canada. You are to help design, locate and construct a new road in a remote, Northern Area in Canada, Near Baffin Island. As a first step in this process, you are to conduct a desk study and subsequent site investigation.

- 5 Marks            a.     Describe what factors you will have to take into consideration before going to your construction site as part of a desk study; From this list, what are the major factors of concern?
- 5 Marks            b.     What resources will you require to complete a comprehensive desk study and what agencies, specifically, will you contact as part of your desk study? What items, in particular will you ask for?
- 5 Marks            c.     What codes, guidelines, laws etc. (i.e. design / legislative framework) will you have to cite in order to include as a consideration within your site investigation?
- 5 Marks            d.     List the major headings and sub-headings of your plan as part of your site investigation;
- 5 Marks            e.     What sort of information will you have to amass on-site (during your site reconnaissance) in order to conduct a comprehensive field exploration component as part of the site investigation? What tests or equipment, specifically, will allow you to amass the required information?

**25 Marks**

**Question #2**

An underground gasoline fuel tank as part of a gas station was determined to have been breached (i.e. leaking).

- 5 Marks            a.     List the factors that must be considered when trying to determine the extent of the plume.
- 5 Marks            b.     What type of parameters would you have to amass in order to conduct your site assessment?
- 5 Marks            c.     How would you determine the stratigraphy of the ground and what type of equipment would you use to determine this?
- 5 Marks            d.     How would you determine the rate at which the gasoline is moving through the Soil? Rock? Aquifer?
- 5 Marks            e.     What are the factors that one has to take into account when setting up a groundwater monitoring study using monitor wells? List and describe relevant sampling techniques associated with groundwater monitoring wells.

**25 Marks**      **Question #3**

List and describe at least 5 industry accepted in-situ testing techniques for soil. Describe each technique, its method, equipment used, effectiveness, limitations and the specific soil parameters (or properties) that can be obtained or inferred.

**25 Marks**      **Question #4**

Site Investigations have implicit risk and multiple phases associated with them. As such comment on the following:

- 5 Marks              a.      What changes would apply to your site investigation with respect to your ground characterization and in-situ testing plan for projects of:
- i.    Low Risk
  - ii.   Medium Risk; and,
  - iii.  High Risk
- 5 Marks              b.      Describe the activities associated with Phase I of a site investigation;
- 5 Marks              c.      Describe the activities associated with Phase II of a site investigation; and,
- 5 Marks              d.      Describe the activities associated with Phase III of a site investigation.
- 5 Marks              e.      How would you incorporate the environmental risks associated with your site investigation? What factors would you consider and include within the site investigation report?