ASSOCIATION OF CANADA LANDS SURVEYORS
BOARD OF EXAMINERS

PROFESSIONAL EXAM 1
ACTS AND REGULATIONS RELATING TO SURVEYS OF CANADA LANDS

October 2012

Notice to Candidates:
This examination is based on the e-Edition to the Manual of Instructions for the Survey of Canada Lands.

This examination consists of 10 questions on 8 pages, Sketches 1 and 2 in duplicate and Tables 1 and 2 in duplicate.

Q. No	Time: 3 hours	Marks Value	Marks Earned
1.	During his annual tour of the North, Prime Minister Stephen Harper announced in Cambridge Bay, Nunavut on August 22, 2012 the 2012 Franklin Expedition, a new project to continue the search for the ill-fated 1845-46 Franklin Expedition vessels, the HMS Erebus and HMS Terror. The Prime Minister's Office media release states: *... The two lost ships ... are together designated as a national historic site of Canada - the only such "undiscovered" national historic site. Locating these shipwrecks, or their contents, offers unprecedented information on the search for the Northwest Passage, the exploration of Canada's North and the fate of Sir John Franklin.* *... A number of attempts to locate the HMS Erebus and HMS Terror have been unsuccessful to date, but an increasing area of the seafloor has been systematically ruled out, thus narrowing the search.* *The 2012 Franklin Expedition is led by Parks Canada under the National Historic Sites Directorate and the Underwater Archaeology Services program … includes the participation of a new private partner - the Arctic Research Foundation - and with the continued support from the Government of Nunavut, Fisheries and Oceans Canada's Canadian Hydrographic Service and the Canadian Coast Guard, Environment Canada's Canadian Ice Service and Wildlife and Landscape Science, the Canadian Space Agency and the University of Victoria Ocean Technology Laboratory. Parks Canada is also partnering with the Canadian Broadcasting Corporation ...* *...The main technologies being used include side-scan sonar and multi-beam bathymetry, which have also been employed to chart a large portion of the Canadian Arctic Archipelago during past Canadian missions, including those to find the Franklin shipwrecks. The search will also benefit from the use of LIDAR, an airborne technology used to acquire underwater bathymetric data in shallow waters, satellite imagery and an autonomous underwater vehicle (UAV), equipped with similar remote sensing equipment, supplied by the University of Victoria...* In the Prime Minister's words at the announcement: *"... It is a national historic site designated some time ago. It is the only undiscovered national historic site. It is a historic ... and iconic moment in our country's history - that's why people still write songs about it and essays about it ...they're not just*		

	looking for the Franklin, they're involved in comprehensive surveying as part of the process... *"...I'm sure some day they're going to come around the bend and there's going to be the ship, and there's going to be the body of Franklin ... right on the wheel and they're going to find him right there waiting all this time."* a) The confidence in declaring a national historic site without first knowing the geographic location of the remains is based on one basic assumption. Explain. b) In the event that the condition in a) above is satisfied, assume you are a Canada Lands Surveyor in private practice in Iqaluit, Nunavut and you are retained by Parks Canada to make a legal survey of the national historic site. A rectangular area has been designed by Parks Canada officials to envelop the historic wreckage located. Describe the principal activities that will form your completed legal survey. c) With respect to the Association of Canada Lands Surveyors, what three key requirements must be met in order for you to undertake this assignment? d) Identify the federal statute under which the official survey will be conducted. e) What options are available to you in meeting the requirement for monumentation of boundaries of the legal survey? f) Does the Association of Canada Lands Surveyors have any particular role to play in the process of finalizing the establishment of this national historic site? g) If you were the president of the Association of Canada Lands Surveyors, what specific action might you take with respect to this project? h) What federal statute provides for disposition of mineral rights in the offshore?	2 2 2 2 2 2 2 2	
2.	The shape of the earth approximates an oblate spheroid. The Clarke 1866 ellipsoid commonly used in North American coordinate systems has an equatorial radius of 6,378,206.4 metres and a polar radius of 6,356,583.8 metres. Assume for the purposes of this question that the surface of the earth along the equator is even and uniform at mean sea level. A steel band is wrapped around the equator and measured. The steel band is then released so that it is 1.0 foot above the earth's surface throughout. a) How much longer will the steel band have to be to enclose its raised position? b) What are the UTM coordinates of the point where the centre of the center of the steel band intersects the prime meridian? c) What is the combined UTM scale factor at the point described in b) above?	3 3 2	
3.	Yukon Energy Corporation (YEC), a Government of Yukon corporation, generates electricity at the Whitehorse Rapids hydroelectric plant using storage authorized by a water licence on the Yukon Southern Lakes - Bennett, Nares, Tagish and Marsh. Tagish Lake also extends into British Columbia and is fed by Atlin Lake, the largest natural lake in the province and approximately 40 feet higher in elevation than Tagish Lake. Bennett Lake also extends into BC. These lakes are the headwaters of the Yukon River drainage. The plant was commissioned in 1954. YEC is conducting a feasibility study of increasing the annual energy generation at its Whitehorse Rapids plant by increasing the full supply level (FSL) of the Southern Lakes. Any increase would have to be approved by the Yukon Water Board (YWB) and the Yukon Environmental and Socio-Economic Assessment Board (YESAB). As Tagish and Bennett Lakes are both transboundary lakes, BC regulatory approvals will also have to be obtained.		

The concept would save Yukon customers up to $2 million per year by displacing 2.1 million litres of diesel annually and would reduce greenhouse gas emissions by 5,000 tonnes per year.

Approximately 85% of the affected shoreline of the lakes have medium to steep gradient where a 1.0 foot increase in FSL will cause an upland displacement of the high water line of no more than about 10 feet. The remaining 15% has a much flatter gradient including some shallow marshy areas where the proposed increase could cause a maximum upland displacement in the order of 200 metres.

This 15% comprises four types of lands that will potentially be affected if the project is approved:

- unoccupied Yukon lands under the administration and control of the Commissioner
- lands under certificate title that were granted by Canada since the 1900s pursuant to the *Dominion Lands Act* and *Territorial Lands Act* which relied on the statutory reservation in the grant from the Crown with the red line or bold line on the plan following the rectilinear boundaries and the Ordinary High Water Mark (OHWM).
- lands under certificate of title that were granted in the 1960s pursuant to the federal *Territorial Lands Act* and that were also subject to the statutory waterfront reservations with respect to navigable waters. Many of these properties originally granted under the recreational lot program have now been converted to year-round residences. Original surveys were made of groups of 0.6 to 1.0 acre lots with the natural boundary being delineated in the plan and field notes but with the frontage boundary being one or more monumented straight lines mirroring the OHWM and no closer at any point than the reservation width perpendicularly distant from it.
- Rural (R) blocks and Site Specific (S) parcels of Settlement Land of Kwanlin Dun First Nation and Carcross/Tagish First Nation which prescribe the OHWM as the waterfront boundary and which are not subject to the legislation. Instead, their Land Claim Final Agreements provide for a Waterfront Right-of-Way of the same perpendicular width as the historic waterfront reservations but with the specific provisions:

  15.4.2.1 except as agreed to by the parties to a Yukon First Nation Final Agreement, Natural Boundaries of Settlement Land along Navigable Water and non-Navigable Water shall be located on the Ordinary High Water Mark;

  15.4.2.2 Natural Boundaries, except Natural Boundaries of bodies of water as set out in 15.4.3, shall move with the various natural processes of erosion and accretion, and where an offset Natural Boundary is prescribed, it is also deemed to move and vary according to this natural movement of the Natural Boundary; and .....

a) Describe how you would determine for purposes of impact assessment the OHWM of these lakes that have been regulated for hydroelectric purposes for almost 60 years. 3

b) Describe how you would determine the loss of ownership, if any, of lands to be covered by water at the new FSL for lands described in the second bullet above. 3

c) Describe how you would determine the loss of ownership, if any, for lands described in the fourth bullet above. 3

d) Part of the South McClintock Subdivision, Plan 26014 LTO was surveyed with only one half the statutory reservation for the frontage rectilinear boundaries, with the

	appropriate exception provided in the grants from the Crown or Title Notifications from the Commissioner. e) How wide is the reservation for these properties?	3 1	
4.	The City of Whitehorse, a municipality under the Yukon *Municipal Act*, has an Official Community Plan in place together with a Zoning Bylaw prescribing various zoning classifications and their respective requirements. a) The Whitehorse Copper Belt within the city boundary has had active mining development and exploration activity since the early 1900s. Until recently, these interests granted pursuant to the predecessor *Yukon Quartz Mining Act* interests have not been in conflict with other land use needs, namely those for residential housing. However in recent years there has been increasing encroachment onto mineral interests by residential subdivision development on Commissioner's lands by the Government of Yukon Lands Branch. The city has also had an increased number of land use conflicts from new claims located and granted pursuant to the successor *Quartz Mining Act*. Responding to increased public pressure to limit the number of potential land use disputes, Mayor and Council enact a Bylaw prohibiting further staking of mineral claims in a defined "core area" within the City boundary. The Bylaw includes a "grandfathering" of existing quartz claims in good standing as of its effective date. A prospector in 2012 stakes a standard quartz mining claim within the "core area" and makes application to the mining recorder to record the claim. It adjoins an existing claim held by him and has been staked to cover a probable extension of mineralization confirmed on the first claim. Should the mining recorder issue a grant for the claim? Why or why not? b) The federal Ministry of Transport in 1972 brought into effect the Whitehorse Airport Zoning Regulations (C.R.C., c. 122) pursuant to the *Aeronautics Act* (R.S.C., 1985, c. A-2). Parts II and III of the Schedule to the Regulations provide the Description of Outer Limits of Lands and the Description of Approach Surfaces respectively. Both descriptions are related to the intersections of Runways 13L-31R and 18-36 and are referenced to the runway threshold elevations on geodetic datum. In 2009 the City of Whitehorse engages an architectural firm as prime consultant for a new Public Safety Building to be located near the Erik Nielsen Whitehorse International Airport. The architect prepares the design, tenders the project and the City awards the contract for construction to a local general contractor. The general contractor applies for and receives a Building Permit from the City for the project and commences site preparation. The Airport Manager learns of the project at the time of contract award and publication of a news article and architect's rendering of the project in the *Whitehorse Star* and *Yukon News*. While he had been aware that the project site was close to the northern projection of Runway 13L-31R, he was not aware that the hose tower was as high as it appeared to be in the rendering published. He obtains a copy of the Site Plan and the Elevation Views of the building plans, does some rough calculations and suspects that the hose tower projects into the designated approach surface. You are a Canada Lands Surveyor in private practice in Whitehorse and are engaged on a high priority basis by the Regional Manager to determine whether there is in fact an	3	

	encroachment into the approach surface by the proposed structure as designed. Formwork is being framed and the first concrete pour for foundations is scheduled within one week. i. Describe in point form the work you will undertake to provide the answer the Airport Manager has requested. ii. Your survey confirms the Airport Manager's suspicion and finds that the closest corner of the hose tower penetrates 9.2 feet into the approach surface for Runway 31L. A safety railing 3.5 feet in height has also been specified for the top of the structure. Does the Airport Manager have any ability to intervene in the construction of the structure as designed? Why or why not?	5 3	
5.	James Grierson MacGregor's 1981 publication *Vision of an Ordered Land: The Story of the Dominion Land Survey* recounts the death of J.J. Cadenhead, DLS in 1910 that underscores the high importance of the preservation of original field records. Mr. Cadenhead was crossing the Yukon River to Dawson City returning from a winter traverse when he broke through the river ice only a very short distance from the Dawson shore. He was found the next morning at daybreak frozen to death and encased in a dome of ice. His field books were found several yards away, obviously tossed clear of his breakthrough and river overflow. A century later, field records of the type Mr. Cadenhead had maintained are all but a thing of the past. Electronic data capture by total station equipment, precise positioning by GPS technology and electronic marine depth sounding techniques have replaced the traditional field book with handwritten entries. a) Describe the precautions you would take as a Canada Lands Surveyor to protect your original electronic field records with the dedication that Mr. Cadenhead exhibited. b) Give two examples of Supplementary Field Notes that the Surveyor General might receive related to an official survey.	5 2	
6.	In 1963, Marshall Macklin Monaghan Limited was retained by Crest Exploration Limited for a legal survey of its Snake River iron deposit mineral claims which had been located pursuant to the iron and mica claim provisions of the then *Yukon Quartz Mining Act.* The Surveyor General issued survey instructions to J.W.L. Monaghan DLS for the survey that was executed by him during the late spring and summer of 1963. The staking and recording of the claims was found to be in compliance with the Act. Mr. Monaghan submitted his survey returns for the project in 9 sheets of combined plan and field notes comprising 518 lots in total. The title for the returns is: "Plan and Field Notes of Survey of Iron Claims CLAIM NAME AND NO. LOT NUMBER A'int 14-16 2 - 4 Ann 17, 18 399,400 Bonzo 14-16 5 - 7 ..... etc etc All in Group 1155 Situated in the Snake River Area in the Mayo Mining District Yukon Territory Lat. 65°15'N Long. 133°00'W"		

	Once all statutory requirements had been met, Mr. Monaghan's plan was confirmed by Surveyor General Robert Thistlethwaite on June 9, 1966. The plan was recorded in the Canada Lands Surveys Records under number 52972. Field notes for the plan were also recorded under Numbers 52981and F.B. 30581. Crest was issued mineral leases for the claims in 1967 and those leases have been renewed at each successive full term. Crest Exploration Limited is owned by Chevron Resources Canada. It has been described in reports as "... one of the largest known iron deposits in North America." Almost fifty years later the deposit is being examined again for its economic production viability. There is now successor legislation in force governing quartz and iron mining in Yukon. For the purposes of the following questions, unless stated otherwise, the successor legislation has the same provisions with respect to claim requirements and configurations. The claims are considered to have been located in compliance with the Act and there are no other recorded claims within thirty kilometres. a) Identify the successor legislation. b) What entity administers the legislation? c) What type of monuments would have been available for Mr. Monaghan to use in his survey? d) If you were to perform the Crest survey today what types of monuments would you be authorized to use? e) What units of angular, linear and areal measure show on the plans and field notes? f) What is the maximum allowable area for the iron claims included in the survey? g) When is the next anniversary year for renewal of the leases? h) Use one copy of Figure 1 for preliminary work if desired. The other copy is to be completed with the claim configuration Mr. Monaghan will have established from his survey based on the information in Table 1. No geometric calculation is necessary to answer the question. Your sketch must be neat, legible and must identify each claim in the survey. Use lines of different colours to delineate the claim boundaries.	1 1 1 1 3 1 1 5	
7.	a) Identify two of the three purposes for which a compiled plan can be prepared. b) Is a compiled plan an official plan for purposes of the *Canada Lands Surveys Act*?	2 1	
8.	A portion the Louis Bull 138B Indian Reserve, Part of Tp. 45, Rge. 25, W.4th M., Province of Alberta is required for the placement of a buried mechanical chamber associated with an Enbridge Inc. natural gas pipeline. The Louis Bull administration has agreed to lease the 30.0 metre square portion to a depth of 14.0 metres below the 825.0 metres average surface elevation based on geodetic datum. The parcel required is surrounded by Indian reserve land or Road designated part of the reserve. You are a Canada Lands Surveyor and Alberta Land Surveyor in private practice in Edmonton and are retained by the Louis Bull Band to prepare a plan of survey that will be the basis for the 30-year lease of the cubic shaped parcel to Enbridge. The Louis Bull		

	Lands Director confirms that the band is not an adherent to the *First Nations Land Management Act.* a) Who will issue instructions for this survey? b) Draw the diagrammatic portion of the resulting plan (assume that separate field notes in plan form will be filed). c) Write the title for the plan of survey. d) What additional statements will have to be made in the Legend of the plan and with respect to the quantum of the parcel involved? e) Mr. Monaghan from Question 6 above is also an Ontario Land Surveyor and his related firm MMM Geomatics Alberta Ltd. has offices in the province. Can Mr. Monaghan make the required survey? Why or why not? f) What type of monuments would you place in this survey?	1 5 2 2 1 1	
9.	The Transportation Safety Board of Canada (TSB) has retained your firm of engineers and surveyors to assist its technicians in the investigation of an aircraft crash in Nunavut. The wreckage and debris is to be located before it is removed for reassembly and analysis in a warehouse in Quebec. The wreckage of the aircraft and its contents covers several square kilometres. You have been asked to prepare a plan and digital data file of the results. TSB will have a technician accompany your survey party and he will supply coding for the various types of objects being recovered, geo-referenced and inventoried. There is a municipal boundary within a few kilometres of the principal wreckage site. There are also several aerodrome navigational aid sites operated and maintained by Transport Canada in the vicinity. The area is also covered by mineral claims in good standing located pursuant to the former Canada Mining Regulations. a) Write your work plan in key point bullets indicating how you would undertake this work and present your results. b) Name the statute that authorizes the Canada Mining Regulations. c) If the mineral claims were being located in 2012, identify the legislation that would govern them.	3 1 1	
10.	Sketch 2 attached in duplicate shows an array of legal posts for creek and bench claims located on Flat Creek and Allgold Creek in the Dawson Mining District. Table 2 attached shows the details of evidence found at the legal post locations relevant to this question. The claims were field examined by a Mining Inspector prior to issuance of the grants and the staking was found to be within acceptable compliance with the Act. Relevant parts of the Flat Creek Baseline and the Allgold Creek Baseline were resurveyed in 1983 by P.E. Thomson, CLS and the plan from that survey is recorded as 68972 CLSR. As a Canada Lands Surveyor in private practice in Dawson City, Yukon you have been engaged by a joint venture partnership to make a legal survey of claims held by members of the syndicate prior to the commencement of very large scale placer mining operations. a) What is the minimum size of legal post that should have been used to locate these placer mining claims? b) How many claims can be grouped under a Grouping Certificate and why would a claim holder want to do so? c) What type of monuments will you use in this survey? d) Anticipating significant ground disturbance with heavy equipment, describe the steps	1 2 1	

	you would take to protect the original evidence to the extent possible? e) Use one copy of Figure 2 for preliminary work if desired. The other copy is to be completed with the claim configuration you will establish from your survey and the information in Table 2. No geometric calculation is necessary to answer the question. Your sketch must be neat, legible and must identify each claim in the survey. Use lines of different colours to delineate the claim boundaries.	2 5	
	Total Marks:	100	