PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 35 14: Special Project Procedures for PHAI Waste Nuclear Substance License Compliance.

1.2 MEASUREMENT AND PAYMENT

.1 Development of a radiation protection plan, updates as required and its implementation including provision of all material equipment and labour as required for the duration of the project work will be paid according to Lot Price.

1.3 REFERENCES

.1 AECL PHAI Radiation Protection Plan, 4500-508740-PLA-001 (PHAI RP Plan).

.2 Department of Justice Canada
.1 Nuclear Safety and Control Act S.C. 1997,c. 9.

.3 Canadian Nuclear Safety Commission (CNSC) Regulatory Guide: G-129 rev 1, Keeping Radiation Exposures and Doses "As Low As Reasonably Achievable (ALARA)". October 2004.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.4 SUBMITTALS (Cont'd)

.2 Develop a site-specific Radiation Protection (RP) Plan, Radiation Protection Standard Operating Procedures (SOPs) and Dosimetry Program. Contractor's RP Plan, SOPs and Dosimetry Program must be developed with reference to and be consistent with the latest version of the PHAI RP Plan (4500-508740-PLA-001). Submit to Departmental Representative for review and comment at least three months prior to start of radiological related field activities (including suspect radiological activities, i.e., enabling works along Lakeshore Road, Nichols Roads South and within the northern areas of the PGWMF). The RP Plan shall include a radiation protection training manual consistent with the PHAI RP Plan required under the terms of the construction services contract, and include details of Contractor's contamination control and worker radiation protection measures for each step of the construction process for which it is responsible. Periodically update with changes and new information as dictated by project requirements.

.3 Submit to the PHAI RP Program Administrator, to be identified by the Departmental Representative:

.1 List of Nuclear Energy Workers (NEWs) and their personnel information, as well as any unique identifier assigned to personnel by each Dosimetry Service Provider used. This list shall be provided every four weeks for new workers, and shall be submitted prior to any dose report including these personnel.

.2 Doses measured for project shall be submitted in both paper and electronic format within four weeks of the end of a monitoring period. Monitoring periods will be stipulated by the Departmental Representative.

.3 Submit reports of regular inspections, meetings, non-conformances, incidents, RP related events, and key performance indicators.

.4 Submit radiological areas and radiological zones for each site, including submission of any changes to these.

1.5 RESPONSIBILITY

.1 Contractor shall:

1.5 RESPONSIBILITY (Cont'd)

.1 (Cont'd)

.1 Assign qualified Radiation Protection Specialist(s) to provide active oversight and ongoing support for implementation of radiation protection measures, defining, documenting, implementing, and monitoring the Contractor's RP Program.

.2 Ensure provision of any additional resources required for successful implementation of radiation protection measures.

.3 Ensure appropriate radiation protection training is provided to workers and visitors to sites.

.4 Implement and provide support for radiation protection measures.

.5 Design work practices that are consistent with radiation protection requirements and principles including strategies for control at source.

.6 Provide required PPE, equipment and tools for implementation of radiation protection measures.

.7 Require workers and visitors to properly utilize PPE and related equipment.

.8 Define and document Dosimetry program.

.9 Facilitate as appropriate, worker time management where other dose control measures have not sufficiently reduced dose accumulation. Implement a dose management program to facilitate worker time management.

.10 Support monitoring under the radiation protection requirements.

.11 Identify or acknowledge and implement opportunities for improvement of Radiation Protection in accordance with "As Low As Reasonably Achievable (ALARA)" principle.

.12 Conduct self-protection tests using portable radiation meters and qualified personnel to confirm the level of radiation hazard in a work area as work progresses.

.2 Contractor's Radiation Protection Specialist(s) shall work on a day-to-day basis with Contractor organization to ensure radiation protection requirements are appropriately and consistently implemented. Radiation Protection Specialist(s) shall be primarily responsible within this group to:

.1 Provide ongoing oversight and quality control of the radiation protection measures.

1.5 RESPONSIBILITY (Cont'd)

.2 (Cont'd)

.2 Prepare Contractor's radiation protection training manual and training materials and deliver radiation protection training to Contractor personnel working on site and new hires.

.3 Respond to worker questions and concerns about radiation protection.

.4 Undertake compliance verification activities as specified.

.5 Complete inspections prior to and upon completion of any work involving radioactive materials and regular active site inspections to ensure appropriate implementation of the Contractor's RP Plan/Program, Dosimetry Program, and SOPs including relevant aspects such as: access control, signage, contamination control, record keeping practices, work practices.

.6 Ensure appropriate implementation of personnel monitoring requirements.

.7 Complete required radiation protection monitoring.

.8 Provide radiation protection quality control during construction activities associated with handling of radioactive materials, loading of transportation vehicles and, contamination control for vehicles, equipment and people exiting sites.

.9 Ensure radiation instrumentation is properly calibrated and maintained.

.10 Identify further opportunities for implementing ALARA principles.

.11 Complete reporting requirements, including regular reporting and immediate reporting related to unplanned events or deviations from the radiation protection performance expectations.

.12 Provide localized hazard identification and signage.

.13 Provide appropriate training, manage and supervise visitors to sites.

.14 Unplanned events of a radiological nature and any other indication of deteriorating radiological conditions shall always be brought to the attention of the PHAI MO RP Program Administrator.

.15 Refer to PHAI RP Plan for more information on responsibilities of RP Staff.

.3 Contractor's General Staff:

1.5 RESPONSIBILITY (Cont'd)

.3 (Cont'd)

.1 Contractor's general staff is a broad category for active workers. While specific work requirements may vary and be detailed for more specific worker categories, categorize workers as general staff for the purposes of the radiation protection measures. All workers that may potentially be exposed to radiation from the waste materials, including labourers, equipment operators, truck drivers, etc. General staff are required to be Nuclear Energy Workers (NEWs - see article 1.6.2 below) and shall be responsible for:

.1 Following requirements of radiation protection measures.

.2 Use of PPE and dosimeters assigned to them.

.3 Participate in the Dosimetry Program defined by the Contractor (including submission of urine bioassay samples).

.4 Use of administrative and engineering controls for radiation protection.

.5 Reporting to Contractor's Radiation Protection Specialist(s) any work conditions which conflict with necessary conditions for implementation of the radiation protection measures.

.6 Communicating questions and concerns about radiation protection to Contractor's Radiation Protection Specialist(s).

.7 Communicating to Contractor's Radiation Protection Specialist(s) any identified opportunities to improve radiation protection consistent with ALARA principles.

.8 Immediately notify Contractor as soon as a NEW becomes aware of being pregnant.

.9 Refer to responsibilities outlined in PHAI RP Plan for more information.

.2 Contractor's general staff shall be authorized to:

1.5 RESPONSIBILITY (Cont'd)

.3 (Cont'd)

.2 (Cont'd)

.1 Complete radiation work at work sites following the work practices established in the Contractor's RP Program and SOPs, work plan and HASP and under the supervision of Contractor's Radiation Protection Specialist(s). Radiation work practices must be reported to a Contractor's Radiation Protection Specialist(s) for assessment and work planning.

1.6 WORKER STATUS

.1 Contractor responsible to maintain required security clearance level in accordance with the Contract Documents and provide escort as required to those that do not have clearance. Monitoring surveillance to be maintained by the Contractor, however, the owner reserves the right to complete routine inspections as required.

.2 Contractor site staff, Contractor Radiation Protection Specialist(s), personnel driving waste trucks, and Contractor general staff working on a work site will designated as Nuclear Energy Workers (NEW) as used in the Nuclear Safety and Control Act and receive training as a Group 1, 2, 3, or 4 worker as defined in the PHAI RP Plan.

.3 The following persons shall not be employed as a NEW:

.1 The person is under 18 years of age; or

.2 The person's radiation exposure records are such that regulatory limits could be violated.

.4 The following information must be provided to employees designated as NEW and sign-off by the employee to confirm receipt of this information is required to be collected in the employee training records:

.1 His or her designation as a NEW;

.2 The risks associated with radiation work;

.3 The individual NEW's responsibility to notify supervisor and RP Program Specialist as soon as she becomes aware of being pregnant and/or returns to work and is nursing; and

.4 The applicable Regulatory Dose Limits and Administrative Control Limits prescribed in the RP Plan.

1.6 WORKER STATUS (Cont'd)

.5 Any Nuclear Energy Worker who becomes aware that she is pregnant shall immediately notify the Contractor, who will then inform the PHAI RP Program Administrator, within one business day. The Contractor will then review and, if necessary, adjust the work suitable for the NEW, to ensure doses are ALARA and below the CNSC regulatory limits for pregnant workers. The Contractor will also be required to provide a detailed description of the controls to be employed for the NEW to the PHAI RP Program Administrator, and be aware that this information may also be requested during routine oversight visits/audits.

1.7 SITE VISITORS

.1 To enter site, site visitors need pre-arranged permission and authorization from the Contractor.

.2 Site visitors will be allowed to enter a Controlled Area, if they agree to and abide by site access restrictions and Contractor H&S requirements, and are escorted by Contractor's Radiation Protection Specialist(s) or a Contractor's Site Management Team member.

.3 Prior to entry to site, an authorized visitor must receive and sign-off on delivery of training related to:

- .1 Commitment to a sound safety culture and approach for ALARA principles.
- .2 Requirements to respect the instructions of the site escort.
- .3 Potential radiation hazards on site and any site-specific radiation hazards and controls.
- .4 The need for the visitor to indicate to Contractor's Radiation Protection Specialist(s) if the visitor is a NEW designated visitor is or is likely to be pregnant or nursing.
- .5 Site access controls and contamination control procedures.
- .6 Use of required PPE for the visitor.
- .7 That no radiation work is to be performed by the visitor.
- .8 Designation as NEW or non-NEW and the potential levels of exposures the NEW visitor may be exposed to. Non-NEW visitors shall not be exposed to levels above regulatory limits and the Contractor shall ensure that appropriate controls are in place to facilitate this.

1.8 RADIOLOGICAL AREAS

.1 Radiological areas associated with the project will be segregated into one or more Controlled Areas, Supervised Areas, and/or Uncontrolled Areas based on the potential for external and internal radiation exposures and the probability of spread of contamination. Within the Controlled Areas there will be radiological safety zones 1, 2 and 3 (see the PHAI RP Plan for more information). The definition and process of characterizing the radiological areas and safety zones will be described in the Contractor's SOPs. The radiological areas and the number of radiological safety zones established at each site indicated and will be determined by Contractor's Radiation Protection Specialist(s) and made available for review by the PHAI MO RP Program Administrator. Changes will also be reviewed by the PHAI MO RP Program Administrator.

.2 Signs at the entrance to each zone shall reflect both radiation and contamination levels, in addition any PPE requirement.

.3 In accordance with the PHAI RP Plan, the radiological safety zones are described as follows:

- .1 Radiological Safety Zone 1:
  - .1 A Radiological Safety Zone 1 is considered a "clean" zone.
  - .2 Dose received by individual from external sources of radiation during continuous occupancy in a Radiological Safety Zone 1 should not exceed 1 mSv in 1 year.
  - .3 A Radiological Safety Zone 1 is considered suitable for unrestricted occupancy (e.g., clean side of contamination).
- .2 Radiological Safety Zone 2:
  - .1 A Radiological Safety Zone 2 is normally free of radioactive contamination, but may be subject to infrequent cross-contamination from higher numbered zones.
  - .2 Chronic removable contamination shall not be tolerated in Radiological Safety Zone 2 and removable contamination discovered shall be eliminated.

1.8 RADIOLOGICAL AREAS (Cont'd)

.3 (Cont'd)

.2 (Cont'd)

.3 Will be used as a buffer area between a higher numbered zone containing removable contamination and Zone 1 (e.g., access from active work area to contamination control area, area for staging equipment for use in active work area, area between clean and impacted haul routes).

.3 Radiological Safety Zone 3:

.1 Radiological Safety Zone 3 is considered a zone of medium occupancy and such occupancy shall be subject of continuing review by Contractor Management and employees that are trained and qualified as Contractor Radiation Protection Specialist(s).

.2 Radiological Safety Zone 3 includes active work areas with activities that generate removable surface contamination.

.3 In Radiological Safety Zone 3 efforts shall be made to eliminate removable contamination upon discovery, or as soon as practicable based on ALARA considerations. If the removable contamination cannot be immediately eliminated, the contaminated area is small (in comparison to size of zone) and the area requires additional contamination control measures (in excess of the requirements posted at the zone entrance) the hazard shall be locally posted until cleaning is completed.

.4 Note that the existing PGWMF is a licensed waste management facility. AECL is required to have access of the PGWMF to perform routine Waste Water Treatment Plant (WWTP) operation and site monitoring activities and will be required to retain responsibility of operation of the existing WWTP system at the PGWMF inclusive of the East and West Reservoirs.

.1 Prior to removal of waste the entire PGWMF site shall be designated as a Controlled Area with the exception of the north area of the PGWMF to be fenced (that includes the existing WWTP). Refer to existing PGWMF-X-04 Drawing.

1.8 RADIOLOGICAL AREAS (Cont'd)

.4 (Cont'd)

.2 The Contractor shall allow for AECL staff to have open unrestricted access, subject to compliance with the Contractors Site Specific Health and Safety Plan, to Uncontrolled Areas, however, the Contractor shall provide AECL with escorted access to Controlled Areas as required.

.3 Controlled Areas at the PGWMF will be modified over the project as directed by the Departmental Representative upon the onset of waste relocation activities and as areas are remediated, verified, isolated and re-designated as Uncontrolled.

.5 Localized Hazard(s) Within Radiological Safety Zones:

.1 Within various zones at sites, concentrated radioactive materials on surfaces or sources of beta radiation may occasionally exist that could give rise to localized (extremity) hazards (i.e., localized hazard(s)). In such cases, assuming a near contact dose rate exceeding 1 mGy/h (100 mrad/h), localized hazard(s) exceeding the general dose rate posted at the entrance to the zone by >25 times shall be posted in a highly visible fashion within the zone.

.2 Information pertaining to the dose rate at near contact with the localized hazard(s) shall be posted along with any other pertinent information.

.3 Accessible localized hazard(s) shall be eliminated or reduced as soon as possible consistent with the ALARA principle.

.6 Non-uniform general doses within zones:

.1 Within a given zone, dose rates may vary considerably, and therefore a mechanism is required to alert workers to local field variations within accessible locations.

.2 Localized dose rate variations at site by more than a factor of 5 either way from the general posted dose rate within the zone shall be posted in a highly visible fashion within a zone. Post the maximum dose rate measured at 300 mm from the surface.

.7 Trucks used for movement of waste materials will make only direct trips between the LTWMF and the site where the waste is being excavated.

1.8 RADIOLOGICAL AREAS (Cont'd)

.8 Truck wheel wash facility to be designed to collect overspray and mist, within the footprint of the cleaning area/pad. These facilities will be an interim measure to reduce the potential for tracking of waste materials.

1.9 SITE ACCESS

.1 Each site will have controlled access and this will be established prior to any work involving radioactivity-contaminated material commencing on site consistent with the requirements of the PHAI RP Plan.

.2 As appropriate, each site will have perimeter security fencing, and suitable signage and/or barriers.

.3 The access point between Zone 1 and Zone 2 of each site will include a Personnel Contamination Control Area and a Vehicle Contamination Control Area that will be the location for personnel and vehicle or construction equipment monitoring, haulage truck tarping prior to departure from site, personal hygiene and decontamination facilities for personnel and hand-held equipment exiting site.

.4 A daily entry log book will be maintained at these access control stations and all on-site project personnel and visitors will be required to "sign in" and "sign out" of site using this book. Information to be provided by each individual includes their full name, date, time of entry or exit, affiliation to project (e.g., contractor personnel, visitor, etc.) and escort (if applicable). The log book will maintain a record of the time spent on site by each individual, allow identification of individuals currently on site and track all individuals that have visited site during any particular period.

.5 In addition to the entry log book, the access control station will also contain a comprehensive up-to-date list of persons authorized to enter site.

.6 Authorized visitors must be with their designated escort at all times while on site. NEW designated Owner Personnel can access the site unescorted but shall comply to Contractor and Site specific requirements related to Radiation Protection and Health and Safety.

1.9 SITE ACCESS
(Cont'd)

.7 Vehicles shall only be provided access to site if required and with authorization of Contractor's site supervisor.

.8 Vehicles or construction equipment must undergo cleaning, monitoring and inspection prior to exiting the Controlled Area at the Vehicle Contamination Control Area.

.9 Controlled site access will be in place at each site from commencement of Work involving radioactivity-contaminated material to work completion, including verification of remediation and work criteria and, clean up of any potentially cross-contaminated areas on site. Each site refers to the two facilities applicable to the project; the new LTWMF and the existing PGWMF (inclusive of regions and excavations within the PGWMF).

.10 Posting and signage identifying radiological hazards will be done as required by per the regulations specified herein, and shall comply with the following, as applicable:

.1 The sign must bear the radiation warning symbol and the words "RAYONNEMENT - DANGER - RADIATION".

.2 The radiation warning symbol must include a trefoil that is either black or magenta, and a background of lemon yellow.

.3 The symbol shall be oriented with one blade pointed downward and centered on the vertical axis.

.4 The size of the trefoil shall be as large as permitted by the size of the sign on which it appears, provided that the proportions are maintained.

.5 The symbol shall be identifiable from a safe distance.

.11 At the entrance to each radiological safety zone, post a sign that contains the radiation warning symbol (zone 3 signs only), the words RAYONNEMENT - DANGER - RADIATION, radiation levels, contamination levels and if there are any respiratory protection requirements.

.12 The warning sign for external radiation fields shall include:

.1 The radiation warning symbol.

.2 The words RAYONNEMENT - DANGER - RADIATION, and in the case of localized hazard(s) the words CAUTION - LOCALIZED HAZARD.

1.9 SITE ACCESS (Cont'd)

.12 (Cont'd)
.3 An indication of the general dose rate in accessible location.
.4 The date on which the survey was done.

.13 The warning sign for airborne contamination shall include:
.1 The radiation warning symbol.
.2 The words RESPIRATOR AREA or CAUTION - AIRBORNE ACTIVITY.
.3 The minimum respiratory protection required.
.4 Other available information concerning the hazard.
.5 The date on which the airborne contamination survey was done.
.6 Radiation and contamination information and radiological protection requirements should appear on the same warning sign, whenever possible, to minimize the number of signs and maximize safety.
.7 Signage that is required for respiratory protection and/or due to airborne contamination should also indicate that personnel protective equipment and clothing (PPE&C) "is required beyond this point".

.14 Requirements for Personnel Contamination Control Area:
.1 Establish a Personnel Contamination Control Area between Radiological Safety Zone 2 and 1, to allow detecting external personnel contamination at exit points from Radiological Safety Zone 2.
.2 The Personnel Contamination Control Area to allow for removal and collection of PPE, personnel hygiene requirements and decontamination of personnel and hand-held equipment.
.3 Decontamination of equipment or materials to be undertaken if removable surface contamination exceeds the levels shown in the PHAI RP Plan. Collect any potentially contaminated wastes from the decontamination processes.
.4 The Personnel Contamination Control Area will consist of a weather tight trailer suitable for year round use that has one door in Zone 1 and one door in Zone 2 to allow personnel to pass from one Zone to the other through the trailer. If site size does not permit the use of a trailer, alternate facilities will be proposed by Contractor for the approval of Departmental Representative.

1.9 SITE ACCESS (Cont'd)

.15 The following requirements at a minimum must be met prior to commencement of Work each day:
- .1 Sign-in at the access control station and complete the required information.
- .2 Pick-up assigned Thermoluminecent Dosimeter (TLD).
- .3 Change into work clothing (e.g. coveralls) over or in place of street clothing.
- .4 Check safety equipment such as hard hats, safety glasses and/or goggles and respirators.
- .5 Don safety boots and gloves and tape to coverall if required based on PPE requirements based on type of assigned work.

.16 To leave Radiological Safety Zone 2 for any reason, including end of work day and lunch breaks, personnel must at a minimum complete the following:
- .1 Enter contamination control station and remove protective footwear and place in designated location.
- .2 Remove, inspect, and clean hard hat, safety glasses and/or goggles.
- .3 Remove coveralls and gloves and place in designated location.
- .4 Remove respirator. Remove cartridges in designated location.
- .5 Proceed to wash area and clean hands and face and additional washing in accordance with site procedures.
- .6 Complete monitoring for contamination, and if found acceptable don any street clothes removed upon entry to site. If contamination is found to be unacceptable, follow decontamination instructions from Contractor's Radiation Protection Specialist(s).
- .7 Return TLD to storage location and sign out of log book completing required information.

.17 For vehicles that have to enter Zone 2 and/or Zone 3, establish a Vehicle Contamination Control Area between Radiological Safety Zone 2 and 1:
- .1 Vehicle Contamination Control Area shall allow detecting external contamination on vehicles or construction equipment exiting Radiological Safety Zone 2.

1.9 SITE ACCESS (Cont'd)

.17 (Cont'd)

.2 Vehicle Contamination Control Area shall allow for scanning of the vehicles for external contamination and inspection of material loading and covers and other dust control measures to ensure the vehicle meets any requirements provided in the PHAI Radioactive Material Transportation Plan and the Contractor's site-specific Environmental Protection Manual. Refer to requirements of PHAI RP Plan.

.3 Decontamination of vehicles or construction equipment shall be undertaken if removable surface contamination exceeds the levels according to Table 3 of PHAI RP Plan.

.4 The Vehicle Contamination Control Area shall be constructed in a manner that permits inspection of the full height of the vehicle and the installation of tarps following inspection (e.g., scaffolding). The ground surface shall be covered with an impermeable membrane with sufficient durability to withstand vehicle traffic. If water is used for decontamination, the full area will be surrounded with barriers to collect all washwater for treatment prior to discharge.

.5 Truck decontamination facility to be designed to collect overspray and mist, within the footprint of the cleaning area/PAD.

.6 A preliminary inspection will be undertaken by the Contractor for vehicles moving between Zones 3 and 2 as applicable prior to entering Zone 2 to prevent the spread of contamination.

.18 Vehicles or construction equipment that are required to exit Radiological Safety Zone 2 and leave site shall at a minimum undergo the following:

.1 Just prior to entering the contamination control area the vehicle shall be cleaned of removable contamination.

.2 Upon entering the contamination control area the vehicle shall be monitored to ensure it is free of external contamination according to the PHAI RP Plan.

.3 If external contamination is above acceptable limits, additional decontamination must be completed and follow-up monitoring completed.

1.9 SITE ACCESS (Cont'd)

.19 The vehicle or construction equipment shall be inspected by Contractor for appropriate material loading and use of covers and other dust control measures to ensure the vehicle meets requirements provided in the PHAI Radioactive Material Transportation Plan and the Contractor's site-specific Environmental Protection Manual.

1.10 ACTIVITY SPECIFIC REQUIREMENTS

.1 Certain project activities will require special considerations to be employed such that the radiation protection requirements can be adapted to the unique characteristics of work activities. These unique characteristics are related to the type of site, the characteristics of the waste material, or the work activities required to remediate, handle, transport and dispose of the waste. Various requirements are specified in the PHAI RP Plan.

.2 If waste is identified with unexpected characteristics special work procedures and practices are required to maintain radiation protection consistent with ALARA principles. In addition, ALARA assessments should consider the following concepts to optimize radiation protection, economic and social considerations taken into account:

.1 Work equipment shall remain on-site to the extent possible to reduce the need for repeated decontaminations and the potential for trace amounts of contamination from being transferred off site.

.2 Vehicles for transporting waste material that regularly leave the work site shall be routed such that they avoid driving through active work areas to the extent possible. This may be achieved by establishing loading areas at the edge of active excavation area or construction area, avoiding high traffic areas used by excavation and earth moving equipment.

.3 To reduce the potential for the creation of dust, work plans shall be designed in consideration of opportunities to minimize the handling of the waste. Reducing the amount of handling and double-handling of waste material will help to reduce potential for dust creation. Further dust minimization shall be achieved by maintaining adequate moisture content in the waste material.

1.10 ACTIVITY SPECIFIC REQUIREMENTS (Cont'd)

.3 To reduce cumulative dose, the number of persons granted access to the work site for nonessential purposes shall be minimized. Many general observation visits may be possible from outside the perimeter fencing. To the extent possible, persons entering site shall be limited to contractors undertaking, supervising and directing the work.

.4 Limit entry to sites to persons required to verify the progress or completion of Work, persons required for monitoring or auditing environmental, health and safety and, radiological issues.

.5 To reduce the potential of any inadvertent down-wind exposures from an ALARA perspective, consider the direction of prevailing winds in establishing lower radiological safety zones, contamination control areas, rest areas and food consumption areas.

.6 Site set-up shall also consider the proximity of lower radiological safety zones, contamination control areas, rest areas and food consumption areas to minimize incidental external radiation exposures from excavation sites, temporary waste storage areas and vehicle loading areas and temporary staging areas for loaded vehicles for waste transport.

.7 Staff must not to pick or eat food that grows or lives on site (berries, mushrooms, wild game, etc.).

.8 Activity specific considerations are provided below to identify potential issues that will require additional radiation protection measures:

.1 PGWMF: Waste within the PGWMF includes low-level radioactive waste (LLRW) and soils that have become contaminated by the LLRW (termed marginally contaminated soils, or MCS) as well as debris of varying sizes. The target contaminants associated with the LLRW at Port Granby have been identified as arsenic, Ra-226, Th-230, and uranium. Removal of the LLRW, MCS, and debris will require the use of mobile equipment, and managing dust generation will be a focus for the Contractor's site-specific environmental procedures and also for radiation protection in accordance with ALARA principles. It is anticipated that some debris will require reduction in size prior to placement in the LTWMF.

1.10 ACTIVITY SPECIFIC REQUIREMENTS (Cont'd)

.8 (Cont'd)

.2 LTWMF: placement of waste in the LTWMF will require use of mobile heavy equipment. Managing dust generation will be a focus of Contractor's site-specific Environmental Protection Manual, however, minimizing dust generation will also be important aspect for radiation protection consistent with ALARA principles.

.9 Contractor shall not bring radioactive sources or x-ray emitting devices onto Site without the express written permission of the PHAI MO Radiation Protection Program Administrator. Permission may be withheld for any reason.

.10 Advise staff that all workers have obligations under Section 17 of the NSCA's General Nuclear Safety and Control Regulations. All Contractor workers will understand and abide by these obligations.

1.11 RADIATION EXPOSURE MANAGEMENT

.1 Plan radiation work in advance to maintain radiation doses are ALARA. The degree of formalization of the planning process and optimization method used shall be proportional to the potential doses to personnel and members of the public. The planning process shall include a review and assessment of radiation and other industrial hazards, including an estimation of the individual and collective doses, selection of appropriate tools and instruments, protective measures and equipment, dosimetry, etc. Radiation work planning is subject to Radiation Safety Assessments, Work Permits/Assessments, review and approval and other requirements described in the PHAI RP Plan. Work planning shall include the provision of written work procedures commensurate with the complexity and degree of hazard associated with Work. The planning process for radiation work shall ensure that a dosimetry program, appropriate to the hazards involved in Work, is in place before Work proceeds, and that personnel are up to date on their dosimetry requirements prior to work starting.

.2 Plan, schedule, and execute radiation work with the following objectives:

.1 Keeping doses below dose Action Levels and regulatory dose limits.

.2 Keeping exposures and doses as low as reasonably achievable, economic and social factors taken into account.

1.11 RADIATION EXPOSURE MANAGEMENT (Cont'd)

.2 (Cont'd)

.3 Preventing the occurrence of unplanned events that could lead to exposures exceeding deterministic effect dose thresholds and reducing, to the extent possible, the probability of occurrence of unplanned events exceeding a dose Action Level or regulatory dose limit.

.3 The degree and extent of the ALARA assessment and review of work should be commensurate with the levels of anticipated hazards, expected exposures and potential exposures. An ALARA assessment and review shall include a process to identify radiation sources and justify their use.

.4 Complete radiation safety assessments in sufficient detail to quantify the contribution of both the ambient and task-related radiation dose, and their causes, to provide adequate data for the optimization process.

.5 Analyze new and non-routine activities to determine if the activity will introduce new or non-routine radiological aspects, hazards or safety concerns.

.6 Perform a radiological work assessment for new and non-routine radiological work. The evaluation of the radiological concern level for anticipated hazards, expected exposures and potential exposures and the overall radiological significance level shall be done using the criteria and guidance given in CNSC guidance document G-129 Rev 1 and PHAI RP Plan.

.7 Prior to the start of work at any site, Contractor's site supervisor shall ensure that a pre-work briefing of workers is held by personnel who are knowledgeable of work, hazards and the necessary safety measures. This shall be done for work in controlled Areas and for tasks that could result in reasonably significant estimated individual dose or collective dose. Contractor's RP Plan to define thresholds for estimated individual dose and collective dose, that would require such detailed work planning.

.8 A pre-work briefing shall include the following but is not limited to:

.1 Scope of work to be performed.

.2 Radiological conditions of the workplace.

.3 Procedural and work plan requirements.

1.11 RADIATION EXPOSURE MANAGEMENT (Cont'd)

.8 (Cont'd)
- .4 Special radiological control requirements.
- .5 Radiological limiting conditions, such as contamination or radiation levels that may void the work plan.
- .6 Radiological control hold points.
- .7 Emergency response provisions.

.9 Make sure that information in the pre-work briefing is documented and each worker signs off that they attended the pre-work briefing. This sign-off will be kept with training records.

.10 In addition to the pre-work briefing, make sure that a daily briefing is held prior to the beginning of work each day to discuss changes to the information provided in the pre-work briefing (e.g., lessons learned, radiation levels, etc.) and to remind workers of the hazards and safety measures.

.11 Maintain a log of daily briefing attendance in a retrievable manner for the life of the project.

.12 After completion of the work task at site, complete a post-work review. This post-work review includes examining the performance of the work and documenting any unplanned events, unusual occurrences and lessons learned. The information from the post-work review must be used in work planning and ALARA considerations for similar work in the future or at other sites that still must be completed.

.13 Implement procedures to have lessons learned available from post-job reviews and reports of past radiological events.

.14 Contractor's Radiation Protection Specialist(s) should evaluate lessons learned, provide prompt distribution, and incorporate the lessons into the radiation protection program, including the radiation protection training program, as well as other related operations.

.15 Contractor shall track and report monthly the following Radiation Protection Key Performance Indicators:
- .1 Dose Management.
- .2 Personnel Contamination Incidents.
- .3 Internal Dosimetry Compliance.
- .4 Reportable Non-Compliances with RP and RP Program Regulations.

1.12 DOSIMETRY PROGRAM

.1 Submit a written Dosimetry Program.

.2 Ensure that the Dosimetry Service Provider is licensed by the CNSC and supporting documentation provided at the request of the Departmental Representative.

.3 Make sure that doses of ionizing radiation received by personnel as a result of work at sites are measured and assessed, communicated and recorded consistent with the PHAI RP Plan.

.4 Contractor's Radiation Protection Specialist(s) shall ensure that sites maintain dosimetry programs accepted by the Departmental Representative. These programs shall cover both external and internal dosimetry and shall include procedures to ensure that appropriate dosimetry is provided for all personnel entering Controlled Areas.

.5 Implement procedures with the understanding, among others, that the objectives of the dosimetry programs are to:

.1 Assign and record individual occupational radiation doses,and doses of visitors, in an appropriate and approved manner to demonstrate compliance with the PHAI licence.

.2 Maintain doses within approved regulations and administrative limits and ALARA.

.3 Provide performance indicators on the effectiveness of the overall radiation protection program and its implementation.

.4 Identify needs for corrective actions.

.5 Ensure personnel are up to date / in compliance with dosimetry requirements prior to work starting.

.6 Consider the follwoing for information and general guidance:

.1 The dosimetry programs shall meet the technical and quality assurance requirements specified in the service provider's QA manual. Dosimeters are required to be calibrated according to approved procedures. Radiation doses to personnel received in Controlled Areas shall be monitored individually. The Departmental Representative may authorize exceptions on a case-by-case basis. Individual monitoring is required for personnel in controlled areas and any other personnel who may approach 1 mSv in a calendar year.

1.12 DOSIMETRY PROGRAM (Cont'd)

.6 (Cont'd)

.2 The standard dosimeter used at sites for dose recording of external dose ("deep dose equivalent") shall be a thermoluminescent (TL) dosimeter. There will be 13 dose monitoring periods per calendar year, each being of 4 weeks in duration, except perhaps for the first or last period in the year which may be a few days longer or shorter than 4 weeks. The Departmental Representative will provide the details of the monitoring periods for each calendar year, in advance of each year.

.3 At the end of each monitoring period the dosimeters shall be processed, the doses assigned, and the values submitted to the RP Program Administrator, preferably within 4 weeks of the end of a monitoring period. Doses must be submitted within 8 weeks of the end of a monitoring period. Doses will be submitted in both paper and electronic format. Electronic format will use the dosimetry service provider's unique identifier for each person to ensure doses loaded to the PHAI RP Program dosimetry system are loaded to the correct person. Prior to submitting dose reports for persons, Contractor shall provide a list of persons and their dosimetry service provider(s) unique identifier(s). A dose estimate shall be performed and recorded for each instance of a lost, damaged or contaminated dosimeter issued to any individual. Dose estimates will be provided to the PHAI RP Program Administrator individually if not included in the electronic and paper dose reports.

1.12 DOSIMETRY PROGRAM (Cont'd)

.6 (Cont'd)

.4 Intake of radioactive material (chronic or acute) shall be detected and quantified by bioassay analysis with sufficient sensitivity to measure 1/20 of the PHAI Project's Annual Limit of Intake (ALI), defined as 1200 bq in the PHAI RP Plan, which corresponds to a 20 mSv Committed Effective Dose. If this is not possible, the bioassay tests shall be supplemented with workplace monitoring or personal air sampling to identify intakes at or below 1/20 of an ALI. Workers shall participate in a routine internal contamination monitoring program if there is a potential for an intake (chronic or acute) of radioactive material of 1/20 ALI. The responsibility for identifying the potential of intake rests with Contractor's Management Team in co-operation with Contractor's Radiation Protection Specialist(s). The internal dosimetry program for quantification of intake of radioactive material is expected to be urine bioassay for both Uranium and Ra-226. If an alternate dosimetry program is to be used, documentation of the reasoning for not using the expected method is required to be submitted with the dosimetry program.

.5 Monitoring requirements shall be assessed commensurate with the potential for intake of radioactive material. The potential for intake shall be reviewed by Contractor's site supervisor in cooperation with Contractor's Radiation Protection Specialist(s) for employees who enter designated Radiological Safety Zone 2 since the predominant radiological hazard is expected to be internal exposure due to radioactive contamination in or on materials and wastes. However, the need for the use of personal protective equipment or frequent entry into any controlled area will generally indicate a requirement for participating in a bioassay program.

.6 The establishment of specific bioassay requirements is the responsibility of Contractor's Radiation Protection Specialist(s)

1.12 DOSIMETRY PROGRAM (Cont'd)

.6 (Cont'd)

.6 (Cont'd)

.1 Details of these tests and the conditions under which the test must be applied to achieve the requirements shall be documented. Instruction will be provided to the employees' and must be clearly conveyed to those participating in the program.

.7 Specific requirements for the internal dosimetry and associated bioassay programs are specified in CNSC Regulatory Document S-106 and Guidance Document GD-150.

.8 Personnel radon dosimetry, or a radon monitoring program that assigns doses to personnel, will be implemented and doses for exposure to radon progeny reported. If two years of data prove that there is no significant dose due to radon (i.e., relative to the PHAI RP Plan action level), then such dosimetry may be discontinued with the Departmental Representative's concurrence.

1.13 PPE&C REQUIREMENTS

.1 Develop and implement plans and procedures to implement and maintain personal protective equipment and clothing (PPE&C) including, but not limited to, the following:

.1 Employees who may have the potential for intake of radioactive material, due to radioactive contamination in or on materials and wastes, must be provided with suitable and adequate PPE&C that will prevent or reduce the potential for the intake of radioactive materials into the body. PPE&C requirements are included in the PHAI RP Plan.

.2 Prior to wearing PPE&C, employees shall receive sufficient instructions, and where appropriate, fitting and training in the proper use and limitations of the PPE&C.

.3 Each site shall be equipped with an adequate supply of radiological protective equipment as approved and authorized by the responsible Contractor's Radiation Protection Specialist(s). The selected PPE&C must provide an appropriate degree of protection for anticipated radiation hazards during normal operations, and for control of credible hazards in the event of unplanned events and emergencies.

1.13 PPE&C REQUIREMENTS (Cont'd)

.1 (Cont'd)

.4 Contractor's Radiation Protection Specialist(s) shall develop, maintain and authorize selection criteria and technical specifications for all personal protective equipment used at each site. At a minimum, the following requirements will be met:

.1 Protective equipment shall be maintained in good condition and be used correctly and effectively.

.2 All employees working within the Control Area (Group 1, 2 and 3 employees as defined in the PHAI RP Plan) shall receive training in the use of protective equipment.

.3 Contractor's Radiation Protection Specialist(s) shall be responsible for training and maintenance of personal radiological protective equipment, and PPE&C.

.5 Protective equipment shall be worn or used as required in operating procedures:

.1 Only personnel who have successfully completed the training in the use of protective equipment shall be allowed to enter zones that require the use of protective equipment.

.2 Only Contractor's Radiation Protection Specialist(s) can authorize protective equipment required for radiation work and can provided training in its use.

.3 PPE&C shall be used for entry or work in potentially contaminated zones or with potentially contaminated equipment or materials.

.4 PPE&C designated for radiological control use shall be specifically identified and shall not be used for other purposes.

.5 The selection of PPE&C shall be determined by the type and level of radiological hazard and the nature of Work.

.6 Adequate respiratory protection shall be ensured through a program of respirator selection, maintenance, fit-testing and training.

.7 Only respirators that are approved and authorized by Contractor's Radiation Protection Specialist(s) and comply with the minimum protection standards specified Respiratory Protection shall be used.

1.13 PPE&C REQUIREMENTS (Cont'd)

.1 (Cont'd)

.8 Only employees who do not have medical restrictions on the use of respirators and who have been successfully fit-tested for a specific respirator type shall be allowed to enter locations requiring the use of that specific respirator type. Such employees shall not have interfering facial hair.

.9 Respiratory protective equipment shall be worn if radioactive airborne concentrations could exceed one Derived Air Concentration (DAC). Exceptions shall be justified based on an ALARA assessment and shall be approved by Contractor's Radiation Protection Specialist(s).

.10 Default values for airborne contamination concentrations requiring use of respirators shall be defined in the Contractor's SOPs.

.11 Protective clothing, as selected by Contractor's Radiation Protection Specialist(s), shall be used for entry or work in potentially contaminated zones or with potentially contaminated equipment or material.

.12 The Contractor shall provide boot cleaning stations to remove dirt and mud from boots when personnel are leaving potentially contaminated areas, and prior to performing personal monitoring for contamination. Any water generated by these stations is to be collected and treated.

.13 All Group 1, 2 and 3 employees shall receive training in the dress/undress procedures of protective clothing.

.14 The type and level of radiological hazard and the nature of Work shall determine the selection of protective clothing. Gloves shall be worn if contaminated material or potentially contaminated material is to be handled.

.15 Protective footwear shall be worn if the work area is, or is likely to become, contaminated. Colour, symbol, or appropriate labeling shall specifically identify protective clothing designated for radiological control use. Such clothing shall not be used for other purposes within sites.

1.13 PPE&C REQUIREMENTS (Cont'd)

.1 (Cont'd)

.16 Instruments used for personnel monitoring shall be capable of detecting surface contamination at the maximum values for unrestricted use, as indicated in the PHAI RP Plan. Individuals exiting from an area or zone of higher contamination probability to an area or zone of lower contamination probability shall monitor themselves for radioactive contamination at the exit point, and pass through survey instrument frisking stations upon leaving the Controlled Area.

.17 If radioactive contamination is detected at the exit point where monitoring is required, employees shall not proceed until decontamination procedures have been carried out and authorization has been received from Contractor's Radiation Protection Specialist(s).

.18 Personnel who work with radioactive materials, or who have entered zones where hand or other skin contamination is possible, shall wash their hands and/or shower as necessary, or as directed by work procedures or Contractor's Radiation Protection Specialist(s).

.19 Personnel handling radioactive material or leaving Radiological Safety Zone 2 or higher shall monitor themselves for contamination prior to entering a beverage or food consumption area/room.

.20 No one shall enter an authorized food consumption area wearing protective clothing or protective equipment for radiation protection purposes. Consumption of food and beverages, and smoking at sites shall only take place in authorized locations, according to site specific procedures.

.21 Consumption of food, smoking and preparation of beverages are restricted to Radiological Safety Zone 1 areas.

.22 To allow drinking of beverages in Radiological Safety Zone 2 areas, Contractor must document a site-specific procedure and provide the procedure for acceptance by the PHAI MO RP Program Administrator. At a minimum, the procedures shall require that beverages may only be consumed in Radiological Safety Zone 2 areas, if:

.1 The individuals handling and consuming the beverages have washed their hands.

1.13 PPE&C REQUIREMENTS (Cont'd)

.1 (Cont'd)

.22 (Cont'd)

.2 The area designated for beverage consumption is away from any dust generating activities.

.3 The beverage is in a factory-sealed container and was transported to and stored in the area designated for beverage consumption while still sealed.

.4 The area designated for consumption of beverages is routinely checked for contamination by the Contractor's Radiation Protection Specialist(s).

.23 Contractor shall provide a means to collect protective clothing and work clothing that may be contaminated and launder as required such that the worker's street clothing does not become contaminated. An offsite laundering facility may be used, however the contaminated clothing must be shipped under the Transport of Dangerous Goods Class 7 regulations, Packaging and Transport of Nuclear Substances Regulations and the facility must be licensed to launder contaminated clothing.

.24 Contractor shall provide sufficient amount of additional PPE&C (including but not limited to anti-contamination clothing, respirator filters, gloves, boot covers, etc.) for 12 visitor suit-ups per day allowing for the possibility of multiple daily visitor changes. The Contractor is responsible for collecting, managing, maintaining, cleaning and laundering as may be required similar to Contractor supplied personnel PPE&C.

.25 Disposable coveralls that are adequate (and accepted by the Contractor's Radiation Protection Specialist) and cover all the PPE&C requirements of the radiation protection program can be worn. The coveralls, disposable or otherwise, must be suitable for the assigned work and remain functional (meeting all requirements of the radiation protection program), throughout their usage. Damaged or excessively soiled coveralls are to be replaced when they no longer meet the requirements or achieve the desired results.

1.14 RP EQUIPMENT AND INSTRUMENTS

.1 Develop and implement plans and procedures to supply, maintain, calibrate, and implement proper use and storage of RP Equipment and instruments including, but not limited to, the following:

.1 Contractor's Radiation Protection Specialist(s) and other Group 1 and 2 employees who are authorized and required to use portable radiation meters shall have access to them. In determining accessibility, the frequency of use required and the extent to which the employee relies on the instrument to indicate unusual situations will be considered.

.2 Radiation protection instruments that are not in good order shall be so marked and promptly removed from service (for repair/replacement, maintenance and calibration).

.3 Function checks are normally performed daily for instruments that are in continuous use, and prior to each use for those that are used intermittently except when otherwise specified in instrument specific procedures.

.4 Function checks should include (if applicable to the instrument)general condition, verification of calibration date, source check, battery condition, background reading, response check, zero setting, alarm settings, alarm function and mechanical defects and damage.

.5 Response checks are normally performed daily for instruments that are in continuous use, and prior to each use for those that are used intermittently except when otherwise specified in instrument specific procedures. Normally response checks are conducted in conjunction with function checks where practicable.

.6 Response checks for area external radiation monitoring are normally conducted monthly where accessible and consistent with ALARA principles. Otherwise response checks shall be conducted on a quarterly basis.

.7 The instrument must respond (e.g. increase in measurement indication, alarm annunciation,etc.) as appropriate for the type of instrument being checked. If the response is not as anticipated as per instrument specific procedures, the instrument shall be removed from service for maintenance and calibration.

1.14 RP EQUIPMENT AND INSTRUMENTS (Cont'd)

.1 (Cont'd)

.8 If a source check or calibration is conducted, an additional response check is not required the day of the source check or calibration. Source checks shall be performed at a minimum on a weekly frequency except when otherwise specified in instrument specific procedures. The instrument reading shall be within ±20% of the expected response. If the instrument readings are outside of this range, the instrument shall be removed from service for maintenance and calibration. A response check does not substitute for a source check.

1.15 DOSE/DOSIMETRY RECORDS

.1 Develop and implement plans and procedures for Dose/Dosimetry Records including, but not limited to, the following:

.1 Maintain both historical and current dosimetry records for personnel who are designated as Nuclear Energy Workers (NEW) and are monitored for radiation exposures. Each individual's dose record shall contain information on doses from occupational sources of ionizing radiation, previous and current. At a minimum, the records shall contain dose information as applicable for each monitoring period to include:

.1 External penetrating (whole body) deep dose equivalent.

.2 External surface (skin) shallow dose equivalent.

.3 Dose equivalent from internal exposures.

.4 Dose equivalent to extremities.

.5 Details of any internal exposures, including test results from in-vitro sample analyses, in-vivo counting results, personal air-sampler results, as well as any associated doses that were assigned.

.6 Details of the workplace environment necessary to support dose assignments (or absence of dose) when these are based on workplace monitoring records.

.7 Effective doses for the current year and previous five years dosimetry periods.

1.15 DOSE/DOSIMETRY RECORDS (Cont'd)

.1 (Cont'd)

.1 (Cont'd)

.2 NEW shall have their dosimetry records updated each period for all personnel being monitored and Contractor's Radiation Protection Specialist(s) shall forward summaries of each person's occupational doses to the PHAI RP Program Administrator, in accordance with paragraph 1.12.6.3. The Contractor shall have a Dosimetry Service Provider (DSP) licensed by CNSC submit doses to the National Dose Registry of Health Canada. Personnel shall have access to his or her personal radiation dose record upon request, and the Contractor shall regularly notify personnel of accumulated doses, as well as providing an annual report of accumulated doses. Accumulated dose reports shall also be provided to the PHAI RP Program Administrator. Should a person question the accuracy or completeness of his or her dose record, Contractor's Radiation Protection Specialist(s) and the PHAI RP Program Administrator shall conduct a joint review.

.3 Contractor shall be responsible for mailing annual dose reports to contractor personnel and copies shall be sent to the PHAI MO RP Program Administrator.

1.16 MONITORING PROGRAM AND RECORDING

.1 Develop and implement a radiation monitoring program and recording including, but not limited to, the following:

.1 External radiation monitoring shall be conducted at sites while work is in progress.

1.16 MONITORING PROGRAM AND RECORDING (Cont'd)

.1 (Cont'd)

.2 Radiation measurements shall be made at a series of designated locations throughout each occupied site by project personnel on a regular/daily basis (e.g., field offices, change-out areas, food consumption areas, excavation area, etc.). The exact location of the measurements will be established by Contractor's Radiation Protection Specialist(s) based on the inspection of the physical layout of the individual sites according to the Contractor's SOPs. Radiation measurements are to be taken with ionizing radiation detectors capable of measuring whole body dose rate levels that are calibrated by a CNSC-approved Canadian calibration facility, within 12 months of the last calibration.

.3 Radiation measurements shall be made by a qualified worker (i.e., trained by Contractor's Radiation Protection Specialist(s)) twice a day at multiple locations throughout sites.

.4 Radiation measurements shall be taken with ionizing radiation detectors at a height of 1 m above the ground surface and at contact with the ground surface. In accordance with standard procedures, radiation measurements will be taken from low radiation areas first (e.g., Zone 1, entrance to site) and then move to expected higher radiation areas (e.g., active work areas).

.5 Radiation measurements shall be recorded on a topographic plan of site, and copies of this topographic plan will be incorporated into a survey results sheet. The survey results sheet will include the topographic plan with locations, date, time, surveyor, meter (including serial number and last calibration date), action levels and responses to take if reading exceeds action level.

.6 These completed survey results sheet shall be reviewed by Contractor's Radiation Protection Specialist(s) and filed at site. These records will be kept for at least 1 year, either at site (if open/active), or if site has been closed provided to Departmental Representative.

1.16 MONITORING PROGRAM AND RECORDING (Cont'd)

.1 (Cont'd)

.7 Control levels shall be set for each site by Contractor's Radiation Protection Specialist(s) based on the natural background radiation levels. If a control level is reached or exceeded, Contractor's Radiation Protection Specialist(s) shall conduct an investigation on the elevated radiation levels, and develop mitigation measures to implement in order to reduce the levels before the radiation levels reach the action level for site. Action level for the site is defined in the site licence and the PHAI RP Plan.

.8 Administrative Control Levels shall be developed for each site prior to beginning of work at the site. Departmental Representative and the PHAI RP Program Administrator must be notified immediately of any radiation levels reaching the Action Level, to allow the PHAI MO to complete the government agency notification.

.9 Measure and document surface radioactive contamination levels (i.e., alpha, beta and gamma radiation) on equipment, vehicles, structures and personnel to minimize potential worker exposures within work areas and to confirm that there are no increases in radiation levels which could impact project personnel.

.10 Surface contamination monitoring shall be conducted at all sites while Work is in progress.

.11 Surface contamination measurements shall be made at a series of designated locations throughout each site occupied by project personnel on a regular/daily basis (e.g., field offices, change-out areas, food consumption areas, excavation area, etc.).

.12 The measurements shall be made on various surfaces, including (but not limited to) personnel, equipment, vehicles, floors and tables. The exact location of the measurements shall be established by Contractor's Radiation Protection Specialist(s) based on the inspection of the physical layout of individual sites according to the Contractor's SOPs.

.13 Surface contamination measurements are to be taken with open-faced "pancake" Geiger counters. Contractor may request to use alternate equipment, to be approved in advance by AECL.

1.16 MONITORING PROGRAM AND RECORDING (Cont'd)

.1 (Cont'd)

.14 Surface contamination measurements shall be made by a qualified worker at least twice a day at locations throughout sites. Surface contamination measurements on personnel shall be conducted each time personnel move from a higher to lower zone, and anytime personnel are leaving site. In addition all equipment being moved from a higher to lower zone and leaving site must always have surface contamination measurements conducted.

.15 If surfaces are determined to be contaminated (i.e., outside range of natural background for site), clean and decontaminate the surface if practical. Once decontamination has been completed, perform surface contamination measurements to ensure the surface is no longer contaminated; however, if surface is still contaminated, if practical, clean and decontaminate surface again.

.16 Surface contamination measurements for surfaces at designated locations (i.e., not including personnel, vehicle or equipment) shall be recorded on a surface contamination monitoring results sheet. This results sheet shall include a schematic of site with locations, date, time, surveyor, meter (including serial number), results, action levels and responses to take if reading exceeds action level. These completed results sheets will be reviewed by Contractor's Radiation Protection Specialist(s) and filed at site.

.17 Surface contamination monitoring results for personnel and equipment shall be recorded in the surface contamination log book, with the date, time, results, control level, location, method used to decontaminate and surface contamination results after decontamination.

.18 Surface contamination monitoring results for vehicles leaving site shall be recorded on a surface contamination vehicle monitoring results sheet. This results sheet will include a space for a drawing of the vehicle, date, time, surveyor, meter (including serial number), results (at each side of vehicle), control levels and responses to take if reading exceeds the control level.

1.16 MONITORING PROGRAM AND RECORDING (Cont'd)

.1 (Cont'd)

.19 These completed results sheets shall be reviewed by Contractor's Radiation Protection Specialist(s) and filed at site.

.20 Surface contamination results sheets shall be kept for at least 1 year, either at site (if open/active), or if site has been closed provided to Departmental Representative.

.21 The Adminitrative Control Levels for surface contamination measurements at each site shall be set by Contractor's Radiation Protection Specialist(s) based on the range of natural background measurements at each site. Any exceedances of the Administrative Control Levels will result in decontamination of the item. If decontamination of the item is not practical, then the item must be properly removed from site (i.e., treat as contaminated material and dispose in appropriate manner) and replaced.

.22 No item may leave site if contaminated in excess of the limits specified in the PHAI RP Plan.

.23 Personnel decontamination shall be performed when any level of contamination is detected on personnel.

.24 Long-lived gross alpha air sampling will be conducted at sites while work is in progress.

.25 Long-lived gross alpha measurements will be made at a series of designated locations throughout each site occupied by project personnel on a regular/daily basis (e.g., field offices, change-out areas, food consumption areas, excavation area, etc.). The exact location of the measurements will be established by Contractor's Radiation Protection Specialist(s) based on the inspection of the physical layout of each site according to the Contractor's SOPs.

.26 Long-lived gross alpha measurements are to be taken using glass microfiber filters in filter holders attached to plastic tubing to an air pump.

.27 Long-lived gross alpha measurements will be made by a qualified worker on a daily basis during the entire time work activities related to the preparation, excavation and removal of material from sites is being conducted.

1.16 MONITORING PROGRAM AND RECORDING (Cont'd)

.1 (Cont'd)

.28 The types of analyses to be performed by Contractor's laboratory (e.g., gross counts, gross counts excluding radon), including follow-up analyses to be performed (e.g., alpha spectroscopy) if initial results are high, shall be specified in the Contractor's SOPs.

.29 Control levels shall be set for each site by Contractor's Radiation Protection Specialist(s) based on the potential for exposure, magnitudes of potential exposures, and considering the dose limits and natural background for each site. If a control level is reached or exceeded, Contractor's Radiation Protection Specialist(s) shall conduct an investigation on why the elevated levels, and develop mitigation measures to implement in order to reduce the levels before reaching the action level for site. The Administrative Control Levels shall be based on the PHAI RP Plan and the Waste Nuclear Substance Licence. If an action level is reached, then a report must be filed as required by the regulations. As required, Departmental Representative and the PHAI RP Program Administrator must be notified immediately of long-lived gross alpha measurements reaching the Action Level, to allow the PHAI MO to complete the government agency notification.

.30 Radon gas concentrations will be measured at sites while work is in progress.

.31 Radon gas concentrations will be measured at a series of designated locations throughout each of sites occupied by project personnel on a regular/daily basis (e.g., field offices, change-out areas, food consumption areas, excavation area, etc.). The exact location of the measurements will be established by Contractor's Radiation Protection Specialist(s) based on the inspection of the physical layout of individual sites.

1.16 MONITORING PROGRAM AND RECORDING (Cont'd)

.1 (Cont'd)

.32 Radon gas concentration measurements are to be taken using both continuous monitoring and grab samples. The continuous monitoring should use alpha track devices (passive monitors that require no electrical power), while the filtered grab samples use an appropriate electronic device. The alpha track devices sample over a short or long time period, while the grab samples provide quasi real-time values to confirm there are no elevated radon gas concentrations which could impact project personnel. Other methods and devices such as continuous monitoring and alpha track detectors may be used, subject to prior acceptance by the PHAI MO RP Program Administrator. The procedure for radon monitoring will be documented by the Contractor in their SOPs.

.33 Radon monitoring devices will be set up at each of the designated locations by a qualified worker (i.e., trained by Contractor's Radiation Protection Specialist(s)) and left for the duration of work at site. The device will be replaced at the frequency required by the method. Collected devices shall be returned to the laboratory for analysis and the results received from the laboratory will be reviewed by Contractor's Radiation Protection Specialist(s).

.34 Filtered grab samples for measuring radon gas concentrations will be collected by a qualified worker (i.e., trained by Contractor's Radiation Protection Specialist(s)) on a weekly or more frequent basis at the designated locations at site. These samples will be analyzed (or sent for analysis if required by the method) and the results will be reviewed by Contractor's Radiation Protection Specialist(s). Radon monitoring results shall be normally reviewed by the Contractor's Radiation Protection Specialist on a weekly basis, except in cases where control levels are reached.

1.16 MONITORING PROGRAM AND RECORDING (Cont'd)

.1 (Cont'd)

.35 Control levels shall be set for each site by the Contractor's Radiation Protection Specialist(s) based on the potential for exposure, magnitudes of potential exposures, and considering the dose limits and natural background for each site. Control levels are to be set below the site action levels per the licence and RP Plan.

.36 If a control level is reached, Contractor's Radiation Protection Specialist(s) will conduct an investigation on why the elevated levels, and develop mitigation measures to implement in order to reduce the levels before reaching the action level for site (e.g., reduce surface area of exposed contaminated material, workers wear appropriate respiratory protection).

.37 If an action level is reached, then a report must be filed as required by the regulations. As required, Departmental Representative and the PHAI RP Program Administrator must be notified immediately of any radon gas concentrations reaching the Action Level, to allow the PHAI MO to complete the government agency notification.

.38 Monitor the ambient radon progeny levels in air at selected locations throughout sites, to minimize potential worker exposures and to confirm that there are no elevated radon progeny levels which could impact project personnel.

.39 Radon progeny levels will be measured at sites while work is in progress.

.40 Radon progeny levels will be measured at a series of designated locations throughout each of sites occupied by project personnel on a regular/daily basis (e.g., field offices, change-out areas, food consumption areas, excavation area, etc.). The exact location of the measurements will be established by Contractor's Radiation Protection Specialist(s) based on the inspection of the physical layout of individual sites according to the Contractor's SOPs.

1.16 MONITORING PROGRAM AND RECORDING (Cont'd)

.1 (Cont'd)

.41 Radon progeny levels are to be measured using both continuous monitoring and grab samples. The continuous monitoring provides the radon progeny levels over a specified time period, while the grab samples provide quasi real-time values to confirm there are no elevated radon progeny concentrations which could impact project personnel.

.42 Measurements using the continuous monitors and grab samples will be conducted by a qualified worker (i.e., trained by Contractor's Radiation Protection Specialist(s)). The continuous monitors will be replaced at the frequency required by the method. The continuous monitors shall be returned to the laboratory for analysis and the results received from the laboratory will be reviewed by Contractor's Radiation Protection Specialist(s). The grab samples will be collected on a weekly or more frequent basis with the samples sent for analysis to the laboratory and the results reviewed by Contractor's Radiation Protection Specialist(s).

.43 Control levels for each site will be set by Contractor's Radiation Protection Specialist(s) based on the natural background radon progeny levels. If a control level is reached, Contractor's Radiation Protection Specialist(s) will conduct an investigation on the elevated levels, and develop mitigation measures to implement in order to reduce the levels before reaching the action level for site (e.g., reduce surface area of exposed contaminated material, workers wear appropriate respiratory protection).

.44 The requirement for personal dosimetry will be applied at sites and to individuals on sites (i.e., including visitors).

.45 There is no specific location that the monitoring will be conducted; however, individuals (i.e., workers, visitors) that enter Zone 2 or higher of a site will be issued a thermoluminescent dosimeter (TLD) and dosimetry will be measured and recorded. Some individuals may also be assigned a direct reading dosimeter (DRD) or equivalent. The PHAI RP Plan requires that external dosimetry shall be conducted for all employees entering PHAI radiological safety zones.

1.16 MONITORING PROGRAM AND RECORDING (Cont'd)

.1 (Cont'd)

.46 Individuals entering Zone 2 or higher (including visitors) will be assigned a TLD and required to wear on the trunk of their body. The person providing the TLD to the individual will only do so after the following information has been collected:

.1 Legal Surname, including previous surnames.
.2 Given Name(s).
.3 Social Insurance Number.
.4 Sex.
.5 Job title.
.6 Date of Birth (YYYY/MM/DD).
.7 Place of Birth (Province/Country).
.8 Dose records for current calendar year and previous 4 years.

.47 TLDs will be stored on a board near the entrance of site, and will be returned to the board prior to leaving site. Contractor's Radiation Protection Specialist(s) will collect the TLDs every monitoring period or upon completion of work at site and send to supplier of TLDs for analysis.

.48 Alternate analysis frequencies are required for certain groups. TLDs for pregnant NEWs are exchanged at pregnancy declaration. Visitor TLDs are collected at the completion of the visit. Results will be entered into a personnel dose monitoring database/system. Doses measured for project are to be submitted in both paper and electronic format to the PHAI RP Program Administrator preferably within 4 weeks of the end of a monitoring period, but must be submitted within 8 weeks of the end of a monitoring period.

.49 Action levels for external exposure (measured by personnel dosimetry) are as indicated in the PHAI RP Plan and the Waste Nuclear Substances Licence.

.50 Departmental Representative and the PHAI MO RP Program Administrator must be notified immediately of any personnel doses reaching the Action Level, to allow the PHAI MO to notify the CNSC.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

END OF SECTION