DEPARTMENT OF HEALTH & HUMAN SERVICES　　Public Health Service

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August 29, 1989

Mr. Malcolm R. Knapp, Director
Division of Radiation Safety and Safeguards
U.S. Nuclear Regulatory Commission
Region 1
475 Allendale Road
King of Prussia, PA 19406

Dear Mr. Knapp:

This letter is our response to your letter of July 25, 1989 requesting additional information on the meteorological analysis of incinerator stack discharge and validation of environmental air sampling station locations pursuant to the following:

Docket Nos:	030-01786	License Nos:	19-00296-10
	030-06922		19-00296-12
	030-08478		19-00296-17
	030-17872		19-00296-20
	070-01366		SNM-1345

EA No. 88-300

Environmental Airborne Radioiodine Monitoring Program

An environmental monitoring program for airborne radioiodines has been operational since July 1987. This program is specifically directed to the evaluation of environmental air concentrations of radioiodines that may result from incinerator stack releases.

There are eight sampling stations specifically sited to sample for incinerator stack effluents. Each air sampling station is equipped with a HI-Q Environmental Products Company Model 1-CMP-14CV cabinet-mounted pump system in a weather housing. These units are self contained, rated for continuous duty, and provide a regulated, constant-flow vacuum source for sampling air. An elapsed time meter on each unit indicates total sample collection time. The iodine collector used is a HI-Q Environmental Products Company TCAL-30 TEDA-impregnated carbon cartridge, preceded by a HI-Q LB5211 Borosilicate Glass Microfibre Filter which is laminated on one side with spun polypropylene for high structural strength. The carbon cartridge and glass fiber filter are retained in a HI-Q RVH-30 Combination Holder. The TCAL-30 carbon cartridge has a certified retention factor of > 94 % for methyl iodide at the two cfm flow rate used in this monitoring program. Since methyl iodide has the poorest retention efficiencies of organic iodides and other iodine species, it is expected that the actual iodine retention factor is considerably greater than the stated 94%.

Charcoal cartridges are analyzed for radioiodines by high-resolution gamma spectroscopy using an Ortec Gamma-X coaxial germanium detector interfaced with a Nuclear Data ND 683 multichannel analyzer system. The glass fiber prefilters are given a screening count with either a Beckman Gamma 300 or Beckman Gamma 8000 gamma counter, and if necessary subjected to a more comprehensive analysis.

Air samples are collected continuously for a one-week period, with a flow rate of two cfm. The constant-volume air flow valve in the air pump maintains this flow rate over a wide range of filter loadings. Sampling cartridges and prefilters are changed weekly.

The charcoal cartridges are counted for 60 minutes with the coaxial germanium detector. With this counting time, the minimum detectable activities (MDA) in a cartridge are 2.7E-6 microcuries of I-125 and 6.5E-6 microcuries of I-131. With a one-week sampling period, a flow rate of two cfm, these MDAs, and assuming the retention factor of 94.35%, the minimum detectable concentrations (MDC) of radioiodines in air are as follows:

I-125	5.0E-15 microcuries/ml
I-131	1.2E-14 microcuries/ml

Comparison of these MDCs with the MPC values listed in 10 CFR 20, Appendix B, Table II, for soluble forms, indicates that our radioiodine detection capabilities are as low as 0.006% of the MPC for I-125 and 0.01% of the MPC for I-131. Although regulatory guidance suggests the use of a level of 10% of the MPC values for determining "significant" findings, we have adopted a level of 1% of MPC values for the assessment of "significant" concentrations of radioiodines measured by our environmental air monitoring program. Concentrations of less than 1% of MPC values are deemed to be insignificant.

Environmental air sampling station locations were established based on a comprehensive meteorological analysis of incinerator stack discharges using National Weather Service meteorological data and the U.S.E.P.A. recommended ISCLT modeling software provided by Trinity Consultants, Inc. The results of this analysis were described in a report forwarded to Region I of the Nuclear Regulatory Commission on May 2, 1989, and in a followup sent on May 31, 1989 (see copies enclosed).

Ash Sampling and Analysis

An experiment was conducted at the NIH to determine if a grab sample from the top layer of the dumpster ash is a representative sample for the entire ash within the dumpster. A report presenting the findings of the experiment is enclosed. It was concluded that a grab sample from the top layer of an ash dumpster is representative of the average of samples taken from different layers within the dumpster.

Demonstrating Compliance with 10 CFR 20.106(a) Using Environmental Air Sampling Data Rather Than Direct Effluent Monitoring

In the conference telephone call of August 18, 1989 between NRC Region I and the Radiation Safety Branch, NIH, we questioned what additional information NRC required beyond that already submitted and found acceptable according to paragraph two of your letter. It was agreed that reference to previous submissions would answer this question. The enclosures which are included with this response should satisfy your requirements in this regard.

ALARA Considerations for Other Air Effluent Streams

The NIH Radiation Safety Program requires that experiments or procedures which could generate volatile radioactivity be performed in appropriate facilities, both for containment of effluents and for personnel protection. In the biomedical research environment the majority of procedures which have this potential involve the use of radioiodines in labelling biochemicals or for administration to patients in diagnostic or therapeutic procedures. One other type of experimental procedure with a high potential for volatile radioactivity is the use of large activities of tritiated water, tritiated sodium borohydride or tritiated potassium borohydride for low efficiency labelling. The criteria for maximum activities in laboratories, together with the "protocol" system requiring written approval by RSB for certain types of experiments involving larger activities or requiring special facilities insure that RSB is in a position to appropriately supervise the design and execution of these types of experiments (see Section 10.5, page 10-7 of NIH Application for Renewal License No. 19-00296-10 submitted 7/28/86). Most of these procedures are performed in the Isotope Laboratory, Building 21, under the direct supervision of a staff health physicist. Volatile species are contained with local systems such as iodination boxes and are further treated by in-line filter systems in the exhaust ducts servicing the fume hoods employed during the experiments. There are RSB approved iodination facilities in several locations on the NIH campus. In each location an activated charcoal filter iodination box placed within a fume hood or a dedicated containment system with a charcoal filter is employed. All iodination facilities are monitored by RSB for effluent emissions from the exhaust ducts or building risers of the fume hoods involved. Our design goal for such facilities is that radioiodine effluents will be at small fractions of the unrestricted area MPC. In addition to experimental laboratories, the radioactive waste processing facility in Building 21 is equipped with state-of-the-art bag-in bag-out treatment systems which contain prefilters, HEPA filters and activated carbon adsorbers. Three such systems service the liquid waste processing area, general laboratory, and solid waste compacting operation.

Medical Pathological Waste (MPW) Box Monitoring System

In a letter dated June 28, 1989, to Dr. Shanbaky, Chief NMSS, Region I (see enclosure) the Radiation Safety Branch provided a general description of the automatic alarming system for detecting radioactivity in MPW boxes at the NIH incinerators. This system will utilize two detectors mounted on the incinerator conveyor belt so that each MPW box will be monitored on two sides. These detectors are on order and are expected to be in place and operating by October 1, 1989. The design criterion for alarm settings is that if a 1 mCi Cs-137 source is located anywhere in an MPW box it would be detected. This setting will also ensure the detection of significant (i.e. millicurie) levels of other nuclides with medium to high energy gamma emissions. When the monitoring system is mounted and fully tested, the Radiation Safety Branch will calibrate the alarm settings for this criterion. A temporary system with an alarm point approximating these conditions is installed in the interim.

Update on Continuous Monitoring of Incinerator Effluent

A gas stream from incinerator three can be "conditioned" (i.e. cooled and demoistured) to accommodate sampling for chemical effluent emissions by an Exemplar Model PEL-3 Thermoelectric Cooled Gas Conditioner attached to a multiple outlet manifold. The sampling probe provided for this system was constructed of hastelloy and was installed in a port of the incinerator stack exhaust in early July 1989. On July 28, 1989, an electrical storm caused the shutdown of the blowers on the incinerator. For several hours there was a severe temperature excursion. The elevated temperatures in the incinerator stack destroyed the probe. In an attempt to avoid this problem in the future, a new sampling probe has been ordered which is constructed of a ceramic designed to withstand much higher temperatures. The new probe is estimated to be delivered to NIH by October 1, 1989. When the sampling probe and conditioning system have been tested and proven reliable, the Radiation Safety Branch will research the feasibility of employing activated charcoal or silver zeolite samplers on the sampling manifold to collect potential radioiodines for laboratory analysis.

Please contact Mr. Robert Zoon (FTS 496-5774) if you need clarification or additional information.

Sincerely,

Ted W. Fowler

Ted W. Fowler
Acting Radiation Safety Officer, NIH

Enclosures

cc: Dr. Joseph E. Rall, Deputy Director for Intramural Research, NIH
Dr. Jacob Robbins, Chairman, NIH Radiation Safety Committee
Mr. Norman Mansfield, Associate Director for Research Services
Dr. Robert W. McKinney, Director, Division of Safety
Dr. William J. Walker, Jr., Chief, Radiation Safety Branch