Council Meeting Date: February 2, 2009 **Agenda Item:** 6(a)

CITY COUNCIL AGENDA ITEM

CITY OF SHORELINE, WASHINGTON

AGENDA TITLE:	Washington State Public Health Lab Risk and Safety Assessment Final Report
DEPARTMENT:	City Manager's Office
PRESENTED BY:	Scott MacColl, Intergovernmental Relations Manager

PROBLEM/ISSUE STATEMENT

The Washington State Public Health Lab (Lab) has proposed to enlarge the existing facility on the Fircrest Campus to provide additional biosafety level 3 space and replace and enlarge the existing specimen receiving area. As part of the decision-making process to fund the expansion, the State House Capital Budget Committee (Committee) requested that the Lab perform a risk and safety assessment.

The House Capital Budget Committee requested in a March 8, 2008 letter that the State Department of Health perform a safety and risk assessment of the Lab as part of the expansion. The Committee indicated in that letter that they believe it's important for Committee members and the Shoreline community to understand the risks and the safety measures associated with the operations of the Lab. The Committee specifically noted that they would like to see:

- a thorough discussion and understanding of the existing assessment of community safety procedures in place to protect the community;
- how that information is communicated to the surrounding community;
- consideration of risk to public facilities in the neighborhood (schools, etc.);
- an exploration of what those risks may be; and
- a discussion of the need for changes in the oversight or regulation of all such labs.

The Committee also recommended that the appropriate community representatives, stakeholders, and agency officials be included in the discussions.

In response, the Lab formed a stakeholder group made up of local community members leaders, public officials, teachers, and local government representatives. Two City of Shoreline employees were part of that group, including Ray Allshouse as the Building Official and Gail Marsh for emergency management. The full Stakeholder list is available as an attachment to this report (Attachment A). This stakeholder group provided input on the hiring of a consulting firm (Kleinfelder) to provide the risk assessment.

The State Department of Health released the final report on January 2, 2009. The assessment report provides information on potential hazards from biological, chemical,

and radiological materials that may arise from the laboratory, as well as risks of illness, injury, or other harm to the general public who may be exposed directly or indirectly to consequences of the presence and activities of the Lab.

For the February 2, 2009 Council meeting, representatives of the Department of Health, the Public Health Lab, consultants, and the stakeholders group are going to present the findings of the report. A copy of the Executive Summary (Attachment 'B') is attached for your information. Copies of the full report (approximately 150 pages) are available in the Council Office or City Manager's Office for review or to check out.

Attachment 'A': Stakeholder Advisory Group List
Attachment 'B': Final Risk and Safety Assessment Executive Summary

Approved By: City Manager ___ City Attorney ___

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Risk and Safety Assessment
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EXECUTIVE SUMMARY

This Risk and Safety Assessment was conducted to provide a comprehensive evaluation of potential hazards to the community posed by the presence of the Washington State Department of Health's (DOH) Public Health Laboratory (WA-PHL) located in Shoreline, Washington. Kleinfelder prepared this assessment report in accordance with the Statement of Work (SOW) under DOH Work Order #1, Contract # GA 32206, DOH #N17187. This assessment report provides information on potential hazards from biological, chemical, and radiological materials that may arise from the laboratory, as well as risks of illness, injury, or other harm to the general public who may be exposed directly or indirectly to consequences of the presence and activities of the WA-PHL.

Intro

This assessment includes both quantitative and qualitative methodologies to evaluate hazard and was performed according to accepted professional and academic industry standards by a team of professionals in the fields of laboratory biosafety, laboratory chemical hygiene, laboratory radiological safety, and laboratory risk analysis.

qualifications

Based on the risk and safety assessment described in this report, the WA-PHL is in compliance with applicable regulations that protect laboratory workers and the community in which the laboratory operates. Under normal operating conditions, the most-probable risks that may be associated with the laboratory can be efficiently mitigated by existing programs, policies, and procedures and are unlikely to pose a hazard to the surrounding community.

BACKGROUND

The WA-PHL provides a wide range of diagnostic and analytical services for the assessment and surveillance of infectious, communicable, genetic, chronic diseases and environmental health concerns, for the citizens of the State of Washington. The laboratories also serve to coordinate and promote quality assurance programs for private clinical and environmental laboratories through training, consultation, certification and quality assurance sample programs. In addition, over the last decade, the Public Health Laboratories have expanded their role in providing scientific and managerial leadership for the development of public health policy.

what the lab does

The laboratory is currently a 70,000 square-foot facility, which has operated since 1985, and contains several laboratories, (including microbiology, environmental, and newborn

Size date

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screening), shipping and receiving areas, maintenance areas, storage, and office space. To facilitate program growth and changes in laboratory design standards since 1985, the DOH is planning to enlarge the existing laboratory to provide additional biosafety level 3 (BSL-3) space and replace and enlarge the existing specimen receiving area. Based on a review of the design plans and interviews of laboratory staff involved in the design, the laboratory expansion is not expected to introduce hazards different or of greater magnitude than those evaluated in this risk and safety assessment report.

Expansion specifics

Recently, concerns have arisen regarding potential hazards to communities surrounding public health laboratories. Therefore, the DOH prepared an SOW to conduct a risk and safety assessment for the activities at the WA-PHL as they might affect the surrounding community. In addition, the DOH requested that recommendations be provided for risk management measures as they apply to any risks identified during the assessment.

Per the SOW, the following assessments were conducted:

- Evaluation of the location of the WA-PHL compared to other public health laboratories in the United States
- Biological Hazards Assessment
- Chemical Hazards Assessment
- Radiological Hazards Assessment
- Physical Hazards Assessment
- Security Vulnerability Assessment
- Earthquake Hazards
- Emergency Response Program Assessment

Summaries of these assessments are provided below.

WASHINGTON PUBLIC HEALTH LABORATORY LOCATION ANALYSIS

For comparison of the WA-PHL location to the locations of other PHLs across the country, an initial list of 56 PHLs was obtained from the Association of Public Health Laboratories (APHL) State Public Health Laboratories Emergency Contact List, August 2006. To reduce this extensive list to a size manageable under this task, a subset of 12 PHLs was identified based on two criteria: size of surrounding population and similarity of mission as compared to the WA-PHL.

Population estimates were obtained from the United States Census Bureau. According to the Census Bureau, the population of the Seattle area is 594,210. For this evaluation, areas with populations ranging from 500,000 to 800,000 were assumed to be comparable to the population surrounding the WA-PHL. Cities with populations in this range (per the Census Bureau estimates) were then compared to the APHL list of 56 public health laboratories. Cities with populations and PHL locations similar to the WA-PHL were selected for this evaluation. From this list of cities with PHLs, 12 with PHL missions similar to that of the WA-PHL were identified for the location comparison. To assess the similarity of mission, websites for each of the PHLs were accessed to obtain each PHLs individual mission.

The WA-PHL is located immediately north of the City of Seattle limits, approximately eight miles from downtown Seattle. Four other laboratories were also located just outside the major metropolitan area they are serving, ranging in distance from three to 20 miles. These outlying locations also range from small rural residential communities to areas of a more industrial nature. Eight laboratories are located in downtown/metropolitan areas of the cities served. Four are located on or near universities and have a combination of residents, students, and research facilities (including hospitals). Others are located in major downtown areas surrounded by government buildings and residential neighborhoods. Based on the comparison of the 12 labs selected for evaluation, the Shoreline lab is located in areas similar to other public health laboratories around the country.

Of the 12 laboratories selected for this evaluation, eight responded to inquiries regarding "best practices" to reduce risk and enhance community safety. None of the labs indicated that they had "best practices" to reduce risk and/or enhance community safety outside of any mandated state and/or federal regulations and/or requirements. They also did not have active community groups in the area with an interest in the operation of their local PHL.

BIOLOGICAL HAZARDS EVALUATION

Per Work Order #1, the biological risk assessment was conducted in accordance with the methods and standards provided in the *Biosafety in Microbiological and Biomedical Laboratories* (BMBL) 5th Edition publication by the Centers for Disease Control (CDC) and the National Institute of Health (NIH). Among the guidelines, the BMBL provides a classification system called biosafety levels (BSLs) that are based on risk assessments which evaluate at which BSL level the laboratory work should be conducted (BSL-1, -2,

-3, or -4, indicating lowest to highest risk levels). The BMBL guidelines provide information to architects and engineers designing and constructing laboratories for biohazards; information to scientists working with hazardous microorganisms; and information to biosafety officers on how to conduct risk assessments.

Results of the evaluation of the appropriateness of the WA-PHL BSL classification indicated that the BSLs currently in place are appropriate for the microorganisms worked with at the WA-PHL, according to the select agent classification (BMBL) and the Material Safety Data Sheets. Through direct observation, discussion with laboratory staff, and review of training materials the worker practices and procedures implemented at the WA0PHL meet the CDC/NIH published standards. In addition, the BSL-3 select agent laboratory meets or exceeds the safety requirements for a BSL-3 laboratory.

The potential for biological hazards to the community from the WA-PHL is difficult to assess because of the various protective measures in place at the WA-PHL. These include:

- Extensive training for employees as to the proper way to handle infectious microorganisms;
- Biological safety cabinets used throughout the WA-PHL to contain microorganisms worked with;
- Procedures for decontamination of infectious waste materials;
- Procedures for decontaminating equipment to be removed from a laboratory room;
- Procedures for decontamination of laboratory clothing;
- High efficiency particulate air (HEPA) exhaust filters for the BSL-3 laboratory;
- Spill response protocols;
- Controlled storage for potentially infectious waste material before pick-up by a licensed contractor.

A review of the many security programs in place at the WA-PHL indicates that access to the microorganisms stored in the BSL-3 containment laboratory would be difficult for a laboratory "outsider" to achieve. There are several checks and balances in place to reduce this type of risk. For example, only a few people have the clearances needed to work in the BSL-3 laboratory and access requires two individuals with unique keys for unlocking the laboratory doors. Card key access to the wing housing the BSL-3 laboratory is also in place.

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Furthermore, due to the small quantity of select agents stored at the WA-PHL, theft of these materials is unlikely to be attractive to any group looking for potential microorganisms that could be used for terrorist actions. In addition, threat analyses conducted by federal, state, and local law enforcement concluded that there were no known criminal or terrorism threats to the WA-PHL. These agencies have also concluded that the existing security systems are adequate for this facility.

CHEMICAL HAZARD ASSESSMENT

The WA-PHL maintains an extensive inventory of liquid and solid chemicals and compressed gasses consistent with its mission and with the maintenance and repair of equipment, instruments, and the physical plant. Although the chemical inventory is extensive, the laboratory work performed generally requires only small amounts of any given chemical.

The Chemical Hygiene Plan (CHP) prepared by the WA-PHL describes the hazards of the chemicals maintained in the laboratory and procedures and programs for minimizing those hazards during the normal course of operations. The CHP forms the basis for establishing safe work practices that protect WA-PHL staff and the community. The chemical hazard assessment focused on the programs, policies, and procedures for chemical management that have been implemented by the WA-PHL and largely documented in the CHP. The chemical hazard assessment also included a risk assessment of potential releases of chemicals from the WA-PHL under various accidental or intentional hazard scenarios.

EVALUATION OF CHEMICAL MANAGEMENT PLAN

Procedures for chemical inventory, ordering, receipt, storage, distribution, use, and disposal, as identified in the CHP, were evaluated by conducting visits to the facility and staff interviews. Results of this evaluation indicated that controlled procedures are in place and are followed for these tasks. In addition, the CHP outlines the training necessary for staff that is or will be using chemicals in their work. These training programs are also followed at the WA-PHL.

The overall effectiveness of the CHP was then evaluated based on reports of incidents within the laboratory and on fire department reports documenting responses to calls from the WA-PHL. Incident reports were available for the years 2002 through 2007. Of the 47 total incidents reported, only four involved chemical exposure and only one

resulted in days away from work (Two missed work days were recorded in 2002 for an employee who received a chemical splash to the eye). In general, the number of reportable injuries each year (less than eight) has been low based on the average number of employees (144) and hours worked by all employees (between 250,000 and 300,000 hours each year). The Shoreline Fire Department provided documentation of the responses to calls from the WA-PHL since 2001. Only two fire department calls to the WA-PHL involved chemicals: in 2001, "a potentially hazardous package was not triple bagged," and in 2005, the fire department responded to an inhalation exposure to "gas and smoke." No reports of chemical releases or injuries that required aid from the fire department have been recorded. The fire department has not been called to any incidents involving releases of chemicals to the community. Results of the CHP evaluation indicate that it appears to be generally effective and adequate for the safe operation of the laboratory and protection of the community.

Based on the review of the CHP, facility visits and interviews, the following list provides recommendations for enhancing or updating the procedures already in place at the WA-PHL:

- Update the CHP to ensure that procedures, facility assets, and staff are correctly discussed and identified
- Regularly audit the chemical lifecycle across the laboratory to ensure adherence to the CHP
- Implement a computer-based chemical inventory tracking system
- Maintain appropriate chemical handling and safety training to ensure staff are proficient in the storage, use, disposal, and hazards of chemicals
- Review storage locations of chemicals to ensure that:
  - Incompatible chemicals are not stored together;
  - Storage locations are appropriately identified with signage;
  - Storage locations are secured to prevent toppling in case of an earthquake;
- Ensure chemical storage cabinets and shelves are secured to building walls to prevent toppling in an earthquake;
- Ensure liquid chemical storage areas have spill containment trays;
- Update the air dispersion modeling study performed in 1992 and prepare a report that addresses current configurations; and
- Develop a tracking system for training.

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Under current programs, policies, and procedures, the WA-PHL safely manages the entire lifecycle of the chemical inventory necessary to its mission. The recommendations made here, as noted above, are enhancements and updates to a system that is already protective of worker health and safety, and the surrounding community.

Rec's No Changes

RISK AND SAFETY ASSESSMENT FOR CHEMICALS

Under "most-probable" conditions, chemical releases at the WA-PHL will remain completely within the building and will be effectively mitigated under existing programs, policies, and procedures. Therefore, the chemical hazards assessment addressed the consequences of potential chemical releases from the laboratory under reasonable worst-case scenarios. Such chemical release scenarios are unlikely to occur under normal operating conditions.

Eight chemicals from the WA-PHL inventory were modeled to provide a screening-level evaluation of hazards to the public. These eight chemicals were selected based on an evaluation of:

- Relative toxicity in humans or other animals;
- Volume maintained at the WA-PHL;
- Commercial availability;
- Environmental mobility; and
- Reactivity/Stability

Chemicals evaluated were: acetonitrile, benzene, hydrochloric acid, hydrofluoric acid, nitric acid, perchloric acid, potassium cyanide, and sodium cyanide.

Three exposure scenarios were considered for chemical releases from the WA-PHL:

1. Environmental release – instantaneous release of a gas, liquid, or solid to the atmosphere that is then carried into the community by the wind.
2. Theft of a chemical and intentional release of that chemical in a nearby school
3. Theft of a chemical and intentional release of that chemical in the neighboring Fircrest swimming pool

The results of the risk assessment for the three scenarios are provided below.

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Environmental Release

For the environmental release scenario under worst-case conditions, an explosion or some other event was assumed to cause the release of the entire inventory of a given chemical from the WA-PHL into the atmosphere. An air dispersion model was then used to estimate the concentrations of that chemical that might occur in the surrounding community. Such a scenario is possible, although highly improbable for reasons discussed below. Nonetheless, the modeled concentrations were then compared to health-based screening concentrations for airborne chemicals: Emergency Response Planning Guidelines (ERPGs) and Temporary Emergency Exposure Limits (TEELs). These screening levels are generally used to plan for and manage large-scale commercial or industrial accidents and large volume releases, not the small scale, small volume releases from a laboratory such as the WA-PHL. ERPGs and TEELs are further explained in the following table.

ERPGs	TEELs
ERPG-1: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for **up to one hour** without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odor.	TEEL-1: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed without experiencing other than mild transient adverse health effects or perceiving a clearly defined, objectionable odor.
ERPG-2: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for **up to one hour** without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.	TEEL-2: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.
ERPG-3: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for **up to one hour** without experiencing or developing life-threatening health effects.	TEEL-3: The maximum airborne concentration below which it is believed that nearly all individuals could be exposed without experiencing or developing life-threatening health effects.

Based on the worst-case atmospheric chemical release scenario, none of the schools or nursing homes was located within the ERPG/TEEL-3 hazardous radius for any of the chemicals evaluated. This result indicates that the school and nursing home populations are unlikely to encounter airborne concentrations of chemicals, released in an explosion at the WA-PHL that could cause life-threatening health effects.

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Hydrochloric acid and nitric acid might reach ERPG/TEEL-2 levels at three schools and one nursing home. Hydrochloric acid and nitric acid might reach ERPG/TEEL-1 (mild health concerns that do not last or odor issues) levels at all schools and nursing homes within the vicinity of the WA-PHL.

The closest facility to the WA-PHL is Fircrest. The closest building on the Fircrest campus is 250 feet from the north end of the WA-PHL. Based on the worst-case atmospheric chemical release scenario, acetonitrile, hydrochloric acid, nitric acid, and perchloric acid might exceed ERPG/TEEL-3 levels on the Fircrest campus.

As noted above, the chemical release scenarios evaluated in this report are worst-case and are unlikely to occur under normal operating conditions at the WA-PHL. Furthermore, the release of the entire inventory of a given chemical to the atmosphere is unlikely because chemicals are stored in more than one location, which significantly reduces or eliminates the possibility of a complete inventory release. The probability of this and other release scenarios is discussed in more detail below.

Theft of Chemical/Intentional Release in a Nearby School

Acute Exposure Guideline Levels (AEGLs) were used to describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals such as an intentional release in a school. AEGLs were used for the classroom scenario because these guideline levels are developed for various exposure durations from ten minutes to eight hours. The following definitions are provided by U.S. EPA:

- AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.
- AEGL-2 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.
- AEGL-3 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

To evaluate the intentional classroom spill scenario, the modeled concentrations that could be reached within 10 minutes of a spill were compared to the AEGL-1, -2, and -3 concentrations. Model results indicated that hydrochloric acid, hydrofluoric acid, and nitric acid could reach airborne concentrations within 10 minutes of a spill in a classroom that might cause long-lasting effects or might be life-threatening.

Theft of Chemical/Intentional release in Neighboring Fircrest Swimming Pool

Cyanide in the form of sodium or potassium cyanide was evaluated under this scenario. Assuming the total inventory of cyanide at the WA-PHL was dissolved in the Fircrest swimming pool, the dose a child swimmer might receive was estimated to be about 0.09 milligrams of cyanide per kilogram of body weight. For comparison, the estimated dose of cyanide was compared to the U.S. EPA Reference Dose (RfD) for cyanide. The RfD is considered to be an estimate of the daily dose over a lifetime of exposure at which no harmful effects would be expected in an exposed individual. The reference dose for cyanide is 0.02 mg/kg per day over a lifetime. Therefore, dissolving the entire WA-PHL inventory of cyanide into the Fircrest swimming pool may produce harmful health effects in swimmers.

Probability of the Chemical Release Scenarios Evaluated

The risk and safety assessment scope of work directed the evaluation of "most-probable" chemical release scenarios from the WA-PHL. However, the most-probable chemical release scenarios are unlikely to result in chemical releases outside the WA-PHL. Most releases are accidental spills of small volumes that are quickly managed based on spill response procedures outlined in the WA-PHL Spill Response Guide. Vapors generated from spills of volatile chemicals would either dissipate within the building indoor air space or be captured in the building exhaust system and diluted to levels below health concern. Therefore, worst-case chemical release scenarios were evaluated based on the unlikely occurrence of an explosion, either accidental or intentional, or the theft of chemicals from the laboratory and intentional release in a school classroom, or the Fircrest swimming pool.

Although not impossible, accidental or intentional explosions that could cause an atmospheric release of chemicals are low probability events for the following reasons:

- Laboratory personnel are generally trained in science and the management of chemical implemented in the WA-PHL CHP and Laboratory Safety Manual;

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- The WA-PHL and DOH require chemical safety training courses for laboratory personnel and training is monitored by supervisory staff;
- The WA-PHL work spaces are designed for safe handling of chemicals;
- Based on law enforcement agency reviews, the WA-PHL has implemented appropriate levels of security to reduce the likelihood of a malevolent act by an outsider that could result in a release to the community;
- The WA-PHL does not present an attractive target based on law enforcement agency review of the laboratory and on monitoring of terrorist information exchange and communication at the Washington Joint Analytical Center; and
- Based on the security vulnerability assessment developed as part of this risk and safety assessment (Section 7); an attack on the WA-PHL is not likely because damage to or destruction of the laboratory would not result in large numbers of casualties; disruption of the local, regional, or national economy; damage to the reputation or operations of a global brand; collateral damage to a regional or national landmark; or other consequence generally associated with targets attractive to terrorist organizations.

For some of the same reasons, theft of chemicals with the intent to release them in a public place, such as a school, is a low probability event. For example, a level of security appropriate for the mission and operations performed at the WA-PHL is already in place and has been reviewed by local and federal law enforcement agencies. Furthermore, although the laboratory maintains an extensive chemical inventory, the number of the chemicals that are highly toxic is low; stocks of a given chemical are generally spread among more than one location; and many of the chemicals that would be attractive to someone with malevolent intent are available from commercial or other sources that are more accessible than those stored at the WA-PHL. Each of the chemicals evaluated in the screening level assessment can be ordered from on-line vendors or is available at hardware and home improvement stores, including hydrochloric acid, hydrofluoric acid, nitric acid, and sodium cyanide. Most of these chemicals can also be found in use at schools and businesses in Shoreline.

RADIOLOGICAL HAZARDS EVALUATION

The WA-PHL uses radionuclides for qualitatively determining the presence of disease, as components of certain instruments, as calibration tools for equipment used to quantitatively determine levels of radioactivity in environmental samples, and for training. The three primary places at which radionuclides are used are in the

tuberculosis (Tb) laboratory, in the environmental chemistry laboratory, and in the radiation laboratory.

The WA- PHL is required to follow a number of state and federal regulations as well as internal radiation safety procedures for the storage and use of radionuclides. Pursuant to these laws and regulations, the Washington State Department of Health, Office of Radiation Protection, has issued a radioactive materials license (hereinafter, the License) to the WA-PHL (State of Washington, 2003). The License specifies maximum quantities of radionuclides that can be present at any given time. The License also specifies various requirements including training of employees, monitoring exposure to radiation, securing radionuclide samples, maintaining records, and disposing of radioactive waste.

The WA-PHL also abides by the procedures outlined in its *Radiation Safety Manual.* This manual provides guidelines for limiting exposure to radionuclides; for ordering, storing, and disposing of radionuclides; and for reporting and record-keeping. The *Radiation Safety Manual* outlines the laboratory's policy of ALARA, meaning that the goal is to keep exposure to radiation by employees, visitors, and the community "As Low As Reasonably Achievable." Furthermore, the manual serves as a source of general information about the multiple uses of radiation at the laboratory and outlines the Radiation Safety Officer's training course for employees working with radionuclides.

To assess the probability, magnitude, and consequences of accidental radionuclide releases, the radionuclide inventory for the laboratory was reviewed and compliance with appropriate regulatory requirements was evaluated. In addition, procedures for storing, using, and handling radionuclides were evaluated. Potential health implications associated with accidental or malicious, intentional, releases of radionuclides were then modeled.

Based on the inventory review performed, the laboratory is in compliance with the requirements of the License; however, revisions to the inventory system should be made. Specifically, the units in which radionuclide activities are recorded should be updated to the International System of Units (SI) and more detailed records of minor and infrequently used materials should be maintained. It was also recommended that an accurate, complete, and consistent computerized radioactive materials inventory system be developed in place of the current system. After analysis of the WA-PHL's rules, procedures, and documentation for radioactive materials, it was determined that

the WA-HL is in compliance with relevant laws and guidelines governing radioactive material.

RADIOLOGICAL RISK AND SAFETY ASSESSMENT

For the radiological risk assessment, potential health effects from accidental or deliberate releases of radioactive materials were evaluated. The risk and safety assessment scope of work directed the evaluation of "most-probable" release scenarios from the WA-PHL. However, the most-probable release scenarios are unlikely to result in radiological releases outside the WA-PHL. Therefore, worst-case release scenarios were evaluated based on the unlikely occurrence of an atmospheric release, or the theft of chemicals from the laboratory and intentional release in a school classroom or to the Fircrest swimming pool.

Four exposure scenarios were considered for radiological releases from the WA-PHL:

- Theft of radioactive material and entire inventory is dissolved and mixed into the classroom's water cooler
- Theft of one of the sealed sources used in an instrument at the WA-PHL transported to a classroom, where the seal is broken and radioactive material is released into the airspace of the classroom.
- Theft of radiological material and intentional release in the neighboring Fircrest swimming pool
- Atmospheric release of the entire radioactive inventory

The results of the risk assessment for the four scenarios are provided below.

Theft of Radioactive Material/Entire Inventory Dissolved into Classroom's Water Cooler

The classroom water cooler scenario resulted in the highest modeled dose to the exposed individuals, with a dose in the first year, close to 9 times larger than the federally mandated benchmark for licensed facilities annually to the public due to routine facility operations. However, these doses would not cause any acute effect, and the long term effect (average annual increased exposure after 50 years has passed since the event) is smaller than the effect on radiation exposures of living in Denver rather than Seattle (due to the difference in altitude and resultant higher exposure from cosmic rays), or moving to the northeast corner of Washington State from Seattle (due to the higher radon emissions from bedrock in the northeast part of the state.

Theft of Sealed Source/Transported to Classroom and Released into Classroom Airspace

This scenario resulted in exposures under (by about 10 percent) the Nuclear Regulatory Commission (NRC) annual dose limit for the public due to nuclear facility operations. Even after 50 years of remaining in the body and causing continued radiation exposure, the total dose would be less than 1/2 the dose from a single abdominal CT scan.

Theft of Radiological Material/Intentional Release in Fircrest Swimming Pool

The swimming pool scenario resulted in the lowest dose of the scenarios evaluated. External exposure from water immersion is low when the material is diluted by the volume of the pool.

Atmospheric Release of Entire Radioactive Inventory

The atmospheric release scenario resulted in a dose less than 1/10 the dose that one would receive by flying round-trip from Washington, D.C. to Los Angeles (due to cosmic radiation at high altitudes in the atmosphere).

SUMMARY OF RADIOLOGICAL HAZARDS ASSESSMENT

After analysis of the WA-PHL's rules, procedures, and documentation regarding radioactive materials handling and disposal, worker training, and contamination testing, as well as checking the final inventory summary against radioactive material possession limits, the WA-PHL has been determined to be in compliance with relevant laws and guidelines governing radioactive material. Revisions to the inventory system, however, should be made. Specifically, the units in which radionuclide activities are recorded should be updated to the International System of Units (SI) and more detailed records of minor and infrequently used materials should be maintained. Thus, it is recommended that the WA-PHL improve existing radiation inventory methods.

Public health risks were assessed by calculating the radiation doses that would result from worst-case release scenarios. The scenarios evaluated resulted in doses well below background radiation doses when averaged over a lifetime, and only one resulted in doses exceeding the NRC's annual dose limit for the public due to routine nuclear facility operations. The scenarios are sufficiently conservative to demonstrate that even in a worst case event; radiation health risks to the public would have no measurable consequence.

PHYSICAL HAZARDS EVALUATION

Physical hazards, for the purposes of the risk and safety assessment, refer to work place hazards that can adversely affect worker health and well being, and that could result in hazardous conditions that could, in turn, affect the surrounding community. The physical hazards evaluation provides a discussion of the physical hazards that are associated with operating a diagnostic microbiology laboratory based on the equipment, chemicals, and other materials necessary to the public health laboratory mission. Several sources of work place hazards were identified including biological, chemical, radiological hazards, laboratory equipment hazards, and hazards associated with the use of laboratory animals.

The WA-PHL and DOH have prepared extensive programs, policies, and procedures to protect worker health and to manage the hazards of the work place. Written documentation of these efforts is available in the laboratory safety manual, biosafety manual, chemical hygiene plan, radiation safety plan, and other written materials.

The effectiveness of worker health and safety plans was evaluated through interviews of the laboratory safety officer, training officer, risk manager, and administrative staff. OSHA reportable injuries documented on Forms 300 were also reviewed.

Overall, the WA-PHL promotes and maintains a safety culture throughout their operation. Based on document reviews and interviews, the WA-PHL is generally a safe place to work and issues that could affect worker safety are addressed quickly and effectively through formal reporting, review, and interview activities. The risk and safety assessment report offered three recommendations to enhance the safety program at the WA-PHL, including improved organization of the various safety efforts and documents, better tracking of safety training, and the establishment of a recognition program for safety performance.

SECURITY VULNERABILITY EVALUATION

The objectives of the security vulnerability assessment (SVA) were to:

1. Identify security weaknesses and vulnerabilities that could result in a release of biological material or chemicals that might impact the surrounding community following terrorist and/or sabotage activities, and
2. Evaluate countermeasures that provide protection from these potential releases.

The SVA for the WA-PHL followed four basic steps, using information obtained from interviews, site visits, and WA-PHL documents:

- Characterizing the facility by identifying assets and existing countermeasures;
- Assessing the threat by identifying potential threats that could lead to an attack on the facility assets;
- Assessing the vulnerabilities by analyzing the ability of countermeasures to detect, deter, or delay an attack, or to limit the consequences of a successful attack. This was done by considering the existing countermeasures and consequences for four security scenarios:
  1. External attack on the facility with a truck bomb and all microorganisms and chemicals are emitted to the atmosphere.
  2. Intruder removes agent or chemical from the laboratory during the night and material is introduced into a different environment.
  3. Criminal removes agent or chemical from the laboratory during the delivery of a sample and material is introduced into a different environment.
  4. Disgruntled employee removes agent or chemical from the laboratory and material is introduced into a different environment.
- Assessing additional countermeasures, by examining new or improved countermeasures that may reduce the likelihood and/or consequences of an attack.

The level of, and actions involved in, agent and chemical security should be consistent with the likelihood and potential consequences of a threat. Overall, the WA-PHL does not appear to be a high profile target nor very attractive to individuals or groups with malevolent intent. It does not have a large number of employees and does not maintain large quantities of microorganisms, chemicals, or radioactive materials. Mass casualties or extensive damage to critical infrastructure, monuments, or other structures of public value are unlikely in the event of a release, fire, or explosion. Police and counterintelligence reports indicate a low level of concern.

Several additional countermeasures that the WA-PHL could take to improve its security position were identified and are prioritized as presented on Table ES-1. Several were given a low priority because they do not appear warranted given the low potential magnitude of the consequences of a security breach. Others were identified as either medium or high priority based on the results of the consequence analysis.

1 - Redacted portions are exempt from public disclosure under RCW 42.56.420(1)(a).

EARTHQUAKE HAZARDS

A limited evaluation of the seismic design and expected seismic performance of the WA-PHL building was performed to address the risk of biological, chemical, or radiological material release to the environment as a result of an earthquake.

The objective of this evaluation was to compare the seismic design strength (or capacity) of the building to the anticipated load (or demand) that would be applied to the building in a seismic event (earthquake). Five different levels of seismic events were considered. The seismic events included the Maximum Considered Earthquake (MCE) with a return period of 2475 years; the design earthquake, which is two-thirds of the MCE; and seismic ground motions corresponding with return periods of 475, 224 and 72 years, respectively. The design earthquake corresponds to the minimum design load level required by the current building code, the 2006 International Building Code (IBC) at the subject site. Although the buildings were originally designed to older building codes (1982 Uniform Building Code for example), the design strength of each building considered was determined in accordance with the provisions of the 2006 IBC. Evaluation of the building response subjected to a wide range of ground motions was made using current code provisions.

The limited evaluation of seismic design and performance conducted for the risk and safety assessment report indicates good seismic performance with very low probability of collapse at all levels of seismic ground motions considered. Furthermore, the WA-PHL buildings present positive attributes for good seismic performance:

- Buildings are light-weight resulting in better seismic performance;
- The lateral force resisting system (LFRS) appears to have been over-designed (significantly exceeds minimum requirements), therefore, the WA-PHL building may have been designed as an essential facility;
- The buildings are symmetric and regularly shaped; and
- Stucco cladding on exterior walls and gypsum wall board finishes add to initial stiffness of the structure and enhance performance in an earthquake.

Based on the seismic performance evaluation and the conclusion that immediate occupancy is likely to be possible, the laboratory buildings are not expected to collapse up to an earthquake with a mean return period of 1,650 years (2/3 of the MCE). Although the buildings would not collapse, breaches in the building wall and roof may occur through which a release of material could occur if breaches are located near

areas where biological, chemical, or radiological materials are stored or used. A breach in a laboratory wall or roof does not necessarily mean, however, that a release will occur.

Interior storage systems (racks, shelving, cupboards, lockers, etc.) were not evaluated for seismic performance. The storage systems, however, are generally secured to interior walls, have restraint systems to limit the likelihood of materials sliding off shelves due to ground motion, and have spill containment pans for storage of liquids. These features should limit the release of hazardous materials inside the WA-PHL building. As long as the building envelope is not compromised, for example, as long as an exterior wall does not collapse or break open, releases of hazardous materials should remain inside the building and not be released to the surrounding community. Finally, based on the Chemical Hazards Assessment, the volume of chemicals maintained in the WA-PHL inventory is not likely to pose a significant hazard in the event of a Design Level earthquake. Other consequences of such an earthquake are likely to be more serious, such as widespread damage to critical infrastructure in the metropolitan Seattle area.

EMERGENCY RESPONSE PLAN EVALUATION

The objective of the emergency response plan (ERP) evaluation was to assess the WA-PHL ERP for completeness and implementation.

The WA-PHL is subject to federal rules on the possession, use and transfer of select agents and toxins promulgated in the Code of Federal Regulations (42 CFR 73). Subpart 14 specifies incident response plan requirements, and Subpart 15 provides training requirements. The WA-PHL is also subject to state rules for emergency response because of the requirement to protect the health and safety of employees during a response to the release of hazardous substances as promulgated in the Washington Administrative Code (WAC 296-824).

The September 2008 WA-PHL ERP draft, which is the most recent but admittedly incomplete version, was compared to these requirements. The draft WA-PHL ERP is scheduled to be completed by the end of 2008. Additional information for the assessment was obtained by interviews, site visits, and other WA-PHL documents.

The current version of the WA-PHL ERP has several missing, incomplete, or inconsistent sections. In its current state, the written WA-PHL ERP does not provide

1 - Redacted portions are exempt from public disclosure under RCW 42.56.420(1)(a).

adequate protection. An optimal ERP will provide the procedures to minimize the impacts to the employees, visitors, community, environment, and structures from an incident when it is fully developed, exercised, and tested.

The process used to develop the WA-PHL ERP should be modified in the following ways:

- The WA-PHL ERP should be promptly completed and a schedule established for its annual review and updating, if needed. Additional reviews may be needed when conditions change (e.g., laboratory modifications, operating procedures, or personnel responsibilities), or experience is gained through an incident or an exercise.
- The responsible manager for the WA-PHL ERP should be clarified. A single manager needs to be given clear authority and resources to complete this plan on schedule.
- Stakeholders, including first responders, nearby facilities, and the community, should be involved early in the preparation of the ERP. Understanding stakeholder input early in the process will typically reduce the overall time and budget requirements for plan completion.
- The range of facilities addressed should be expanded to include nearby facilities, the community, and the environment. Facilities are near each other and therefore may impact each other.
- The range of covered incidents should be determined in a systematic process, such as a risk assessment. This will reduce the likelihood of missing incidents that may have significant probabilities or consequences.
- Similar procedures discussed in multiple WA-PHL health and safety documents should be modified to maintain consistency. The WA-PHL may want to consider whether the same procedures need to be described in multiple documents.
- Training should be broadened to cover a larger range of potential incidents. Training and exercises are important to understand and test the plan. Exercises should include first responders (fire and police) to facilitate common understanding and communications during an actual incident.

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