Driving Tour

Good Afternoon. My name is Julie Turner and I am with the Department of Energy Pacific Northwest Site Office. As we begin the tour, I'd like to cover a few brief items.

First I would like to introduce Mark Coronado, Ryan Kilbury, Martha Kass, Roland Hirsch, and Kimberly Williams. They are also with the Department of Energy and will be helping with escort responsibilities for the tour.

As a reminder:

The tour will be conducted with a combination of facility walkthroughs and discussion while driving past Laboratory facilities in the North Richland and Hanford's 300 Areas. The package of material provided to you earlier has maps of both the North Richland Area and the 300 Area. Also included is a list of the buildings and whether they will be DOE Owned or leased.

- The tour will involve moderate physical demands including periods of standing and walking, potential tripping hazards, uneven ground, and stair usage.

- Strong magnetic fields are present in some laboratories that will be part of the tour. For safety reasons if you have a pacemaker, defibrillator, Neurostimulator or any metal implant please remind us so that we can evaluate your access into these laboratories.

- While on the tour please stay with the group and refrain from contact with any of the equipment and/or laboratory staff.

- We have drinking water on board the bus. If you would like a bottle please let myself or one of the escorts know anytime throughout the tour. However, please keep all drinks on the bus.

- Restroom breaks will be provided approximately 1 hour into the tour at the Consolidated Information Center and approximately 3 hours into the tour at the Environmental Molecular Sciences Laboratory. In an effort to keep on schedule we want to minimize the number of stops so please plan to take advantage of these break times. In the event you need to take a break outside the designated stops, the tour will continue and one of the escorts will help you catch up to the group.

- No electronic devices will be permitted in the laboratories. Please leave all electronic devices on the bus. It will be secure at all times.

- It is important to remember that we will not be answering questions today. All questions must be submitted in writing on the cards provided to you unless they pertain to building names, room numbers, or your personal safety. Please provide the cards with your questions to Mark Coronado preferably at the end of the tour. Questions and answers will be posted on the SEB website.

As we head out of the City of Richland toward the Hanford Site, our first tour stop will be the 2400 Stevens Building.

Head toward the Hanford Site on Stevens Drive. Turn right on Spengler and as you drive through 2400 parking lot read the following:

- On your left is the **2400 Stevens Building.** This building was initially leased in 1979 and is approximately 93 thousand gross square feet.
- This building is used as a general research laboratory and office space primarily supporting the Energy and National Security missions.
- The structure consists of a two-story office section, dry laboratories and high bay space.
- A small portion of this building is also occupied by other entities for commercial operations.

At our next stop we will see a complex of buildings. We will exit the bus and take a walking tour of the Research Operations Building, the Mathematics Building, the Auditorium, the Engineering Development Laboratory and the Physical Sciences Laboratory. Roger Briggs from the DOE Pacific Northwest Site Office will meet us at the Physical Sciences Laboratory to provide a more detailed guided tour of that building.

Turn right onto Spengler, right on Stevens Drive, right on Battelle Blvd., left at the entrance to ROB. Unload bus and walk up the stairs. At the top of the stairs point to the ROB and read the following:

- As a reminder, we will exit the bus here. Please leave all electronic devices on the bus. Once we have all exited please follow me and I will take you on a walking tour of several buildings.
- The building on your right is the **Research Operations Building.** This building was built in 1969 and is approximately 70 thousand gross square feet. It will be a DOE leased building.
- The building contains two floors. The main floor is primarily offices with some supporting work areas, a main lobby/ reception area, and conference rooms.
- The basement area contains offices and work areas, plus large mechanical room spaces and storage space.

Point to MATH and read the following:

- To your left is the Mathematics building which was built in 1967. This building will be a DOE leased building and is approximately 29 thousand gross square feet.
- The first level is primarily comprised of office space and dry laboratory space
- The basement area contains mechanical workspaces and some office space.
- This building houses the Electricity Infrastructure Operations Center (EIOC) which is a user-based facility dedicated to energy and hydro power research, operations training and back-up resources for energy utilities and industry groups. This facility features several tools for demonstration, testing, research, and operations of energy systems.

Walk forward and point to Auditorium and read the following:

- The building you see ahead, between the two cooling ponds, is the **Auditorium**.
- This building was built in 1967 and is approximately 12 thousand gross square feet.
- This will be a DOE leased building.
- The auditorium area seats approximately 300 people and also provides for some meeting spaces.

Walk to the left toward PSL, point out EMSL, site for BSF and CSFpoint out the EDL Building and read the following:

- Across the way you can see the back side of the Environmental Molecular Sciences Laboratory. We will be stopping at that building later in the tour.
- To the left of the Environmental Molecular Sciences Laboratory is the site where the alternative financed Biological Sciences Facility and the Computational Sciences Facilities will be built. These facilities are a part of the Capability Replacement Laboratories Project you heard about in this mornings briefings.
- Straight ahead is the Physical Science Laboratory You will be touring that facility in a moment. The building to the right of PSL is the **Engineering Development Laboratory**.
- That building was built in 1973 and is approximately 16 thousand square feet.
- It will be a DOE leased building.
- The Engineering Development Laboratory consists of office space, dry and wet laboratories, and a high bay area.
- Research conducted in the building primarily supports the national security mission and includes acoustical imaging and audio and ultrasonic frequencies as well as electromagnetic imaging at microwave and millimeter wave frequencies. Other areas of research include robotics and electronic systems development.

Walk to PSL and meet presenter at the east entrance. Introduce Roger Briggs. Following the tour of PSL load bus at stairs nearest PSL. Cross Battelle Blvd onto Einstein.

The next set of buildings we will see include the Receiving and Shipping Warehouse, the Richland Research Complex Laboratory, commonly called the Annex, the Process Development Laboratories West and East, the Engineering Support Building and the Research Technology Laboratory.

Pause in front of the RSW and read the following:

- On the left is the **Receiving and Shipping Warehouse.** This building was built in 1970 and is approximately 10 thousand gross square feet.
- It will be a DOE leased building.
- The building contains a large shop area, a shipping/receiving area and some offices.
- This building is the primary entry and return point for all PNNL procurements.

As approach the corner of 5th Street note: "There is a privately operated day care facility located at the next cross street."

Turn left on 5th Street. **PAUSE** on 5th across from Annex and read the following:

- On the left side of the bus and to the east of the Receiving and Shipping Building we just saw is the Richland Research Complex Laboratory, commonly called the **Annex.**
- This building was built in 1973, it is approximately 9 thousand gross square feet and will be a DOE leased building.
- This building is office and laboratory space. Research conducted in this building supports atmospheric sciences and global climate change.

Our next stop will be the Process Development Laboratory West where we will exit the bus to meet with Mike Talbot from the DOE Pacific Northwest Site Office. Mike will provide a more detailed tour of the Process Development Laboratory.

Turn into the Process Development Laboratory West (PDLW) parking lot. Unload bus and meet presenter.

Again, we will be exiting the bus here for the tour of the Process Development Laboratory West. Please leave all electronic devices and any food and/or drinks on the bus. Please use caution as you exit the bus as there may be some uneven ground.

Following the tour of PDLW, load bus. Once bus is loaded point to Process Development Laboratory East (PDLE) and read the following:

- The **Process Development Laboratory East** will be a DOE Leased building.
- It is approximately 4 thousand gross square feet.
- This building provides high-bay laboratory space for mechanical research and development efforts and is used for pilot scale test equipment for environmental cleanup and industrial waste recycle processes.

As bus turns left onto 5th Street, **PAUSE** in front of the Engineering Support Building (ESB) and read the following:

- The **Engineering Support Building** is on your left.
- It will be a DOE leased building.
- It is approximately 13 thousand gross square feet and used primarily as office space.

The next laboratory complex we will be driving by will be the Research Technology Laboratory.

Turn right on G. Way. Turn right on 4th street, then left on Q and travel around the RTL building. Point out the Research Technology Laboratory (RTL) and read the following:

- On your left is the **Research Technology Laboratory** (RTL) complex.
- This complex was built in 1966 and will be DOE Leased. The main building is approximately 56 thousand gross square feet.
- The majority of the building is wet chemistry laboratories, dry laboratories and adjacent offices and includes the performance of radiological work.
- A partial basement is the main mechanical room.
- In addition to the main research laboratory, the complex has an additional 16 thousand gross square feet of space for Chemical and Flammable Storage, Radioactive material Storage, Paper Shredder Facility, Technical Services, Utility Building, Autoclave center, Crafts Shop, and Warehouse.

We are now going to head over to the Washington State University Tri-Cities Branch Campus. From this view, on your left you can see the Consolidated Information Center, the Bioproducts Sciences and Engineering Laboratory which is under construction, and the Washington State University Tri-Cities Main Campus.

Turn left on Sprout St, and enter WSU at the main entrance. PAUSE in front of the BSEL to read the following. Continue to Drive to CIC parking lot.

We are continuing to head to the Washington State University Tri-Cities branch Campus. On your right we are passing Hanford High School. Hanford is one of two High Schools in the City of Richland. On the left is the WSU Tri-Cities branch Campus. While driving through the campus I will highlight the Bioproducts Sciences and Engineering Laboratory and the Consolidated Information Center. The laboratory will utilize space in these two buildings which supports various collaboration opportunities with the University such as research in the area of bioproducts.

We are now entering the Washington State University Tri-Cities branch Campus.

- On your right is the **Bioproducts Sciences and Engineering Laboratory, currently under construction**.
- This is a WSU facility and will be approximately 57 thousand square feet.
- DOE plans to lease approximately 50% of the office, dry and wet laboratory space for laboratory operations in support of Energy and Environmental related mission areas.
- The estimated completion date of this building is early calendar year 2008.
- Our next stop will be the Consolidated Information Center. We will be getting off the bus at this building for a restroom break. Our next break will be in approximately two more hours so I would encourage you to take advantage of our stop here. Once you exit the bus please remain with the escorts at all times.
- The **Consolidated Information Center** houses the Hanford Technical Library which is jointly operated by the Pacific Northwest National Laboratory and Washington State University. The Department of Energy Public Reading Room is also located in the Consolidated Information Center and is operated by PNNL.
- DOE uses approximately 30 thousand square feet of space in this facility

Stop at CIC for a Restroom Break. As a reminder: We will be taking a break here. The next break will be in approximately two hours. Please stay with the escorts while in the facility. Just a note, you will see the Hanford Technical library and the DOE public reading room on your right as you enter the building.

From parking lot turn right on University Dr., right on 1st, left on Richardson Street. **PAUSE** across from the APEL to read the following:

Our next tour stop will be the Integration Laboratory, the 331 G building, located in the 300 Area. On our way out to the 300 Area I will draw your attention to the Applied Process Engineering Laboratory, the SIGMA complex, and the Laboratory Support Building.

On your right is the Columbia River

- On the left is the **Applied Process Engineering Laboratory**, commonly called the APEL facility.
- This building was built in 1975.
- DOE leases approximately 50 thousand of the 90 thousand available gross square feet of space.
- This is an Energy Northwest facility and was established as an incubator facility that any company, agency, or individual can use to test the commercial potential for new business concepts and innovative technologies.

We are headed to the Sigma complex next.

Turn left onto 9th Street. Turn right onto Port of Benton Blvd.. **PAUSE** in front of the SIGMA 5 Building and read the following:

- On the right is the **SIGMA 5** Building.
- This building was built in 1981 and is approximately 48 thousand gross square feet. It will be a DOE leased building.
- This is a two-story building consisting primarily of office/administrative space with adjoining wet and dry laboratory space.
- Primary research in this building includes ecology, hydrology, applied geology and geochemistry, environmental characterization and risk assessment.

PAUSE in front of the Sigma 2, 3, and 4 Buildings and read the following:

- On the left is the **SIGMA complex** which includes Buildings 2, 3, and 4.
- These buildings were built in the 70's and will be DOE leased space.
- Each building provides approximately 20 thousand gross square feet of office space.

Turn left on 11th. **PAUSE** next to the Laboratory Support Building (LSB) and read the following:

- On your right is the **Laboratory Support Building (LSB).**
- This building was built in 1996 and is approximately 84 thousand gross square feet.
- It will be a DOE leased building.
- This building primarily consists of office bay areas with some single offices.

Coming up shortly is the Horn Rapids Road. This road designates the southern boundary of the DOE owned land. On the left is the construction site for the Physical Sciences Facility which is the new construction portion of the Capability Replacement Project. Chad Henderson provided an overview of this project this morning. We will stop there again following the tour of the 300 Area buildings.

We are now entering the 300 Area. Most of the buildings you see in this area are scheduled for demolition by the Office of Environmental Management. As we tour the 300 Area I will call out those facilities that the DOE Office of Science will retained long term for the operation of the laboratory and those that will be used on an interim basis until about 2011.

Go north to 300 Area via G Way extension. Turn right on Cypress, take first right and as you travel around the back of 331 read the following:

- On the left is the 331, **Life Sciences Laboratory**. This is a DOE Owned building and will be **one of four remaining buildings** in the 300 Area supporting laboratory operations once the 300 Area clean-up is completed.
- We will tour that building in a few minutes.

Take first left and take a right at the stop sign. Pull into 331H, let passengers out and then turn bus around.

- We will be exiting the bus for a briefing on the Integration Laboratory by Ted Pietrok from the Department of Energy Pacific Northwest Site Office. Please leave all electronic devices on the bus and please use caution when exiting the bus as there is some uneven ground.

Following briefing, load bus and drive to the front of 331.

- We will be heading to the 331, Life Sciences Laboratory. Terri Aldridge from the Department of Energy Pacific Northwest Site Office will be meeting us there to provide a more detailed tour of the building.
- In this building you will be entering a radiologically controlled area so as a reminder please stay with the group and the escorts.
- We will exit the bus here for the tour of the Life Sciences Facility. Please remember to leave all electronic devices on the bus.

Following the 331 tour take a left on Cypress. Read the following on the way to 320.

Our next building tour stop will be the Radiochemical Processing Laboratory (Building 325). The 325 building is a Category 2 Non reactor nuclear facility. Russ Warren from the DOE Pacific Northwest Site Office will meet us at the 325 building to provide a more detailed guided tour of that building. Prior to arriving at 325 we will be driving by 6 DOE owned buildings currently used in the operation of the laboratory. These buildings include: the Ultra Trace Facility (building 320), the Plant Operations and Maintenance Facility (Building 350), the Radiological Calibrations Laboratory (Building 318), the Chemical Sciences Laboratory (Building 329), and the Material Science Laboratory (Building 326).

As you turn Into gate entering the front of the 320 Building **PAUSE** and read the following:

- This is the **320 Building**. It is an Analytical and Nuclear Research Laboratory or otherwise called the Ultra Trace Facility.
- It is a DOE owned building and is approximately 31 thousand gross square feet.
- The first floor contains wet type chemistry labs with filtered exhaust air and office space.
- The basement consists of primarily electronic type labs, a filter and mechanical room.
- Research activities include special-purpose separation and analytical chemistry techniques. A clean zone allows for contamination-free preparation and analysis of samples containing extremely low levels of indicator radionuclides and trace organic compounds.
- Special instrumentation includes various mass spectrometers, electron-beam microscopes, x-ray diffraction, and radiation counters.
- Capabilities located in this building will be relocated to the Physical Sciences Facility, currently under construction, to allow cleanup of the 300 Area.

Turn right onto Nebraska and as the bus continues down Nebraska St. **PAUSE** in front of the 350 Complex and read the following:

- On your left is the **Plant Operations & Maintenance Facility also referred to as the 350 Building complex.**
- It was built in 1980.
- It is a DOE owned building. The main building is approximately 17 thousand gross square feet and consists primarily of offices and shop areas.
- The 350 complex includes a paint shop, Warehouse, storage building and an oil storage facility.
- The complex is approximately 27 thousand gross square feet.
- This facility will be one of four remaining buildings in the 300 Area supporting laboratory operations once the 300 Area clean-up is completed.

Turn left on Ash St. turn left on Arizona St. **PAUSE** in front of the 318 Building and read the following:

- The **318 Building or the Radiological Calibrations Lab** is on the left.
- This building was built in 1967 and is approximately 37 thousand gross square feet.
- It is a DOE owned building.
- The administrative portion of the facility is a three-story, steel-paneled service wing that has administrative offices and laboratories.
- Unique features of the laboratory includes an exposure system for use with dosimeters and two deep pits which contain high radiation sources and are used for calibrating high radiation instruments.
- Capabilities in this building support technical services in internal dosimetry, external dosimetry, instrument calibration, repair and testing for the protection of the health of workers and the public. Specifically, this is currently where the Laboratory, Hanford site, and other entities obtain dosimetry and calibration services. This capability has passed the Department of Energy Laboratory Accreditation Program (DOELAP). It has also passed the National Voluntary Laboratory Accreditation Program which allows it to be National Institute of Standards and Technology (NIST) certified.
- This building will be one of four remaining buildings in the 300 Area supporting laboratory operations once the 300 Area clean-up is completed.

We are currently heading to the 329 Chemical Sciences Laboratory and the 326 Material Science Laboratory. Radiological work is conducted in both of these laboratories. The capabilities located these laboratories will be relocated to the Physical Sciences Facilities, currently under construction, to allow for the cleanup of the 300 Area.

Bus turn left on Cypress and turn right at the last entrance to the parking lot. Drive around parking lot and stop at the corner of Wisconsin St. Point out the 326 and 329 buildings and read the following:

- The first building you see down the right side of Wisconsin St. is the **329 Building, the Chemical Sciences Laboratory.**
- This building was built in 1952 and is approximately 39 thousand gross square feet.
- 329 is a DOE owned facility.
- It is a two-story facility with a partial basement.
- The interior consists of standard laboratories, maintenance shop, offices and counting rooms with concrete walls and ceilings.
- Numerous "caves" constructed of lead bricks have been built to work with radioactive materials.
- The building has physics laboratories for the development of instruments for radiation detection and has chemistry laboratories for the study of isotopes in the environment.
- It has facilities for low-level detection of radioactivity and isotopic analysis.
- A portion of the building is a Limited Area Island for conducting classified work

- The second building you see down the right side of Wisconsin St. with the blue awning is the **326 Building, the Material Science Laboratory.**
- This building was built in 1953 and is approximately 63 thousand gross square feet.
- 326 is a DOE owned facility.
- The two-story, L-shaped building has offices along the outside and wet and dry laboratories along the inside of the first and second floor. It also has a concrete basement.
- Capable of doing radiological work, the mission of the 326 Building is analysis of metallurgical samples of post-irradiated materials, development of radioactive materials detectors, and analysis of air filter samples routinely removed from all PNNL radioactive materials laboratories.
- Capabilities of both the 326 and 329 buildings will be relocated to the new Physical Science Facility to allow cleanup of the 300 Area.

Turn right and re-enter parking lot along the sidewalk/gate and stop at stairs leading to 325 building. Exit bus at the gate opening to 325 Building. Meet presenter in the lobby

- At the next stop we will be exiting the bus for a tour of the 325, Radiochemical Processing Laboratory. Russ Warren from the DOE Pacific Northwest Site Office will be providing the briefing. Dave Biancosino, Joe Escamillo and Bob Mcleod also with the DOE Pacific Northwest Site Office will be the escorts during this tour. 325 is a Category 2 Non-reactor nuclear facility and you will be entering a radiological controlled area. Please stay with the group and the escorts at all times.

- Just a reminder to leave all electronic devices and any food and/or drinks on the bus. Also please watch your step as there are some stairs and uneven ground on your way to the 325 building.

Following tour of 325, load bus and exit 300 Area via G. Way Extension. Approximately half way, point out the location of the new construction, Physical Sciences Facility and read the following:

- This morning, Chad Henderson provided a briefing about the Capability Replacement Laboratories. One of the projects he discussed was the Physical Sciences Facility which will be new construction.

- On the right you can see the construction site of what will be the new Physical Sciences Facility. It will be a DOE owned facility located on DOE land.

- Site preparation work has been nearly completed.

- Foundation work is scheduled to begin in January of 2008. Completion of the foundation and structural steel work is expected to be completed in November of 2008.

- The Physical Sciences Facility will be approximately 200 thousand square feet and will consist of five new buildings. Many of the capabilities currently located in the 300 Area buildings we just looked at will be relocated to these five buildings. The five buildings will be:

    - The Material Science and Technology building (3410)
    - The Radiation Detection building (3420)
    - The Ultra-low Background/Deep Lab (3425)
    - The Ultra Trace building (3430)
    - The Large Detector Laboratory (3440)
- There will also be a central utility plant

Prior to stopping at the Environmental Molecular Sciences Laboratory for our final building tour, we will be driving by the Information Sciences Buildings, the National Security Building, the Environmental Technology Building and the User Housing Facility.

Turn right on Horn Rapids Road and as you turn left on Q Avenue point to the Information Sciences Building's 1 and 2 and read the following:

- The two buildings on your left are the **Information Sciences Buildings (ISB) 1 and 2.**
- These buildings were built in 1992 and are approximately 50 thousand and 60 thousand gross square feet.
- They will be DOE leased buildings.
- Both buildings are predominantly office buildings with small amounts of Laboratory space.
- Information Sciences Building 1 centralizes information technology resources while Information Sciences Building 2 centralizes PNNL's high speed computing infrastructure and Local Area Network servers for the Laboratory.

Continue down Q Avenue and point out the NSB/ETB Buildings and read the following:

- **The National Security Building (NSB) and the Environmental Technology Building (ETB)** were built in 1994 and will be DOE leased buildings. Each building is 100 thousand gross square feet.
- These two-story buildings have a partial basement and are predominantly office buildings with a small amount of lab space.
- The NSB contains a Limited Area Island and a Sensitive Compartmented Information Facility in support of classified work related to the National Security Mission area.
- In addition to environmental research, the ETB also houses PNNL's emergency/access operations center and the offices of the DOE Pacific Northwest Site Office Staff

Continue down Q Avenue, turn left into the user housing facility parking lot and turn around and head back to EMSL while reading the following:

- This is the User Housing Facility (UHF). This facility opened in May 2001 and provides visitors to the Laboratory with quality, affordable housing conveniently located within the Richland North campus.
- Rates have been set, and remain, within student stipend and per diem limits to accommodate students and government business travelers.
- Since October 2002, the User Housing Facility opened their doors to other businesses in Richland north, WSU students and faculty, other Hanford contractors and in some cases the public.
- This facility has accommodations for 81 in a combination of studios, dorm rooms and one bedroom apartments.
- The UHF is approximately 29 thousand square feet and will be a DOE leased facility.

Our last tour stop will be the Environmental Molecular Sciences Laboratory, a DOE Office of Science National User Facility. Melanie Fletcher and Jeff Day from the DOE Pacific Northwest Site Office will be providing the tour and briefing.

Turn at EMSL and exit bus.

- While on the tour I would like to remind you to stay with the group and refrain from contact with any of the equipment and/or laboratory staff. Please leave all electronic devices and any food and/or drinks on the bus. Prior to the tour of EMSL, we will be taking a restroom break. Once in the building I will lead you to the restroom facilities.

Pick up EMSL tour at the south entrance. Return to the Federal Building.

This concludes our tour. On behalf of the DOE Pacific Northwest Site Office I would like to thank you for your participation and cooperation today. As a reminder question cards can be turned into Mark Coronado. It will take us about 10 minutes or so to get back to the Federal Building so please sit back and relax.

PSL Script

Walking up from the vans parked at the south parking lot of the building and entering from the east entrance located in the middle of the building. Congregate along the first hallway to the right.

Welcome to the Physical Science Laboratory. My name is Roger Briggs…

First, a few brief safety items, in the unlikely event of a fire alarm, you will follow me and we will exit the building to a predetermined staging area which is located at the south end of the parking lot. As we tour this facility, I would just ask that you refrain from any contact with any of the equipment and/or laboratory staff. If you have electronic devices, please turn them off at this time. It is important to remember that we will not be answering questions today. All questions must be submitted in writing unless they pertain to facility names, room numbers, or your personal safety.

Now, let's begin with a brief overview of the lab .

The Physical Science Laboratory is comprised of wet and dry labs and office space used by the Pacific Northwest National Laboratory to conduct research and development in materials and chemical sciences.

This is one of the many leased facilities that comprise the National Laboratory.

The programmatic work includes basic research and science, and applied development programs in the energy and environmental mission areas. Primary customers include the Office of Science, Office of Fossil Energy, Office of Energy Efficiency and Renewable Energy, and the Office of Environmental Management within the Department Of Energy, and other federal agencies, such as, Department of Defense, Department of Homeland Security, the Environmental Protection Agency, and industrial clients.

We will be touring the first floor of the facility, The Physical Science Laboratory is an 89,000 sq ft facility comprised of wet and dry labs located at the west end of the Pacific Northwest National Laboratory campus in Richland, Washington. It contains approximately 58 labs and 150 offices and houses approximately 166 Full Time Employees. The 1st floor has non-radiological wet chemistry physical sciences laboratories and adjacent office space. The basement area is non-radiological as well and contains wet and dry laboratories with adjacent offices, 6 shop areas, mechanical rooms, storage area, a telephone equipment room, a locker room, restrooms and a lunchroom. There is a special room location (PSL-1249) designed especially for the storage of hazardous materials.

These labs offer integrated capabilities in chemistry, advanced process science and engineering, applied microbiology and molecular biology to create new uses for agricultural products and other biomass resources.

Technical disciplines represented in the facility include chemists, materials scientists, chemical engineers and a host of other experts and researchers in the areas of:

- Analytical and physical chemistry
- Chemical separations and conversion
- Computational science and engineering
- Design and manufacturing engineering
- Electrochemistry
- Energy technology and management
- Materials science and technology and
- Microengineering and nanoengineering

Other Subject Matter Experts and Unique Facilities Scientific experts; and other certified laboratory personnel are called upon to assist and are available for special tasks or consultation.

Now if you'll follow me down this hallway to some of the laboratories, but please do not enter them.

Walk down to the Solid Oxide Fuel Cell labs (stop in front of room 1611, stand by the open door and point up and down the hallway)

Some of the key research conducted in this facility include research and development in the area of materials properties, chemistry and ceramic processing for solid oxide fuel cells - which includes designing, modeling and fabricating complete fuel cell systems as part the Department of Energy's solid oxide fuel cell development program, called Solid State Energy Conversion Alliance or SECA which is managed jointly by the Pacific Northwest National Laboratory and the National Energy Technology Laboratory for the Department of Energy's Office of Fossil Energy and industry clients. This is an alliance of government agencies, commercial developers, universities and National Laboratories in fuel cell development that seek to commercialize solid oxide fuel cells for a variety of uses

These are some of the wet labs that are currently being used in support of the Energy Mission working on Fuel Cell development.

This lab is the Sensor lab, which supports fuel processing work and analysis.

Many of the labs in this building are exploring the concept of building fuel cell modules, building and testing prototype fuel cells and conducting research and development in:

- Materials and manufacturing
- Modeling and simulation
- Fuel reformation and,
- Thermal management.

Much of the fuel cell research is focused on advancements that could be applied to fuel cells for a variety of applications including distributed power for residential, commercial and utility power plants as well as power for military operations

The researchers are developing advanced subsystem components, including an advanced desulfurizer system that prevents sulfur from damaging the fuel cell. PNNL is actively pursuing advanced fuel processing technology that enables fuel cells to use a wide variety of fuels such as methanol, gasoline and diesel.

Another set of activities conducted in the Physical Science Laboratory is research and development in the fundamental understanding and development of novel, highly active and highly selective catalysts for biomass conversion. Researchers in these laboratories conduct work in formulating, synthesizing and testing catalysts for chemical production applications.

In addition, research is conducted here in the conversion of biomass for energy uses.

Capabilities in Physical Science Laboratory provide the building blocks to create and optimize a fully integrated bio-based products manufacturing system that economically converts biomass into energy and industrial products. Specific technical activities include:

- Thermochemical gasification of biomass for medium-BTU gas production
- Upgrading of bio-oils to transportation fuels and
- Conversion of organic acids to fuel additives

Now if you'll follow me through the corridor.

Continuing along the north corridor, turning left at the corner then walking along the west corridor past the loading dock, stop and point into the window

This is the loading dock, where equipment and materials are received.

Continuing along the west corridor, taking another left at the corner, then continuing along the south end of the building. ***Point out the labs on the corner, the door will be open to room 1324, stop briefly and mention;***

....and here are more labs for chemical analysis, materials synthesis and high-temperature electrochemistry. **This is the ceramic synthesis lab (rm 1324).**

Continue walking along the hallway. ***Stop in front of the door to the Nuclear Magnetic Resonance lab (rm 1316) and mention:***

This is one of the many Nuclear Magnetic Resonance or NMR labs at the Pacific Northwest National Laboratory. This one contains 3 NMR instruments used for the analysis of chemical samples. They can be utilized for a broad range of programs including most of the fundamental chemical research. You should also see the NMR lab in the Radiochemical Processing Laboratory, Building 325 where we can handle radioactive samples as well as the NMR lab in the Environmental Molecular Sciences Laboratory which contains some very unique wide bore magnets.

Let's continue down the corridor toward the exit and we'll stop just before exiting for some final comments *Continue walking east, stop in front of the exit right at the corner*

This facility is typical of many within the National Laboratory. Many of the laboratories in this facility are being used on various mission areas. The laboratories are very versatile and can be reconfigured fairly easily to be used for a different mission or capability. For example, we have recently moved a number of capabilities into this facility in support of the Biological Sciences area. These will again soon transition to the Biological Sciences Engineering Laboratory after it is completed in early Calendar Year 2008.

As you can see the laboratories are in the center of the facility with the offices nearby ringing the perimeter of the building.

This concludes the tour of the Physical Sciences Laboratory, please use caution when exiting the building and returning to your bus.

Process Development Laboratory West

Outside the facility

Hello. My name is Mike Talbot and I'll be your briefer this afternoon.

Before we enter the building I would like to go over a few safety items. In the unlikely event of a fire, we will exit the building through the doors we enter and stage in the parking lot. If the doors we enter through are blocked we will exit through the nearest unobstructed door.

Please watch your step when entering the building there are some uneven surfaces at the entrances due to the secondary containment system. Also a new epoxy coating for the floor was poured within the last month and is still off-gassing, it is perfectly safe, however there is a minor smell.

As we tour this facility, I would just ask that you refrain from any contact with any of the equipment and/or laboratory staff. If you have electronic devices, please turn them off at this time. It is important to remember that we will not be answering questions today. All questions must be submitted in writing unless they pertain to facility names, room numbers, or your personal safety.

Please follow me into the building and again watch your step.

Enter the Facility from the parking lot (south) entrance.

As you can see the PDL is a large high bay facility. It has over 6,000 square feet of high bay space. Projects in the past in this facility have been related to the Energy Mission and the Environmental Mission. We have had parts of this facility working on materials for vehicles for the energy mission as well as emissions research. These projects have been moved to the Applied Process Engineering Laboratory, or APEL, facility to free up this facility for a new project. You'll drive by the APEL facility later in your tour.

We are currently getting this facility ready for a long term project. This will house a non-radioactive, one-quarter engineering scale pretreatment pilot plant for the Waste Treatment Plant in support of the Hanford High Level Waste Tank Cleanup Mission

As you can see in this graphic, this project will take up the entire facility. It will be brought in on a number of skids between the beginning of December and the end of January. They are currently being fabricated in Carlsbad NM.

There will be a number of 4000 gallon receiving tanks along with ultra filtration units, pumps, holding and transfer tanks and pre-treatment units. This activity will help confirm the

flowsheets for the Pre-treatment process and determine throughput, feed rates, and other critical variables.

This is a very important project to the Office of River Protection and to the Department. This project is being funded by the Office of River Protection through the Waste Treatment Plant cleanup contractor. PNNL is supporting the Waste Treatment Plant contractor directly. This is typical of the way that the support to the cleanup mission is handled, in that the cleanup contract is directly responsible for the cleanup and the laboratory is called upon for its technical expertise, knowledge and capabilities.

In support of this project a new floor was put in the facility to handle skids weighing up to 70,000 pounds. This poster shows the configuration of the equipment.

Also a secondary containment system was added around the inside perimeter of the facility. If a leak is detected barriers at the doorways will come up and seal. (Point out the Automatic Spill Barriers) There is also portable containment for the large doors that will always be in place unless the doors are in use.

As you can see, this type of facility can serve multiple projects. Currently there are only a few High bay spaces available for the laboratory's use: PDL-W, PDL-E, EDL, and APEL. The High Bay space in APEL is shared space with other tenants.

Thank you for your attention. Now let's move to the door we entered through so you can re-board your bus.

331-G Script

Name – Hello, my name is Ted Pietrok, and I'd like to welcome you to the 331-G Integration Laboratory.

Before we begin, let's cover the safety procedure for this facility. The briefing will be provided from this location and we will not be going into the building or test area. In the unlikely event of a fire alarm, you will follow me and we will head around the East side of Building 331 to the staging area, which is in the parking lot area on the North side of Building 331. As a reminder, please refrain from any contact with equipment or laboratory staff and remember that all questions must be submitted in writing unless they pertain to your personal safety. I will now begin the overview of this facility.

Mission/Service Provided/Client – The Integration Laboratory was established by the PNNL to support the testing requirements of the Department of Homeland Security's Radiation Portal Monitor Project and other Homeland Security mission based programs. The Radiation Portal Monitor Project represents approximately $80M per year in funding for PNNL and the project execution plan relies on fiscal year funding availability through 2012 and beyond.

This laboratory is a flexible and expandable facility that allows equipment to be arranged into actual port configurations, to simulate field conditions. It is equipped with multiple radiation detection and interdiction systems, including all systems and ancillary components deployed through the Radiation Portal Monitor Project. The detectors you see here in the field are similar to those you might see today at border crossings and shipping ports throughout the World.

Occupancy/Staffing – Staffing consists primarily of Subject Matter Experts and unique facilities scientific experts in fields such as nuclear physics, radiological engineering, test engineering, and statistics; and certified laboratory personnel for calibration and vibration studies. Total PNNL staffing for the Radiation Portal Monitor Project is approximately 175 Full Time Equivalents at this time.

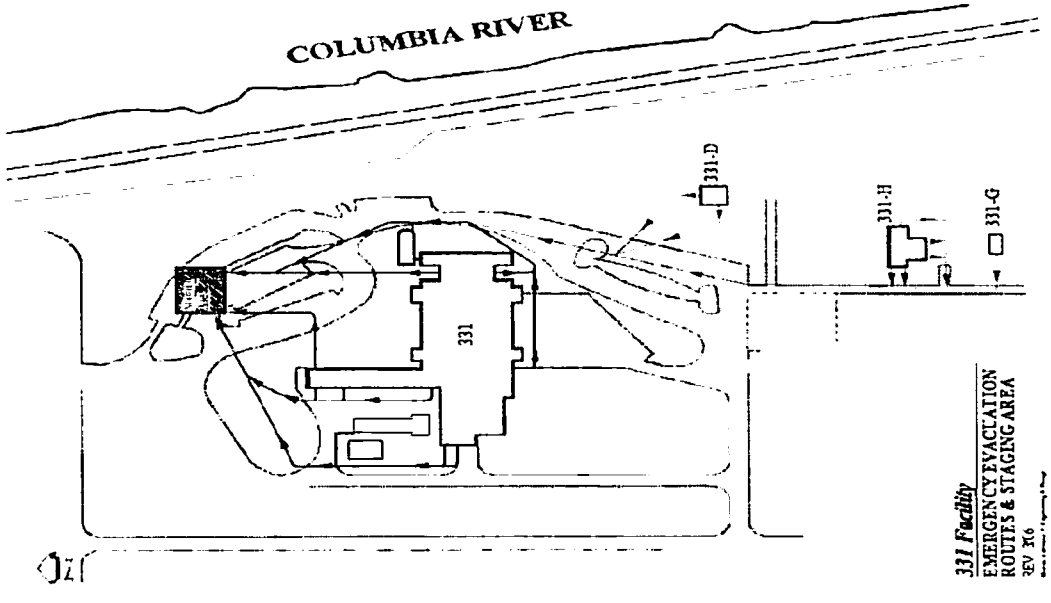
Technical Info (physical description, capabilities, condition, scope uncertainties) - The Integration Laboratory includes both indoor and outdoor facilities located at the 331-G Building. The Laboratory is DOE-owned and sits on 1.5 acres here on the Hanford Site. This Laboratory is expected to be replaced and re-located in 2010 as part of the Physical Sciences Facility Construction Project.

Testing performed at the Integration Laboratory includes both developmental testing, performed in a controlled environment with specific measures of performance, and operational testing, performed under field conditions to confirm the functionality of the system. Testing is used to verify the impact that speed has on detector readings and the effect of shape on vehicle presence sensors, as well as to collect sensitivity data from the detector panels.

Regulatory Status - The entire 1.5-acre laboratory site is a Radioactive Materials Area so that radioactive sources can be used throughout. The Integration Laboratory has access to a diverse and expansive set of radioactive sources, including special nuclear material, which allows systematic testing to challenge a wide range of configurations and operational modes.

Facility (Interior) - The 331-G Building contains a Materials Balance Area for storing limited quantities of radioactive sources. A vault with cipher lock is built into the building, and inside are locked safes for storage of sealed sources. Also, the Building houses a unique computer-based tool developed at PNNL called the 32-Lane RPM8 Simulator. The simulator, which is composed of 32 control modules, can be programmed to replicate a variety of traffic and radiation alarm scenarios for up to 32 lanes of traffic. The simulator is used extensively for verifying proper performance of software, for troubleshooting, and for challenging system components, such as database operations.

This concludes the general overview for the 331-G, Integration Laboratory, thank you for your consideration.



NOTE: Exit the minibus and walk onto the front curbing across from the front entrance of the 331 facility.

Hello, my name is Terri Aldridge. Welcome to 331 Building, the Life Sciences Laboratory.

Before we begin the tour, I will cover a few brief safety items. In the unlikely event of a fire alarm, I will have you follow me, as we exit the building - through the double doors that you see in front of you and head to the staging area, located in the northeast corner of the parking lot. As we tour this facility, I would ask that you refrain from any contact with any of the equipment and/or laboratory staff. If you have electronic devices, please turn them off at this time. It is important to remember that we will not be answering questions today. All questions must be submitted in writing unless they pertain to facility names, room numbers, or your personal safety. Now, let's begin with a brief overview of the lab.

This 115,000 square foot, DOE owned building, is a three story, reinforced concrete building with a mixture of dry and wet laboratories on the first and third floors and a mechanical service floor between them. In addition to administrative offices that were part of the initial structure built in 1970, office space was added during modifications in 1982 and 1996. Several laboratory renovations have taken place as well.

The Life Sciences building has approximately 40,000 square feet of laboratory space, a little over 15,000 square feet of office space, and nearly 61,000 square feet of storage and common space.

MISSION/SERVICE PROVIDED/CLIENT

The research conducted in the Life Sciences Laboratory is largely composed of biological and chemical studies directed at researching impacts on living organisms, both surface and subsurface. The building is equipped with many unique features to facilitate this research, including aquatic laboratories and accredited animal care facilities. Radioactive materials are also permitted within the building in accordance with prescribed work procedures and approved limitations. Multiple capabilities from various labs within this and other buildings around the laboratory campus may be used to solve any given problem set.

I will now provide you with a brief overview of the types of capabilities used to solve problems within the walls of the Life Science Laboratory.

Much of the work in the Life Sciences Laboratory is in the areas of systems biology, environmental science, actinide chemistry, nuclear magnetic resonance, and detection.

IF WEATHER BAD -WALK INTO BUILDING AT THIS POINT –
Conference room

More specifically, experimental studies are conducted to understand molecular and cellular processes resulting from insults by physical and chemical agents. This work provides data that serves as a basis for precise cross-species and low-dose extrapolation of health risks and to supply information to understand disease mechanisms, as well as, levels and effects. Basic and applied research involving microorganisms and/or their processes in various environments is also conducted in the Life Sciences building. Some of the research that is conducted here focuses on subsurface microbiology including the physiology and ecology of subsurface microorganisms, degradation of organic contaminants and bioremediation, enzymatic reduction of metals, and biogeochemical cycling of nutrients. This laboratory currently houses research programs investigating macromolecular structure and dynamics, as well as, biological uptake and distribution of a wide range of environmental contaminants in vivo and in vitro.

This laboratory is also equipped with the capability to provide technical services in internal dosimetry, external dosimetry, instrument calibration, repair, and testing for ***1)*** protecting the health of workers and the public, and ***2)*** providing liability protection for government and industrial customers.

In the future, the laboratory's scope, post Physical Sciences Facility construction, will include subsurface science and environmental biomarkers capabilities, which are key to understanding human health and microbial community ecology and metabolism. These capabilities also further our understanding of the impact of toxic metals and other compounds that have contaminated soil and groundwater as a result of the legacy nuclear and enrichment activities at Hanford - all important areas of research to the Department of Energy.

As we enter the life sciences space, we will be walking through the hallways and stop at several key laboratories. I will identify the types of capabilities within the laboratories as we stand outside the doors—we will not be entering any of the spaces. Keep in mind that multiple capabilities from the various laboratories may be used to solve any given scientific or technological problem. Now, we will begin our tour, please follow me to the first stop on our tour....

Outside the door, describe the two labs below prior to entering the hallway

Our first stop is Lab 152, a large Geochemistry Laboratory equipped with hoods, centrifuges, spectrometers, glove boxes, computers, and ancillary equipment.

A little further down the hall is Lab 116. Lab 116 is a Biosafety Level II Laboratory, a wet lab with double filtered ventilation. It is equipped with a spectrophotometer, a centrifuge, a freezer, and other miscellaneous equipment. Research with pathogens is conducted in this laboratory. Each of you will have an opportunity to look in the laboratory through the door, please follow me.

Please follow me, we will be turning just ahead to our right--under the illuminated exit sign...

As walking past NMR labs...

This large laboratory is the 130 Lab. It houses five Nuclear Magnetic Resonance Spectrometers

Read script below as we stand outside of the hall containing labs 148/149E

In this wing of the life sciences laboratory are Labs 148 and 149E. Both are wet labs with unfiltered ventilation. Lab 148 is equipped with a microscope and an irradiation system. The 149E lab contains equipment and capabilities for High Speed Imaging. It is equipped with microscopes, lasers, cameras, and computers. These laboratories are used to conduct research in molecular and cellular processes. It is a small space so we will take the time for each of you to look into the labs. After you take a look, please, return to where you are now...

Describe next three labs prior to moving the group out to walk past them

Now we will return to the previous hallway and take a right turn. We will be walking by labs 122, 131, 135, and 188, which house the Animal Research Center. The Lab doors will not be open. A variety of animals have been included in the research conducted within this center (such as large laboratory rats, mice and rabbits). Please follow me...

Make a right at the next corner. Walk by the three animal care labs and take a left at the end of the hall

On your left will be Lab 170. This laboratory is an environmental microbiology lab and is equipped with fume hoods, centrifuges, and refrigeration for research being performed with aerobic and anaerobic organisms. This space consists of a wet lab with a double filtered ventilation system. Please take a look at the laboratory and then come stand by me down the hall

Please follow me...

We will now take the stairs to the third floor research labs, please use the handrails as we travel up the stairs. ... We will be passing by the second floor mechanical maintenance area on your left.

Point out Maintenance Floor as Going Up Stairs

When you arrive upstairs and get into the lab hallway space, describe the labs that will be passed prior to entering the space.

Our first stop will be at Lab 350, this lab contains the necessary equipment for cell culture studies. This work space is a wet lab and is equipped with a Ultra-Violet microscope. It is utilized for state-of-the-art research on micro-organisms.

Ahead and to our left will be Lab 355. This large wet lab space is used to conduct cell biology investigation and research. It is equipped with centrifuges, freezers, a spectrophotometer, a spectrofluorometer, a bio-analyzer, and other ancillary equipment. Please follow me as we make our way down the hall.

Collect the group and turn the corner to the right—read in place prior to walking to other hallway

We will now continue to the other side of the third floor, to Labs 320 and 319.

You will pass by lab 320 on the corner, this lab is the virus laboratory. It is a small dry lab equipped with centrifuges and a biological hood.

Across the hall is Lab 319 a wet lab with a single filtered ventilation system. It is used for DNA Repair and Replication research. Proteomics Research is conducted here. Equipment includes UV Detectors, Incubators, Centrifuges, Thermal Cycler, Chromatographs, Synthesizers, a fume hood, a furnace, a spectrophotometer, computers and other ancillary equipment. Please follow me...

When everyone has looked at both labs – describe next 2 labs prior to proceeding down the hall

Our next two stops will be Lab 317 and Lab 316.

And Lab 317, is where Protein Interaction and Chemistry research capabilities are investigated. It is a wet lab with single filtered ventilation. It has fume hoods, computers, fluorescence detectors, a spectrophotometer and spectrofluorometer.

Lab 316, is a Protein Micro-array Laboratory. It is wet lab space equipped with a fume hood, a homogenizer, an electrophoresis system, a DNA Thermal Cycler, Computers, a micro-array printer, and a centrifuge.

Please follow me...

Wait for group to collect and describe the next 2 labs prior to the door of Lab 313

We will now tour Lab 313, and Lab 302. Lab 313, a Core Analytical Laboratory is a wet lab space with single filtered ventilation and is equipped with chromatographs, fume hoods, a gas generator, a mass spectrometer, computers, and other ancillary equipment.

Finally, our last stop before leaving the life sciences laboratory will be the 302 Lab, the Nanoparticle Exposure Laboratory. It is a wet lab equipped with a degasser vacuum, a variable wavelength detector, a mass spectrometer, computers, and other ancillary equipment. Let's proceed

Wait until the group has filed past both lab 316, and lab 302. Conclude the group tour

This concludes our walk through of the Life Sciences Building. On behalf of the Pacific Northwest Site Office, thank you for your consideration. I'd like to remind you to request a notecard for any questions you may have. The answers to all questions will be collected and posted by the Source Evaluation Board as instructed. Lastly, please remember to use the handrails as we walk back downstairs, and enjoy the rest of your visit.

[Stop 1. *Outside front entrance of building:*]
Welcome. My name is Russ Warren and I work for PNSO.
As we tour this facility, I would just ask that you refrain from any contact with any of the equipment and/or laboratory staff. If you have electronic devices, please turn them off at this time. It is important to remember that we will not be answering questions today. All questions must be submitted in writing unless they pertain to facility names, room numbers, or your personal safety. Now, let's begin with a brief overview of the lab.

This is the 325 Building or the Radiochemical Processing Laboratory, or "RPL".

It is currently a Hazard Category II Non-reactor Nuclear Facility. It is a 144,092-square-foot building and consists of

- more than 35,000 square feet of laboratory space,
- nearly 15,000 square feet of office space,
- more than 8.000 square feet of hot cell space,
- and 86,000 square feet of storage, mechanical and common space.

There are a number of life extension upgrades that are planned to allow the 325 Building to continue to operate and meet the DOE mission. They include:

- Additional hot cells
- Additional glove boxes
- Some fume hood removal
- Shielded storage
- HVAC upgrades
- Roof repairs
- Personnel Contamination Monitoring System replacement
- and Seismic upgrades

The RPL was built in 1953 to safely house and handle radioactive materials associated with chemical process development.

The RPL houses specialized facilities for work with microgram-to-kilogram quantities of fissionable materials and megacurie activities of other radionuclides.
The RPL provides the following key capabilities:

- Radiochemical process development
- Chemical and physical separations
- Radiomaterials characterization
- Medical isotope production
- Thermal processing
- Reactor dosimetry
- Analytical chemistry
- Nondestructive assay
- Shielded facilities
- and Hazardous waste treatment units.

During this tour you will not be entering a radiological buffer area, but you will be close to the buffer areas and you are required to be escorted. The buffer areas are clearly marked. Please pay close attention to the postings and to the yellow and magenta tape, which might be on the floor. Do not cross any barriers or break the plane with any part of your body. You will be receiving a safety briefing as we enter the facility. Please follow me.

[*Enter the Facility*]
[Stop 2. *In the lobby:*]
Unescorted access in this facility is limited. Do not enter any Radiologically Controlled Area without an escort. Your escorts today are myself, Dave Biancosino, Joe Escamillo, and Bob Mcleod.

Criticality Safety – The RPL is a Fissionable Material facility and is monitored by a criticality alarm system. The alarm sound is AH-OO-GAH and your response is to run away from the sound and out of the building to the staging area in front of the facility. It would be best to follow one of the escorts.

Radiological Hazards – Work with radiological materials is performed in the RPL. Since we will be remaining outside the Radiological Buffer Areas you will not be exposed to any radiological hazards

We will only be touring the first floor of this facility and only going a short way down one hallway. Again as you've heard please stay together as a group and do not cross any radiological buffer boundaries. Please follow me.

[*Enter the door to the RCA*]
[Stop 3. *At entrance to the 100 Hallway*]

This building has both laboratories and office space. This first hallway has offices on one side and hallways to the laboratories on the other. The radiological buffer area boundary is at the entrance to each hallway where a PCM or Personal Contamination Monitor is installed. Upon exiting the buffer zone one must survey out through these PCMs to ensure that contamination is not spread beyond the buffer area. Please follow me.

[Stop 4. *Proceed west to the end of the hallway; stop at the NMR Lab - Room 209*]

This is where the Nuclear Magnetic Resonance capability is located. Radioactive samples, including those containing fissile isotopes, can be examined in this Laboratory. Instruments include a three-channel 300 MHz Nuclear Magnetic Resonance spectrometer with an Oxford 7.1 Tesla widebore superconducting magnet and a broadband instrument interfaced to a variable-field electromagnet.

Please take turns looking into the laboratory.

This lab is equipped with an array of probes providing a broad spectrum of capabilities for investigating solid and liquid radioactive samples. NMR research has been performed on nuclear waste forms, solution-state uranium complexes, Hanford tank wastes, radioisotope extractant materials and technetium solids. The RPL is the only laboratory in the United States that can perform solution-state tritium NMR measurements. This capability is available for use by others as part of the EMSL user facility.

Samples are prepared in radiological fume hoods or glove boxes located in a separate laboratory. These samples are handled as contained sources, free of external contamination. This NMR lab is maintained in a non-contaminated condition.

[Still at Stop 4. *Outside the NMR Lab and in front of the SAL*]

The RPL contains two fully staffed and equipped hot cell complexes for conducting work with highly radioactive materials. These complexes provide unique, complementary capabilities for conducting bench-scale to pilot-scale work with wide varieties and forms of radioactive materials. One is the High Level Radiochemistry Facility and the other is the Shielded Analytical Laboratory, or SAL, which is located just beyond this room. The SAL consists of six hot cells totaling 200 square feet of floor space. All six hot cells have pass-through capability between cells and share a common air space and criticality space. They are operated in such a way that cell 1 has the least radioactive contamination and cell 6 has the most.

The back face of the cells have a number of access ports and a few of the cells use a lazy susan type device to load samples or equipment.

There is a permitted Treatment Storage and Disposal unit in 325, part of which is located here in the SAL.

Please follow me down to the next hallway I will point out a few other capabilities that reside within this building.

[Stop 5. Walk down to the *300 Hallway and look down the hallway*]

The majority of the laboratories down this hallway support the soil sample analysis work from the Hanford site.

The RPL's Radiological Surface Science Laboratory, or "RSSL", provides a wide range of instruments for examining surfaces. This lab combines these powerful research tools with the ability to examine radiological samples, creating new opportunities for basic through applied research. It can receive, test and prepare highly active and dispersible samples for surface analysis.

The Environmental Science Laboratory within the RPL provides forefront equipment, instrumentation and laboratory facilities that support PNNL's subsurface science capability. These capabilities provide methods for investigating the earth's subsurface and support Department of Energy programs and industrial clients. Study areas are divided into three groups:

1. solids
2. solution composition
3. and water/geologic media interactions.

The RPL's analytical chemistry capabilities are used to characterize materials in support of process development.

Please Follow Me

[Stop 6. Walk down to the *400 hallway*]

Labs in this hallway include:

- An X-ray diffraction laboratory
- An inorganic Mass Spectrometer Lab used to analyze gas samples.
- And the main counting laboratory.

The RPL's dosimetry services can

- help characterize complex reactor environments.
- effectively use material test data,
- increase reactor safety and life extension,
- develop advanced reactor alloy materials
- and design advanced fission and fusion reactors.

Among the key features of the RPL are extensive specialized facilities and instrumentation to identify and quantify chemical species and radioactive isotopes in simple and complex media. RPL has the capability to work with highly radioactive material, highly dispersible isotopes, trace levels of radionuclides and anything in between. The capabilities in radiochemical process engineering can be applied to:

- Develop process flow sheets
- Design, install and test radiochemical process systems
- and Develop engineered systems for toxic and highly radioactive systems.

For more than a decade, the RPL has provided waste separation, processing, and immobilization technologies to the Hanford Site. Much of the development and testing has been performed with actual Hanford waste.

Many of the RPL's capabilities can be used to investigate highly energetic systems having very rapid reaction rates.

Please Follow Me

[*Stop 7. Look down the Hot Cell Hallway (600 Hallway)*]

Please take the opportunity to have a quick look in either of these two windows of this lab to see what the typical RPL wet chemistry lab looks like.

Pause

As stated earlier, the RPL contains two fully staffed and equipped hot cell complexes for conducting work with highly radioactive materials, the Shielded Analytical Laboratory hot cells which we discussed earlier and the High-Level Radiochemistry Facility or HLRF.

Over here, you can see into the gallery of the HLRF through this window.

[A little further down but still at Stop 7. *Direct group to the HLRF window in the hallway*]

Please make sure you do not cross over the barrier as you look in the window. Please take turns and allow enough room for people to get out of the way so as not to cross the yellow and magenta tape.

These complexes provide unique, complementary capabilities for conducting bench-scale to pilot-scale work with wide varieties and forms of radioactive materials.

The HLRF provides a variety of services for radioactive materials, including secret and highly classified data. These services include:

- tank characterization,
- pretreatment,
- advanced analytical methods development,
- isotope processing,
- advanced separations
- and reactor fuel handling.

[redacted]
There are three interconnecting hot cells. The A-cell measures 15 feet by 7 feet, and B and C cells each measure 6 feet by 7 feet. Shielding for the cells is 4 feet of high density concrete.

As an example of the type of work that has been conducted in the HLRF, capabilities have been developed to perform post-irradiation examination of full-length rods in support of the Tritium Readiness Campaign for the National Nuclear Security Administration. Since 2003, the RPL has received and sectioned full-length Tritium-Producing Burnable Absorber Rods in our HLRF. To process the rods, RPL has developed several cutting and handling methods, including longitudinal cutting and disassembly. Once the rods are disassembled, researchers use a variety of techniques to examine them, including:

- Microscopy
- Hydrogen isotope assay
- and Surface analysis

These examinations can also be performed on classified materials.

We will now proceed to where we entered the Facility and will view a short video to demonstrate how some samples have been brought into this Facility and prepared, and used in the HLRF. Please follow me.

Start walking towards the exit of the hall way and out the door
[Stop 8. *In the RPL Conference Room 206:*]

Special Features of the Radiochemical Processing Laboratory to highlight include:

- A Permitted waste treatment storage and disposal facility
- A Low-level waste compactor
- Double-shielded, instrumented waste tanks for hot cell use
- Remote capabilities to inspect dangerous waste tanks
- Continuous program alarming and monitoring systems to ensure safe operating conditions
- Exhaust air sampling capabilities for radioactive material sampling
- A Maintenance shop
- Laboratory gas distribution system for P10, methane, UPH methane, acetylene, and hydrogen
- And a specially shielded sample receiving area with walk-in sample storage cooler.

Again this video demonstrates how some samples have been brought into this facility and prepared, and used in the HLRF. There is no narration with the video.

Show Video.

This concludes your tour of the Radiochemical Processing Laboratory please proceed outside and back onto the bus to continue your tour. Please watch your step.

Please hand your 325 badges to the escorts as you exit the conference room.

E-M-S-L Tour Script

5 minutes – Enter facility and be seated in the E-M-S-L Board Room

Note: Enter through the main doors into the E-M-S-L Lobby and take the group to the immediate left into the E-M-S-L Board Room and shut the doors for privacy.

10 minutes – Safety Precautions & Introduction to E-M-S-L

Name – Hello, my name is Melanie Fletcher and I'd like to welcome you to the *William R. Wiley Environmental Molecular Sciences Laboratory*, which is more commonly referred to as 'E-M-S-L'. Before we begin the tour, I'd like to cover a few brief safety items. In the unlikely event of a fire alarm, or other evacuation, I will have you follow Jeff Day (Jeff raises hand). We will exit the building and head to the staging area, located in the southwest corner of the parking lot where the pole with the 'staging area' sign is. As we tour this facility, I would ask that you refrain from any contact with any of the equipment and/or laboratory staff. If you have electronic devices, please turn them off at this time. It is important to remember that we will not be answering questions today. All questions must be submitted in writing unless they pertain to facility names, room numbers, or your personal safety.

Safety Statement: In order to enter the laboratory spaces you will need 'substantial' footwear. Substantial footwear provides a high degree of stability, support, and protection from lacerations, punctures, and moderate chemical splashes. High-heeled shoes, moccasins, sandals, or other open footwear are not considered substantial footwear.

We will be going into lab spaces that have *strong magnetic fields.* Does anybody have a:

- Pacemaker
- Defibrillator
- Neurostimulator
- Or any large metal implants?

If you have any of these devices or implants, for your own safety *you must wait outside* of those lab spaces with a DOE person while the others in the group tour the lab. You will be advised during the course of the tour which lab spaces you cannot enter with these devices.

Now, let's begin with some background on the E-M-S-L facility. The E-M-S-L is named after Dr. William R. Wiley who was the Director of PNNL from 1984 -1994. In 1986 Dr. Wiley advocated that a scientific user facility dedicated to molecular-level research was necessary for understanding problems and finding solutions for environmental cleanup, energy efficiency, and health. After years of careful planning, the construction of the E-M-S-L was the fulfillment of Dr. Wiley's vision for a scientific user facility.

Mission/Client/Service Provided – The E-M-S-L is a DOE Office of Biological and Environmental Research (BER) National Scientific User Facility located at PNNL. E-M-S-L provides integrated experimental and computational resources for discovery and technological

innovation in the environmental molecular sciences to support the needs of DOE and the Nation.

The E-M-S-L was an Office of Science Major System Acquisition of approximately $230 million in July 1989 and became fully operational on October 1, 1997. The E-M-S-L just celebrated its 10th Anniversary in October 2007.

E-M-S-L provides services to users who are comprised of visiting scientists, professors, and other researchers from academia, government, and industry. Since E-M-S-L's inception, researchers from all 50 states and nearly 30 countries have used the resources of the user facility. This includes more than 10,000 users from more than 360 academic institutions and more than 80 private companies.

Occupancy/Staffing – At the end of Fiscal Year 2007 E-M-S-L was occupied by 352 staff & students.

Facility Description (physical description, capabilities, condition, scope) – E-M-S-L is a 200,000 square foot facility that maintains state-of-the-art instrumentation for molecular-level experimental and computational user research. E-M-S-L includes more than 80 lab spaces, office space with interaction areas, and conference rooms for collaboration and meetings.

The E-M-S-L office areas are two-story wings, and include common areas that are isolated from the laboratory space. An office addition is currently under construction on the other side of the facility where you came in that will add approximately 6000 square feet to E-M-S-L to provide much needed office space for 'unpacking' of the currently overcrowded office space.

In the front of the E-M-S-L facility where you came in there is a cafeteria and publicly accessible conference rooms. It also has a state of the art auditorium that is equipped to facilitate multi-media presentations for technical collaborations or conferences. We will not be touring the conference area today as there is a large conference taking place this week that will be using the conference facilities.

E-M-S-L *User Services* allows instruments to be available to the scientific community at no cost via a peer review proposal process (except for proprietary research, which is full cost recovery). E-M-S-L operations also provide infrastructure, training & mentoring, and equipment maintenance & development resources to support the needs of the user program.

E-M-S-L has *four environmental molecular science themes* that help define and develop key collections of user projects and future capital equipment investments for research instrumentation:

1. Geochemistry-Biogeochemistry & Subsurface Science,
2. Biological Interactions & Dynamics,
3. Science of Interfacial Phenomena, and
4. Atmospheric Aerosol Chemistry.

E-M-S-L has *six internal facilities/capabilities containing state-of-the-art research instr*umentation that supports the following Science Themes:

1. Chemistry & Physics of Complex Systems,
2. Environmental Spectroscopy & Biogeochemistry,
3. High Field Magnetic Resonance,
4. High Performance Mass Spectrometry,

5. Interfacial & Nanoscale Science, and
6. Molecular Science Computing.

E-M-S-L maintains *dedicated support infrastructure* to support the user program through:

- The Instrument Development Laboratory,
- Computing & Network Services, and
- User Services & Outreach.

E-M-S-L's financial scope includes the following:

- An operations funding request to Congress of approximately $36M.
- The next generation E-M-S-L supercomputer is presently under procurement (approx. $24M).
- A capital equipment refreshment of approximately $75M for research instrumentation is scheduled to occur over the next five years.
- In Fiscal Year 2007 there was also $44.2M of programmatic research scope performed in E-M-S-L.

Regulatory Status – E-M-S-L has limited ability to do research with radiological materials and is presently limited to sealed source or volumetrically released materials. The addition of a radiological annex that will allow expanded use of radiological materials in environmental & biological research activities for E-M-S-L users is currently under discussion.

Facility Condition – The condition of the E-M-S-L facility has been assessed as 'new or adequate'.

30 Minutes – Interior tour of the E-M-S-L Research Areas

That concludes our introduction to the E-M-S-L facility. Now, please follow me to the facility interior where the research & support facilities are located.

Proceed down the main hallway to the right and stop in front of windows to the supercomputer on the left.

Stop 1 - Molecular Science Computing Facility – Located in this portion of E-M-S-L is the Molecular Science Computing Facility. The beige racks you see through the windows are the E-M-S-L supercomputer that is available for user research. It is a Linux-based supercomputer with a peak performance of 11.8 teraflops and 6.8 terabytes of memory. The computer consumes ¾ megawatt of power – roughly enough to power 750 homes. Running all the processors generates an enormous amount of heat, so the room is cooled to 68° F using 200 tons of air conditioning. There are 50 miles of cable under the floor tiles connecting the computer's electronics.

The MSCF provides both remote & onsite user access to the supercomputer and its associated software for research in science areas such as aerosol formation, bioremediation, catalysis, climate change, hydrogen storage, and subsurface science.

The computer room was recently expanded to 9,000 square feet to be ready for the installation of a new super computer in 2008. A new $24 million supercomputer with an expected peak performance of 163 teraflops and 37 terabytes of memory is being procured to replace the

current supercomputer. The new supercomputer will become operational in late FY2008 and begin steady state operations in early FY2009.

In FY2007 the MSCF supported 125 user research projects and 202 users. That concludes our time in the MSCF. Let's proceed to our next stop on the tour.

All of the office and lab space to the left of the 1100 hall is devoted to the Molecular Science Computing Facility, while the lab space on the right of the hallway is devoted to the *Chemistry and Physics of Complex Systems Facility*. (Move to hallway near interaction complex). As we walk down the main hallway there is an office and interaction complex for E-M-S-L staff and users across from each of the primary access hallways.

*Proceed to Room 1210 in the 1200 halway. We **will** go into this lab space.*

Stop 2 - Interfacial & Nanoscale Science Facility – The laboratory space for the Interfacial & Nanoscale Science Facility is located between the 1200 hallway on your left and the 1300 hallway on your right.

Please follow me into Room 1210 where some of the instrumentation available to E-M-S-L users for surface characterization is located. E-M-S-L has more surface characterization instruments under one roof than any other DOE user facility.

Resident and visiting E-M-S-L users at the *Interfacial & Nanoscale Science Facility* use this instrumentation to research a variety of oxide mineral films and interfaces, nanoscale materials, electronic and catalysis materials, micro-fabrication and micro-analytical separations, and sensing. Major components of this facility that are available to E-M-S-L users include:

1. Thin film deposition tools, including Molecular Beam Epitaxy systems, oxide metal-organic chemical vapor deposition equipment, sample transfer system and portable experimental stations, and micro-fabrication equipment.
2. State-of-the-art surface science tools.
3. High-resolution electron microscopes and x-ray diffraction instrumentation.
4. Ultra-high vacuum, liquid, and ambient environment scanning probes.
5. Gas chromatography, NOx analyzer, and an RX100 testing and characterizing system.
6. Research tools for micro-fabrication and clean-room capabilities.

In FY2007 the INSF supported 347 user research projects and 266 users.

Proceed back to the main hallway and stop at the NMR model on the right of the hallway.

Stop 3 - 900 MHz NMR Model – I would like to stop here briefly to show you this model of our 900 Megahertz Nuclear Magnetic Resonance Spectrometer (NMR). This is the best view you will have of the most powerful instrument in the laboratory. It was delivered in March 2002 and it was the first of its kind. It is 21 feet high, 8 feet in diameter, and weighs 16 tons. Inside the magnet are 180 miles of superconducting wire. The 900 NMR is topped off weekly with liquid helium and liquid nitrogen which keeps the NMR at minus 459° F!!

Proceed to High-Field Magnetic Resonance Facility in Room 1610 and go over the safety briefing before we enter the lab space.

Safety Statement: This laboratory has *strong magnetic fields*. Does anybody have a:

- Pacemaker
- Defibrillator
- Neurostimulator
- Or any large metal implants?

If you have any of those devices or implants for your own safety, *you must wait outside* of those lab spaces with a DOE person while the others in the group tour the lab.

After the briefing we will go inside the NMR lab. WARNING BEFORE ENTRANCE:

" PLEASE DO NOT cross over the caution line tape where high magnetic fields exist"

Stop 4 - High-Field Magnetic Resonance Facility – In this facility E-M-S-L users can access (both onsite and remotely) state-of-the-art nuclear magnetic resonance (NMR) and electronic paramagnetic resonance (EPR) instruments. These instruments are used for determining molecular structures that impact environmental remediation and biological health.

Resident users offer expertise in structural biology, solid-state materials/catalyst characterization, magnetic resonance imaging techniques, and high-resolution spectroscopy of biological objects using a slow (1 to 100 Hertz) magic angle spinning.

Major components of this facility that are available to E-M-S-L users include:

1. Twelve NMR spectrometers (ranging from 300 to 900 MHz) and one pulsed EPR spectrometer, with capabilities in high-field liquid-state, solid-state, and micro-imaging techniques.
2. Combined optical and magnetic resonance microscope.
3. Low-temperature probes for metallo-protein chemistry and structure.
4. Virtual NMR capability for remote use and collaboration with resident E-M-S-L users through a secure shell over the Internet. This includes secure Internet access to the spectrometers, computer display sharing, use of a remotely controlled laboratory camera, electronic notebook capability, and real-time audio/videoconferencing.

(Move to NMR) Behind the wood entryway is the 900 MHz NMR that I showed you the model of earlier. As I mentioned the 900 MHz NMR is 21 feet high, 8 feet in diameter, and weighs 16 tons. When the 900 was delivered it was lowered by a crane through an opening in the roof and then encased behind a wall of 3-inch thick steel.

The technology of an NMR is similar to that of Magnetic Resonance Imaging (MRI) used in hospitals, but our NMR has a 10 times stronger magnetic field compared to most MRI machines used in hospitals. Just as the MRI's in hospitals use magnetic fields to visualize an elbow or knee joint, our much more powerful magnets allow us to look at the much smaller structures of molecules and proteins.

In FY2007 this facility supported 144 user research projects and 83 users.

Please follow me out into the hallway to Room 1621 where our *High-Performance Mass Spectrometry Facility* is located.

Proceed to High-Performance Mass Spectrometry Facility in Room 1621 and go over the safety briefing before we enter the lab space.

Safety Statement: This laboratory also has *strong magnetic fields*. Does anybody have a:

- Pacemaker
- Defibrillator
- Neurostimulator
- Or any large metal implants?

If you have any of those devices or implants for your own safety *you must wait outside* of those lab spaces with a DOE person while the others in the group tour the lab.

Stop 7 - High-Performance Mass Spectrometry Facility – This is the High-Performance Mass Spectrometry Facility where resident and visiting E-M-S-L users employ cutting-edge mass spectrometry methods.

The research in this facility focuses on global proteomics research and allows the visualization and analyses of cell proteins in great detail. State-of-the-art instruments are available for challenging research in proteomics, cell signaling, cellular molecular machines, and high-molecular weight systems.

Major components of this facility that are available to E-M-S-L users include the following:

1. Fourier transform ion cyclotron resonance mass spectrometers ranging from 7 tesla to 12 tesla, with electro-spray ionization sources.
2. Quadrupole Time-of-Flight Mass Spectrometer (QTOF), Micro-mass QTOF with custom high sensitivity inlet, equipped with a Micro-Spray source. This instrument can handle ultralow flow with minimal sample consumption, providing high sensitivity at very low flow rates.
3. Four Finnigan LTQ ion trap spectrometers, linear quadrupole ion trap-based instruments designed for use with electro-spray ionization sources.

In FY2007 this facility supported 110 user research projects and 80 users.

Proceed back into the hallway.

There is another main hallway in E-M-S-L that parallels the hallway we just came down. Along that hallway are additional lab space and support facilities for the E-M-S-L user facility. **That concludes our tour of the E-M-S-L facility. Please follow me out to the back door where your tour van is waiting to pick you up.**