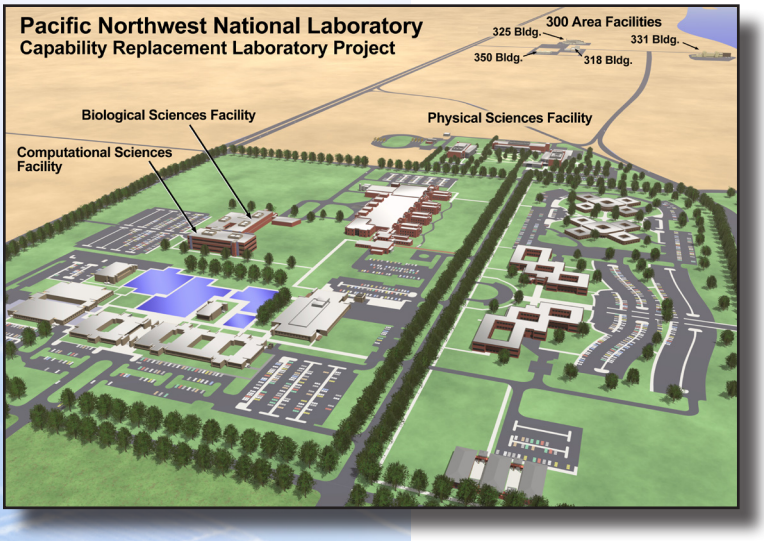
Building Pacific Northwest National Laboratory's

Physical Sciences Facility

Pacific Northwest
NATIONAL LABORATORY



The PSF comprises federally funded laboratories for research that will be displaced from accelerated cleanup of the 300 Area of Hanford. The new buildings are being built through the Capability Replacement Laboratory project. The CRL project also includes extending the operation of four facilities in the 300 Area of the Hanford Site and building two privately financed facilities.

The U.S. Department of Energy's Pacific Northwest National Laboratory is undergoing a transformation. In the summer of 2007, work began on the nearly 200,000-square-foot Physical Sciences Facility (PSF), a research complex with five laboratories and a radiation portal monitoring test track that will house important national and homeland security scientific capabilities, equipment and staff displaced from accelerated cleanup of Hanford's 300 Area.

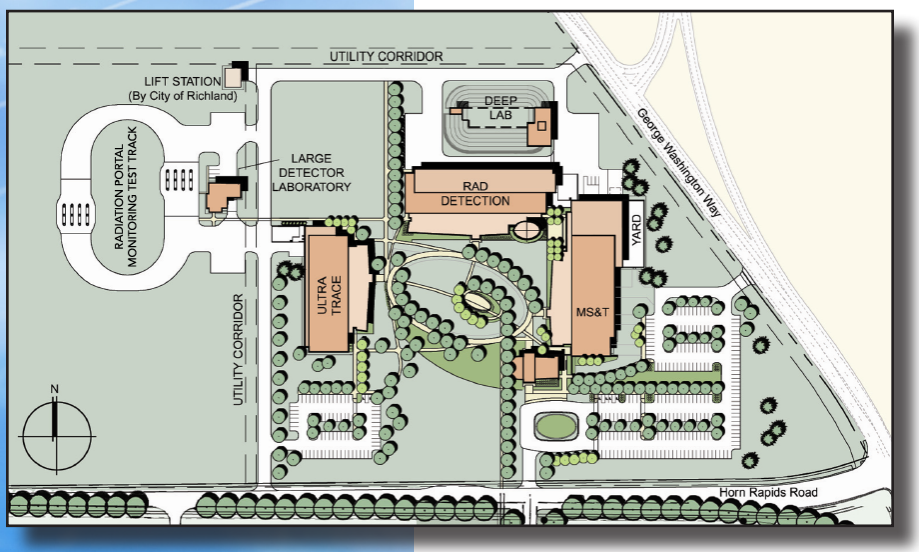
World-Class Radiological Capabilities

Today, more than half of the national laboratory's $855 million business volume supports national and homeland security missions. Several of PNNL's unique capabilities in national and homeland security are not replicated anywhere else in the world.

Transitioning from the 300 Area

Many of the capabilities that the federal government and other clients rely on at PNNL are located in the 300 Area of the nearby Hanford Site. Most of the facilities must be vacated by 2011 for environmental cleanup. Nearly half of PNNL's experimental laboratory space and 100 percent of its nuclear and radiological capabilities are located in these buildings.

Some of the staff, equipment and capabilities in the 300 Area that will be displaced will be relocated to new buildings—the Biological Sciences Facility, Computational Sciences Facility and Physical Sciences Facility—that are currently being constructed through the Capability Replacement Laboratory project. The remaining capabilities will stay in four facilities, Buildings 318, 325, 331 and 350 which are all located in the 300 Area.



The PSF consists of five main laboratories—Radiation Detection, Materials Science & Technology and Ultra-Trace—as well as a large detector laboratory, a deep underground lab, and a radiation portal monitoring test track.

PSF: Unique Research Capabilities

Much of this scientific research and staff will be transitioned by 2010 to the largest replacement facility now under construction, the PSF. This modern, research complex will contain five laboratories—Materials Science and Technology, Ultra-Trace and Radiation Detection—as well as a deep underground laboratory, a large detector laboratory, and a radiation portal monitoring test track.

The Materials Science and Technology Laboratory will contain resources that focus on the performance and life of materials for applications involving

high-temperature, corrosive and/or radiation environments. These capabilities include:

- Radiation materials science for aging and degradation of materials in nuclear systems and development of radiation-resistant structural materials for advanced fission and fusion reactors.
- High-temperature materials for synthesis, characterization and performance of irradiated and nonirradiated materials at temperatures where properties are affected, as well as environmental effects on high-temperature materials.
- Fundamental mechanisms of materials corrosion/stress-corrosion cracking and radiation-induced materials degradation in nuclear reactor environments.
- Computational materials science for radiation effects modeling to understand and predict materials behavior.

Pacific Northwest National Laboratory will add nearly 200,000 square feet of new laboratories for science, homeland security and nonproliferation missions.

The Ultra-Trace Laboratory, will house PNNL's world-class ultra-trace and radioanalytical capabilities which range from radiochemical separations and electron microscopy to mass spectrometric detection. PNNL's scientists use unique, state-of-the-art equipment to develop and apply techniques for nuclear forensics in support of critical national needs, such as international treaty verification. Interrelated capabilities include:

- Advanced radiochemistry and radiochemical separations to prepare samples for ultra-low-level radionuclide mass spectrometric analysis in a wide variety of sample matrices.
- Ultra-trace mass spectrometry to provide isotopic analyses and ultra-low-level radionuclide detection.
- Microscopy, including polarized light microscopy, scanning electron microscopy, transmission electron microscopy, and microprobe x-ray analyzers, for materials characterization.

Ultra-Trace Laboratory

PNNL's Radiation Detection Laboratory will include resources for a variety of low-level and high-level radionuclide measurements.

- Techniques used or under development include state-of-the-art analytical chemistry, radiation physics, light detection, particle detection, chromatography, and scintillating materials, and sorbents ("smart" materials). Capabilities also include field-deployable forensic instrumentation for applications ranging

Materials Science and Technology Laboratory

Radiation Detection Laboratory

from fundamental science (neutrino mass detection) to the detection and prevention of nuclear proliferation and radiation portal monitoring.

- Ultra-low-level counting as a signature capability of PNNL. This capability illustrates the synergy between science and national security missions, such as SC's Majorana Project (neutrino physics) and NNSA's ultra-low-level counting programs.

The Radiation Portal Monitoring Test Track and the Large Detector Lab will contain research important to national and homeland security missions and will include the following research capabilities:

- Ultra-low background radiation detection and advanced radiation detection and testing
- Border and interdiction technology
- Materials development and engineering
- Radiochemistry and quantitative radiation counting
- Data analysis.

The Deep Laboratory will be located 40 feet below the surface and will contain these scientific capabilities:

- Radiation physics
- Ultra-low radioactivity material development
- Fundamental science
- Ultra-low level counting.

Current Construction

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