DOE/EA-1958

Environmental Assessment

Environmental Assessment for Future Development in Proximity to the William R. Wiley Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory, Richland, Washington

U.S. Department of Energy
Pacific Northwest Site Office
Richland, Washington 99352

July 2013

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Summary

The Pacific Northwest National Laboratory (PNNL) is a multi-program U.S. Department of Energy-Office of Science (DOE-SC) national laboratory conducting research to meet DOE strategic objectives. To enable continued research support, DOE-SC is proposing to construct new facilities and infrastructure and/or add to current facilities and infrastructure on the DOE PNNL Site in Richland, Washington. The proposed facilities and infrastructure would be located on 12 ha (30 ac) of previously disturbed federal property south of Horn Rapids Road in immediate proximity to the William R. Wiley Environmental Molecular Sciences Laboratory (EMSL). The proposed facilities and/or additions would provide up to 9,000 m^2 (100,000 ft^2) of additional state-of-the-art general-purpose laboratories (i.e., chemistry, instrumentation, and biology laboratories) and supporting facilities as needed. The necessary infrastructure would include water (e.g., fire protection, potable, and irrigation), sanitary sewer, electrical power, communications, natural gas, and a service road. The proposed facilities and/or additions may contain chemical, physical, biological, limited radioactive materials and other moderate hazards. Specifically, radioactive materials that could be located in the proposed facilities and/or additions would be limited to materials that present no foreseeable impacts to public or environment. The types and quantities of radioactive materials that would be used in the proposed facilities and/or additions would be similar to those currently used in the EMSL. These materials include sealed radioactive sources, consumer products containing radioactive materials, naturally occurring radioactive materials, and low activity research samples. Their use would be covered by existing air, waste, or water permitting.

This Environmental Assessment presents an evaluation of the potential environmental impacts of constructing and operating these proposed facilities and/or additions and proposed infrastructure, including impacts on land use, air quality, water quality, geological resources, biological resources, cultural and historic resources, socioeconomics, environmental justice, resource commitments, transportation, waste management, noise, and human health and safety. Cumulative impacts with other past, present, and reasonably foreseeable operations in the vicinity were also considered.

The exact footprint and design of each facility and/or additions has not been finalized; therefore, bounding analyses were used to determine impacts from the Proposed Action. Data from recent construction of new facilities on the DOE PNNL Site and data from operating facilities were used to bound the analyses. The two alternatives assessed are the Proposed Action and the No-Action Alternative. Under the No-Action Alternative, DOE-SC would not construct new facilities and infrastructure and/or add to current facilities and infrastructure in immediate proximity to the EMSL on the DOE PNNL Site. Existing research laboratories would continue to function without the benefit of the additional research capabilities.

Under the Proposed Action Alternative, construction would be compatible with existing land-use designations established by DOE, Benton County, and the City of Richland. No adverse impacts to site geology are expected. Temporary noise and air-quality impacts would be anticipated during construction, but would be within regulatory standards for criteria pollutants and particulates. Impacts on surface and ground water quality from construction would be expected to be minimal. The area of the Proposed Action houses no historic properties, and protective measures are in place should unknown cultural resources be discovered by site construction workers. The area of the Proposed Action does not contain sensitive biological resources or critical habitats that would be affected by construction. Effluents and wastes generated during construction would be minimized to the extent practicable. Minor positive

employment and income impacts would result from construction. Transportation impacts related to the construction of proposed facilities and/or additions and proposed infrastructure would likely be minor. Approximately 321 m^3 (420 yd^3) of construction and demolition debris would be generated and disposed of at the Horn Rapids Sanitary landfill. Because construction activities would be staged over several years, impacts from disposal of construction debris would be negligible. Health and safety risks to the workers and members of the public from construction activities would be small.

Operational impacts would be minimal and similar to the impacts from current facilities at PNNL. No unique occupational health and safety hazards would be expected from operation of the proposed facilities. Construction and operation of the proposed facilities would result in minimal incremental addition to the cumulative impacts of other PNNL operations and other projects in the vicinity and region.

The notification for the draft EA was published on May 30, 2013. No public comments were received on the draft. During the public comment review for the draft South Federal Campus Development Environmental Assessment (EA), a title change was requested and has been implemented in this final EA. This change is administrative in nature and does not affect any technical aspect of the document—the purpose, need, and scope of this final EA are unchanged from those in the draft. No technical changes were made due to public comment review. The new title for the final EA is "Environmental Assessment for Future Development in Proximity to the William R. Wiley Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory, Richland, Washington."

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Acronyms and Abbreviations

ac	acre(s)
APE	Area of Potential Effect
BCAA	Benton Clean Air Agency
BSEL	Bioproducts, Sciences, and Engineering Laboratory
BSF	Biological Sciences Facility
CEQ	Council on Environmental Quality
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
CFR	Code of Federal Regulations
CSF	Computational Sciences Facility
dBA	A-weighted decibel(s)
DOE	U.S. Department of Energy
DOE-EM	U.S. Department of Energy-Office of Environmental Management
DOE-PNSO	U.S. Department of Energy-Pacific Northwest Site Office
DOE-RL	U.S. Department of Energy-Richland Operations Office
DOE-SC	U.S. Department of Energy-Office of Science
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMSL	William R. Wiley Environmental Molecular Sciences Laboratory
EPA	U.S. Environmental Protection Agency
FR	Federal Register
ft	foot/feet
ft^2	square foot/feet
ft^3	cubic foot/feet
gal	gallon(s)
GHG	greenhouse gas
gpd	gallon(s) per day
gpm	gallon(s) per minute
ha	hectare(s)
HCP EIS	Hanford Comprehensive Land-Use Plan Environmental Impact Statement
hp	horsepower
kg	kilogram(s)
km	kilometer(s)
L	liter(s)
L/d	liter(s) per day
L/s	liter(s) per second
LEED	Leadership in Energy and Environmental Design
m	meter(s)
m^2	square meter(s)

m^3	cubic meter(s)
MGD	million gallon(s) per day
mi	mile(s)
ML	megaliter(s)
ML/d	megaliter(s) per day
mL	milliliter(s)
MT	metric ton(s)
MW	megawatt(s)
NAAQS	National Ambient Air Quality Standards
NEPA	*National Environmental Policy Act of 1969, as amended*
NORM	naturally occurring radioactive materials
NOx	nitrogen oxides
Pa	Pascal(s)
PNNL	Pacific Northwest National Laboratory
PNSO	(DOE) Pacific Northwest Site Office
ppm	part(s) per million
PSF	Physical Sciences Facility
R&D	research and development
RAEL	Radioactive Air Emission License
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	Revised Code of Washington
ROD	Record of Decision
SOx	sulfur oxides
THC	total hydrocarbons
tpy	ton(s) per year
USC	United States Code
VOC	volatile organic compound
WAC	Washington Administrative Code
WADOE	Washington State Department of Ecology
WSU	Washington State University
yd^3	cubic yard(s)

1.0 Introduction and Background

This Environmental Assessment (EA) provides information and analysis of proposed U.S. Department of Energy (DOE) activities associated with future development in immediate proximity to the William R. Wiley Environmental Molecular Sciences Laboratory (EMSL) on the DOE Pacific Northwest National Laboratory (PNNL) Site, in Benton County, Washington. The proposed facilities and/or additions and proposed infrastructure would be located on 12 ha (30 ac) of previously disturbed federal property south of Horn Rapids Road in immediate proximity to the EMSL. The development would provide an additional 9,000 m^2 (100,000 ft^2) of state-of-the-art facilities and associated infrastructure and/or expand existing facilities and infrastructure. These facilities would allow DOE to meet its strategic research objectives.

Specific facility locations and final facility designs for the proposed development are still being determined; therefore, this EA provides bounding analyses for the Proposed Action. The data used for the analyses were obtained from recently built as well as currently operating facilities at PNNL (e.g., the EMSL and the Physical Sciences Facility [PSF]).

Information contained in this EA will be used by DOE-Office of Science (DOE-SC) to determine if the Proposed Action represents a major federal action which would significantly affect the quality of the human environment. If the Proposed Action is determined to be a major action with potentially significant environmental impacts, an Environmental Impact Statement (EIS) will be required. If the Proposed Action is not determined to be a major action that could result in significant environmental impacts, a Finding of No Significant Impact will be issued, and the action may proceed. This EA is prepared in compliance with the *National Environmental Policy Act of 1969, as amended* (NEPA; 42 USC 4321 et seq.); the *Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA* (Title 40 of the Code of Federal Regulations [CFR] Parts 1500–1508); and the DOE *National Environmental Policy Act Implementing Procedures* (10 CFR Part 1021).

The proposed facilities and/or additions and proposed infrastructure associated with this action would be located south of Horn Rapids Road on DOE-SC federally owned land, designated as the DOE PNNL Site, within the PNNL campus. The PNNL campus is located near the Tri-Cities (i.e., Kennewick, Pasco, and Richland) in southeastern Washington State, 270 km (170 mi) east-northeast of Portland, Oregon; 270 km (170 mi) southeast of Seattle, Washington; and 200 km (125 mi) southwest of Spokane, Washington. It is north of Richland and south of the DOE Hanford Site 300 Area (DOE-Richland Operations Office [DOE-RL]). The PNNL campus includes the DOE PNNL Site, as well as adjacent Battelle-owned land and buildings and third-party leased facilities. The DOE PNNL Site occupies approximately 140 ha (346 ac). The area immediately south of the DOE PNNL Site is comprised of Battelle land as well as public and privately owned land. The Battelle land is largely in use by PNNL. The public and private land area will be developed with office, laboratory, residential, and retail space as part of the Tri-Cities Research District. PNNL's collaboration with educational research type institutions is highlighted by a PNNL-leased facility on the Washington State University (WSU) campus. Additionally, PNNL conducts research outside of the Tri-Cities including Sequim, Washington and Portland, Oregon. These outside areas are considered satellite facilities (PNNL 2012a).

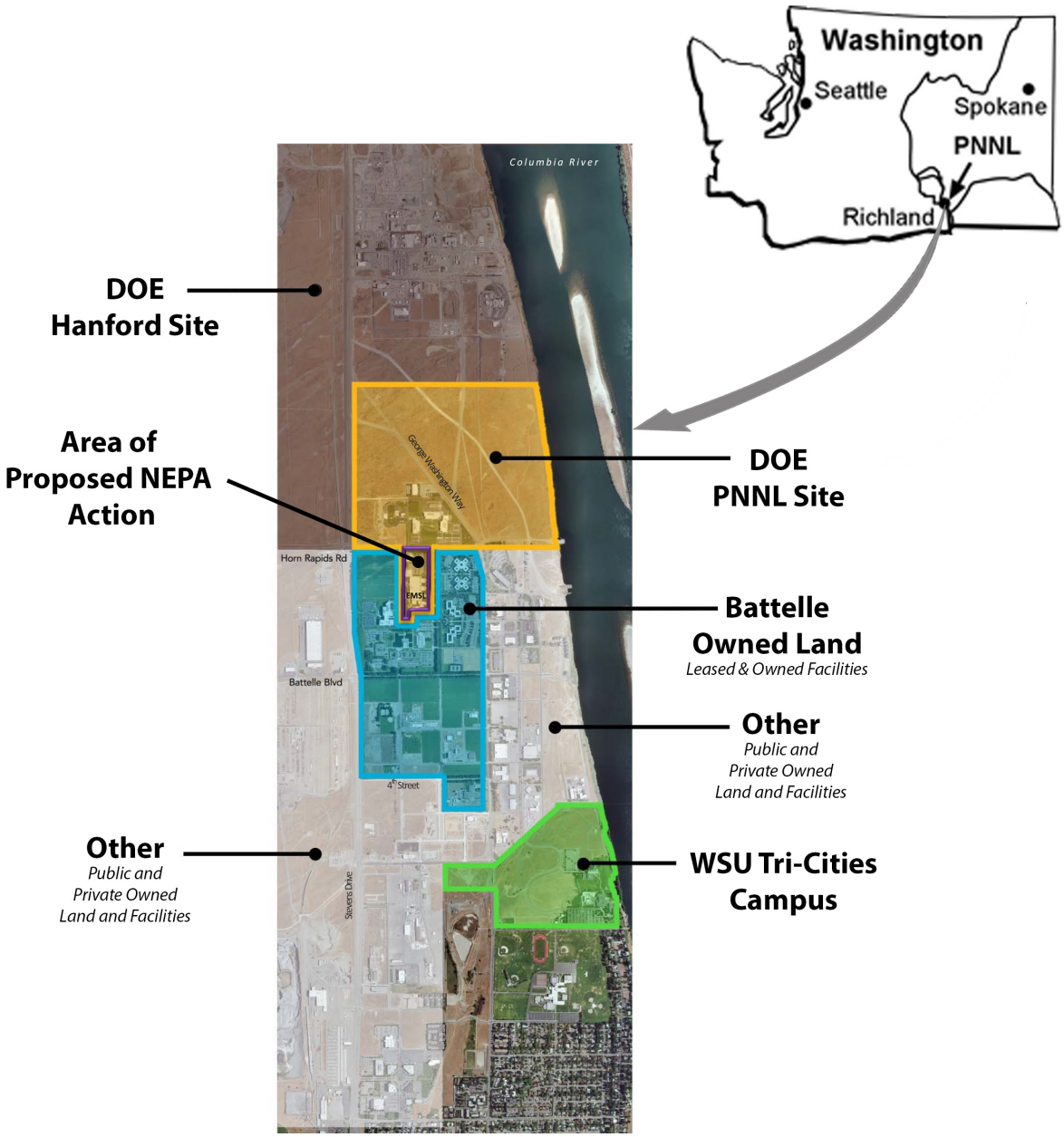

Figure 1.1. Land Ownership Map (Sources: DOE 2007, PNNL 2012a)

2.0 Purpose and Need for Agency Action

To meet DOE-SC's strategic objectives and enable continued research support, DOE-SC is proposing to construct and operate up to 9,000 m^2 (100,000 ft^2) of state-of-the-art facilities and infrastructure or to expand existing facilities and infrastructure in immediate proximity to the EMSL on the DOE PNNL Site.

3.0 Description of the Proposed Action and Alternatives

This section describes DOE-SC's Proposed Action and the No-Action Alternative. It should be noted that final facility design and construction details for the Proposed Action are not complete. The nature, scope, and environmental impacts of the Proposed Action described in this document are expected to substantially reflect and bound those associated with actual construction and operation of the proposed facilities.

3.1 Proposed Action

DOE-SC is proposing to construct new facilities and infrastructure and/or add to current facilities and infrastructure in immediate proximity to the EMSL on the DOE PNNL Site. The proposed construction is within the DOE PNNL Site on DOE-SC owned property surrounding the EMSL (See Figure 1.1).

The proposed facilities and/or additions and proposed infrastructure would enable continued research support for DOE-SC's mission and provide up to 9,000 m^2 (100,000 ft^2) of additional state-of-the-art general-purpose laboratories (i.e., chemistry, instrumentation, and biology laboratories) and supporting facilities as needed. The necessary infrastructure would include water (e.g., fire protection, potable, and irrigation), sanitary and process sewer, electrical power, communications, natural gas, and a service road. The proposed facilities and/or additions may contain chemical, physical, biological, limited radioactive materials and other moderate hazards. Specifically, radioactive materials that could be located in the proposed facilities would be limited to materials that present no foreseeable impacts to public or environment. The types and quantities of radioactive materials that would be used in the proposed facilities would be similar to those currently used in the EMSL. These materials include sealed radioactive sources, consumer products containing radioactive materials, naturally occurring radioactive materials (NORM), and low activity research samples. Their use would be covered by existing air, waste, or water permitting.

3.2 No-Action Alternative

Under the No-Action Alternative, DOE-SC would not construct new facilities and infrastructure and/or add to current facilities and infrastructure in immediate proximity to the EMSL on the DOE PNNL Site. Existing research laboratories would continue to function without the benefit of the additional research capabilities. Environmental impacts of the No-Action Alternative are discussed in Section 5.2.

4.0 Affected Environment

The planned location for construction of the proposed facilities and/or additions and proposed infrastructure is in immediate proximity to the EMSL on the DOE PNNL Site (Figure 1.1). Aspects of the affected area and its environs that might be affected by the construction and operation of the Proposed Action are described in this section.

4.1 Land Use

The proposed facilities and/or additions and proposed infrastructure are within the DOE PNNL Site, which is DOE-SC owned property surrounding the EMSL. The impact area has been disturbed previously for the construction of the EMSL and other related or nearby PNNL facilities. The site is a relatively level parcel of landscaped land (i.e., lawns, ornamental shrubbery, and trees). The impact area was designated as Industrial in a 1999 DOE Record of Decision (ROD; 64 FR 61615**)** for the *Hanford Comprehensive Land-Use Plan EIS (HCP EIS)* (DOE 1999). The proposed facilities and/or additions and proposed infrastructure and all nearby PNNL operations are within the Benton County urban growth area (Benton County Planning Department 2012) and designated by the City of Richland as a Business/Research Park (similar to the adjacent PNNL facilities) (City of Richland 2013a).

Land uses in nearby areas include:

- Existing PNNL facilities, including the EMSL and other research laboratories and support buildings.
- Businesses located east of George Washington Way and south of Horn Rapids Road, including the Penford potato starch production facility and other small laboratories and offices.
- The Columbia River, located due east, which supports a diverse mix of recreational and fishing uses.
- A partially built condominium community currently being constructed along the Columbia River, south of Horn Rapids Road.
- A barge-docking facility, located to the southeast, used for transferring reactor components and other materials destined for the Hanford Site. A haul road connecting the barge facility to Stevens Drive traverses the buffer area from southeast to northwest.
- The WSU-Tri-Cities branch campus, Hanford High School, and a Richland residential area, located to the south-southeast.
- The Bioproducts, Sciences, and Engineering Laboratory (BSEL), jointly operated by WSU and PNNL, adjacent to WSU Tri-Cities.
- Occupied and unoccupied Hanford Site land.
- Industrially and agriculturally developed land located to the west and southwest (all zoned Industrial by the City of Richland).

4.2 Air Quality

In general, air quality within the region is good with occasional exceptions caused by blowing dust, due to arid conditions and high winds. Atmospheric dispersion is relatively good with infrequent periods of stagnation occurring mostly during winter months. Air quality in Benton County, which includes the DOE PNNL Site, has been designated as being in unclassified/attainment with all U.S. Environmental Protection Agency (EPA) and State of Washington nonradiological air quality standards (BCAA 2013).

Facilities with potential air emissions of radioactive and nonradioactive materials at the DOE PNNL Site are research laboratories at the PSF and the EMSL. The types and quantities of radioactive materials that would be used in the proposed facilities would be similar to those currently used in the EMSL. These materials include sealed radioactive sources, consumer products containing radioactive materials, NORM, and low activity research samples. Their use would be covered by existing air permits. Section 6.0

contains additional information about permits that may be required for the proposed facilities and infrastructure.

In October 2009, Executive Order 13514 (74 FR 52117) introduced the federal government's new greenhouse gas (GHG) emissions management and reduction requirements. The Order required agencies to develop an inventory of GHG emissions generated directly or indirectly. These types of emissions have been characterized based on the source of the emission. Scope 1 emissions include GHG emissions from fossil fuels burned onsite, emissions from entity-owned or entity-leased vehicles, and other direct sources. Scope 2 emissions include indirect GHG emissions resulting from the generation of electricity, heating and cooling, or steam generated offsite but purchased by the entity and transmission and distribution losses associated with some purchased utilities (e.g., chilled water, steam, and high temperature hot water). Scope 3 emissions include indirect GHG emissions from sources not owned or directly controlled by the entity but related to the entity's activities and includes transmission and distribution losses associated with purchased electricity, employee travel and commuting, contracted solid waste disposal, and contracted wastewater treatment (EPA 2012).

In fiscal year 2012 (FY12), PNNL reported GHG emissions (Scope 1, 2, and 3) from operation were 64,395 $MTCO_2e$. PNNL realized an 11.44 percent decrease in Scope 1 and 2 emissions and a 6.5 percent decrease of Scope 3 emissions compared to FY11 (PNNL 2012b). The reduction in GHG emissions is the result of increased teleworking opportunities to reduce commuting miles, implementing operational improvements for energy usage, replacing GHGs used in research and operations with viable substitutes, and improving building performance through metering. PNNL offset all of its Scope 1 and 2 GHG emissions (41,339 $MTCO_2e$) by purchasing Renewable Energy Credits and expects to offset some or all of Scope 1 and 2 GHG emissions in the future through continued Renewable Energy Credit purchases (PNNL 2012b).

4.3 Geological Resources

Geological resources in the vicinity of the DOE PNNL Site consist principally of Rupert Sand and Burbank Loamy Sand overlying Pleistocene (1.8 to 0.01 million years ago) Ice Age Flood sediments, Pliocene (5.3 to 1.8 million years ago) ancestral Columbia River and Snake River sediments, and Miocene (24 to 5.3 million years ago) Columbia Plateau Basalt Flows. Like much of the region, the Ice Age Flood sediments and surface soils are characterized by high infiltration rates, low-water-holding capacities, and very low clay and organic matter content (DOE 2007).

4.4 Water Resources

There are no naturally occurring surface water bodies, wetlands, or designated floodplains on the DOE PNNL Site. The Columbia River is located approximately 806 m (2,645 ft) directly to the east and the Yakima River is located approximately 5 km (3 mi) to the southwest of the site.

In general, groundwater beneath the DOE PNNL Site originates as a result of natural recharge from local rain and as snowmelt from higher elevations to the west; it eventually discharges to the Columbia River. The unconfined water table under the site is generally 9 to 18 m (30 to 62 ft) below the ground surface. Fluctuations in the Columbia River flow affect the groundwater levels at the site (DOE/RL 2011).

4.5 Cultural and Historical Resources

The archaeological record of the Mid-Columbia Basin bears evidence of more than 12,000 years of human occupation. The arid climate provides favorable environmental conditions for preservation of materials that may otherwise decay more quickly. Regional development of hydroelectric dams, highways, commercial and residential real estate, and agriculture has obscured or destroyed much of this evidence. Although the region has undergone continuous development, some areas remain largely undisturbed. These undisturbed portions of land have the potential to contain evidence of past human behavior. The history of the Mid-Columbia Basin includes three distinct periods of human occupation: the Pre-Contact period, the Euro-American period, and the Manhattan Project period.

Ethnographically, the Sahaptin-speaking Cayuse, Walla Walla, Palouse, Nez Perce, Umatilla, Wanapum, and Yakama utilized the general area, which may have included the federal land in immediate proximity to the EMSL. During the Pre-Contact period, local residents relied on a pattern of seasonal rounds that included semi-permanent residences in villages along major waterways during the winter months. With the arrival of spring, small groups living in temporary camps would travel into the canyons and river valleys to gather roots. Seasonal camps were used in the inland areas during the spring and early summer months. By late summer or early fall, seasonal rounds focused on ripening berries in the mountains; once the acquisition of food came to an end, families returned to the winter villages (Bard and McClintock 1996, Dickson 1999, Chatters 1980, and Galm et al. 1981).

The Lewis and Clark expedition of 1805 began the Euro-American exploration and settlement of the region. An increase in Euro-American settlement began in eastern Washington in the late 1800s. The initial permanent settlement of non-Indians into the area began slowly with livestock producers who discovered that the area was very suitable for the production of cattle. Ranchers relied on the abundant bunch grass and open rangeland to graze thousands of cattle and later sheep and horses. The land was used as open range lasted from the 1880s to approximately 1910, when homesteaders settled the area and plowed the rangeland to plant crops. The southern Columbia Basin area was unique because agricultural crops and orchard fruit ripened 2 to 3 weeks ahead of surrounding areas, resulting in higher profits. In the early 1900s, dryland wheat and livestock were the primary agricultural commodities in Benton County. As farming increased, water resources other than rainfall were needed to produce higher crop yields. Many irrigation projects began. Most were privately and insufficiently funded. Land speculators began constructing large-scale irrigation canals to supply water to thousands of acres in the White Bluffs, Hanford, Fruitvale, Vernita, and Richland areas (Sharpe 1999). However, poor economic conditions associated with the Great Depression of the 1930s created economic hardships on local residents. These conditions continued until the government took over the area under the *First War Powers Act of 1941* (50 USC App. 601; Marceau et al. 2003).

In 1942, the area around Hanford, Washington, was selected by the federal government as one of the three principal Manhattan Project sites. Occupying portions of Grant, Franklin, and Benton counties, the Hanford Site was created to support the U.S. plutonium-production effort during World War II. Plutonium production, chemical separation, and research and development (R&D) focused on process improvement were the primary activities in the area during the Manhattan Project and the subsequent Cold War era.

Between 2004 and 2007, approximately 146 ha (360 ac) of land in the southernmost portion of the Hanford Site were reassigned from DOE-Office of Environmental Management (DOE-EM) to DOE-SC.

The purpose of the reassignment was to establish the DOE PNNL Site (Figure 1.1) which would support DOE-SC's long-term goals of a continuing science and technology mission at PNNL (DOE/PNSO 2008). The EMSL was constructed in the late 1990s. Prior to construction, a cultural resources review was conducted (Wright and Cadoret 1994; Nickens 1994). Investigations conducted during that review showed evidence of past disturbances from activities associated with the installation of an irrigation canal, agricultural activities, and the construction of Camp Hanford. Cultural resource monitoring of excavations associated with the EMSL was conducted and no cultural materials were discovered (DOE/PNSO 2008).

4.6 Biological Resources

The area of the Proposed Action (Figure 1.1) is located in the lowest and most arid portion of the Columbia Plateau Ecoregion (EPA 2010). The natural vegetation of the Columbia Plateau is shrub-steppe (WWHCWG 2012). The area of the Proposed Action surrounds the EMSL, which is located within the DOE PNNL Site. The area of the Proposed Action was converted from shrub-steppe vegetation to landscaped vegetation in support of construction of the EMSL and has remained so since the EMSL began operating in 1997. The area of the Proposed Action is mostly surrounded by landscaped vegetation; however, an area of irrigated pasture and undeveloped field dominated by herbaceous weedy species (e.g., cheatgrass [*Bromus tectorum*]) borders a large part of the west side of the area of the Proposed Action and a small, undeveloped field dominated by cheatgrass is located just north of Horn Rapids Road across from the northwest corner (Figure 1.1). Landscaped vegetation within and adjacent to the area of the Proposed Action consists of planted lawn grass and ornamental trees and shrubs. Other than the two areas of pasture and the undeveloped field noted above, no other natural vegetation occurs within or adjacent to the area of the Proposed Action.

There are no federally or state-listed threatened or endangered species (WDFW 2013a) that would use the area of the Proposed Action or adjacent areas, except possibly the bald eagle (*Haliaeetus leucocephalus*). In 2007, the bald eagle was delisted as threatened under the *Endangered Species Act* (16 USC 1531) and in 2008 it was reclassified from threatened to sensitive under the Washington Administrative Code (WAC) 232-12-297, *Endangered, Threatened, and Sensitive Wildlife Species Classification* (WDFW 2012). A wintering population of bald eagles occupies the Hanford Reach of the Columbia River annually from approximately mid-November through mid-March (DOE/RL 2009). Bald eagles are known to preferentially perch in trees near the river in north Richland but have also been observed in pasture areas on the DOE PNNL Site near the area of the Proposed Action. Thus, eagles may occasionally use pasture areas and undeveloped fields or perch in large ornamental trees (e.g., American sycamore [*Platanus occidentalis*]) adjacent to or within the boundaries of the area of the Proposed Action.

Wildlife that could inhabit the area of the Proposed Action and adjacent landscaped areas consists of species that can use an artificial, landscaped environment and human structures and which are adapted to human presence. The landscaped vegetation and existing facilities in the area of the Proposed Action provide a suitable nesting habitat for approximately 25 avian species that are common in similar environments throughout the ecoregion. These include birds of prey that nest in trees (e.g., the great-horned owl [*Bubo virginianus*]); upland game birds that nest in trees (e.g., Eurasian collared dove [*Streptopelia decaocto*]), on buildings (rock dove [*Columba livia*]), or on the ground (e.g., California quail [*Callipepla californica*]; mourning doves [*Zenaida macroura*]); and perching birds that nest in trees (e.g., black-billed magpie [*Pica pica*], American robin [*Turdus migratorius*], American crow [*Corvus brachyrhynchos*], American goldfinch [*Carduelis tristis*]), in shrubbery (e.g., Brewer's blackbird

[*Euphagus cyanocephalus*]), on the ground (e.g., killdeer [*Charadrius vociferous*]), or on human structures (e.g., Eurasian starling [*Sturnus vulgaris*], house sparrow [*Passer domesticus*], western kingbird [*Tyrranus verticalis*]). Some of the above species were observed within the area of the Proposed Action during an avifauna survey conducted in April 2013 (see Appendix B).

Avian species that may use the pasture areas and undeveloped fields adjacent to the area of the Proposed Action include the long-billed curlew (*Numenius americanus*), a State monitored species (WDFW 2013a). Long-billed curlews have been observed foraging in pasture areas near the area of the Proposed Action; however, the species likely nests in shrub-steppe habitat on the west side of Stevens Drive. Thus, long-billed curlews most likely use pasture areas and undeveloped fields adjacent to the area of the Proposed Action for foraging. In addition, ground-nesting species (e.g., killdeer and mourning doves) may nest in pasture areas and undeveloped fields adjacent to the area of the Proposed Action.

Mammalian wildlife that potentially uses the area of the Proposed Action includes the eastern gray squirrel (*Sciurus carolinensis*) and Nuttall's cottontail (*Sylvilagus nuttallii*). The eastern gray squirrel is native to the eastern United States and was introduced to Washington State in 1925. The species is common in many urban and developed areas of Washington State (WDFW 2013b). Nuttall's cottontail is common in the Columbia Plateau Ecoregion and typically inhabits the perimeter area of PNNL facilities adjacent to or near areas of natural vegetation. Mammalian species that may use pasture areas and undeveloped fields adjacent to the area of the Proposed Action include mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), American badger (*Taxidea taxus*), and northern pocket gopher (*Thomomys talpoides*). Mule deer have occasionally been observed in landscaped areas of the DOE PNNL Site.

Several locally occurring amphibians and reptile species (Pacific treefrog [*Pseudacris regilla*], bullfrog [*Rana catesbeiana*], and Western terrestrial garter snake [*Thamnophis elegans*]) could potentially use a landscaped environment, based on habitat affinities; however, these species are also known to occur near surface water (WDNR, WDFW, BLM, and USFS 2009). No surface water nor habitat that would support surface water (e.g., wetlands or floodplains) is located within the area of the Proposed Action; therefore, it is unlikely that these species would occur in the area of the Proposed Action. However, the gopher snake (*Pituophis catenifer*) is common in eastern Washington, typically inhabits dry habitats (WDNR, WDFW, BLM, and USFS 2009) and is known to visit the perimeter area of PNNL facilities adjacent to or near areas of natural vegetation. Thus, this species may occur in the area of the Proposed Action.

4.7 Status of Groundwater and Surface Contamination

As stated in the *Pacific Northwest National Laboratory Site Environmental Report for Calendar Year 2011* (Duncan et al. 2012), the groundwater under the northern part of the DOE PNNL Site is monitored routinely through eight groundwater monitoring wells. Under the DOE PNNL Site, contaminants were not detectable or were well below drinking-water standards, with the exception of nitrate, which exceeded drinking-water standards. The nitrate plume underlying the DOE PNNL Site and much of north Richland originates from offsite agricultural and industrial activities (Duncan et al. 2012).

There is no surface water on the area of the Proposed Action.

4.8 Socioeconomics/Demographics

Activities on the Hanford Site and the DOE PNNL Site play a substantial role in the socioeconomics of the Tri-Cities and other parts of Benton and Franklin counties. Since the 1970s, DOE and its contractors have been one of three primary contributors to the local economy (the other two are Energy Northwest and the agricultural community). Increasingly, technology-based businesses, many originating due to PNNL and Hanford Site associations, are playing a role in the expansion and diversification of the local private business sector. In April 2013, PNNL and DOE Pacific Northwest Site Office (PNSO) had a combined total of approximately 4,380 employees. The Hanford Site (e.g., DOE-RL, DOE-Office of River Protection, and their contractors) employed an additional 14,900 workers in 2012 (TRIDEC 2013). Based on 2010 U.S. Census population data, population totals for Benton and Franklin counties were 175,177 and 78,163, respectively. From 2000 to 2010, Benton and Franklin counties grew at a faster rate than Washington State as a whole. The population demographics of Benton and Franklin counties are quite similar to those found within Washington State, although the population of Benton and Franklin counties is somewhat younger than that of Washington State as a whole (USCB 2010a; 2010b; USCB 2000a; 2000b, 2000c).

Based on U.S. Census population data, the population within an 80-km (50-mi) radius of the DOE PNNL Site is estimated to be approximately 466,000 and includes approximately 42 percent minority persons (in order of percentage contribution, Hispanic and Latino, Asian, Native American, and African-American; USCB 2012). The Hispanic population is fairly well dispersed throughout the 80-km (50-mi) radius, with some population concentrated in the Washington cities of Pasco, Kennewick, Othello, Connell, Sunnyside, and Walla Walla, and the Oregon cities of Umatilla and Hermiston. In addition some rural concentrations of Hispanic populations are located in Benton, Yakima, and Grant counties. Native Americans within the 80-km radius reside primarily in Yakima County on the Yakama Reservation near the town of Sunnyside. There are also some smaller concentrations of Native American populations in the Washington cities of Pasco, Kennewick, Walla Walla, and Connell, and the Oregon cities of Umatilla and Hermiston. In addition, some rural concentrations of Native Americans are located in Walla Walla County and in Grant County along the Columbia River near the community of Beverly. Figure 4.1 shows the distribution of minority populations within an 80-km (50-mi) radius of the DOE PNNL Site. Shaded areas indicate regions wherein either a majority of the census block group residents are members of a minority group or the percentage of the minority population is 20 percent greater than the statewide average. The percentages of statewide minority populations in the states of Washington and Oregon are 28 and 22 percent, respectively (USCB 2010a; 2010c).

Based on U.S. Census population data, the population within an 80-km (50-mi) radius of the DOE PNNL Site includes 14 percent low-income residents (USCB 2012). The majority of these households are located to the southwest and northwest (in Yakima and Grant counties) and in the cities of Kennewick and Pasco (Figure 4.2). Figure 4.2 shows the distribution of low-income populations within an 80-km (50-mi) radius of the DOE PNNL Site. Shaded areas indicate regions wherein a majority of the census block group residents are from low-income households or where the percentage of low-income residents is 20 percent greater than the statewide average. The percentages of statewide low-income populations in the states of Washington and Oregon are 13 and 15 percent, respectively (USCB 2010a; USCB 2010c).

Figure 4.1. Location of Minority Populations Near the DOE PNNL Site (Sources: ESRI 2012; USCB 2012)

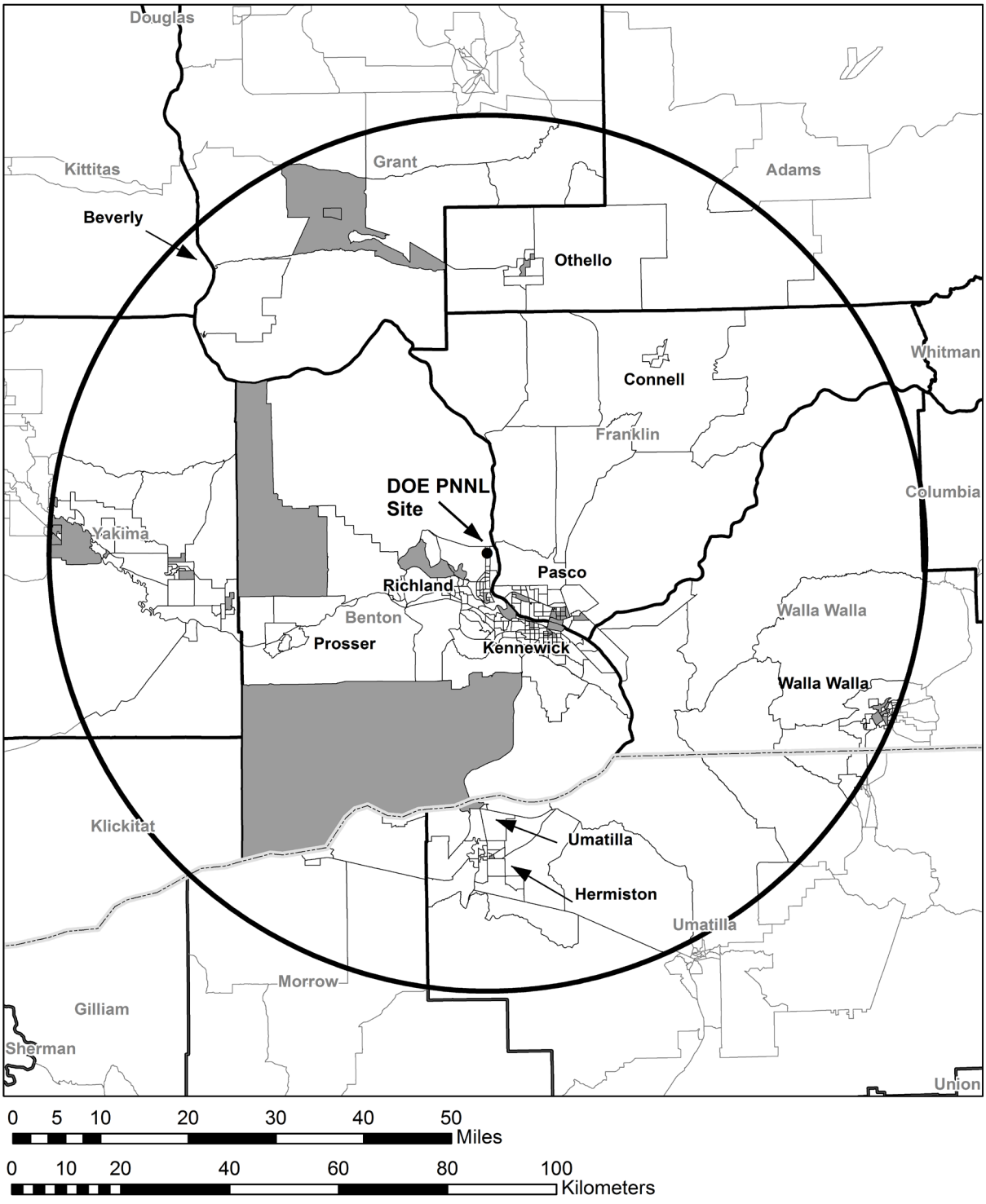

Figure 4.2. Low-Income Populations Near the DOE PNNL Site (Sources: ESRI 2012; USCB 2012)

4.9 Transportation

The Tri-Cities serves as a regional transportation and distribution center with major air, rail, highway, and river connections. Daily air passenger and freight services connect the area with most major cities via the Tri-Cities Airport, located in Pasco. Passenger rail service is provided by Amtrak, which has a station located in Pasco. Freight rail service adjacent to PNNL is maintained and operated by the Tri-City & Olympia Railroad Company. The regional highway network in the vicinity consists of several main routes including a DOE-maintained road network within the Hanford Site; State Route 240, a six-lane highway that feeds to Stevens Drive in Richland; George Washington Way, a principal four-lane north-south arterial through Richland; and State Route 224 (Van Giesen Street), which is used by commuters residing in West Richland and Benton City.

The main road arteries that feed to PNNL are Stevens Drive – from the west – and George Washington Way – from the east. Horn Rapids Road and Battelle Boulevard provide principal access from these arteries. The City of Richland (Peters 2013) provided average weekday traffic counts over the 2010–2011 period for these key access routes shown in Table 4.1. At peak periods, commuter traffic is often heavy on all primary routes to and from the Hanford Site and DOE PNNL Site.

Table 4.1. 2010–2011 Average Daily Traffic on Principal Access Routes

Intersection	Eastbound (number of vehicles)	Westbound (number of vehicles)
Battelle Boulevard and Stevens Drive	1,214	1,355
Battelle Boulevard and George Washington Way	1,312	1,351
Horn Rapids Road and Stevens Drive	481	403
Horn Rapids Road and George Washington Way	1,190	1,210

Source: Peters 2013

4.10 Occupational Health and Safety

Over the 5-year period from 2008 to 2012, the total recordable cases(1) of injuries and illnesses at PNNL averaged 0.84 cases per 200,000 worker hours (DOE 2012). This rate is lower than the average incidence rate for DOE sites across the country (1.2 cases per 200,000 worker hours). For comparative purposes, DOE's average incidence rates were well below the Bureau of Labor Statistics rates for U.S. private industry of 3.74 cases per 200,000 worker hours over the 5-year period from 2007 to 2011 (2012 data were not available; BLS 2012).

5.0 Impacts of Proposed Action and the No-Action Alternative

DOE-SC is proposing to construct new and/or expand existing facilities and infrastructure in immediate proximity to the EMSL on the DOE PNNL Site. The proposed facilities and/or additions would enable continued research support for DOE-SC mission and provide up to 9,000 m^2 (100,000 ft^2)

(1) Total recordable cases are the total number of work-related injuries or illnesses that resulted in death, days away from work, job transfer or restriction, or other recordable cases, consistent with U.S. Occupational Safety and Health Administration definitions.

of additional state-of-the-art general-purpose laboratories (i.e., chemistry, instrumentation, and biology laboratories) and supporting facilities as needed. Potential environmental impacts on the DOE PNNL Site from implementing the Proposed Action or the No-Action Alternative are described in the following sections and are summarized in Table 5.1.

Table 5.1. Summary of Impacts by Resource

Resource Area	Impact Summary
Land use	Proposed facilities and/or additions and proposed utility infrastructure would be constructed in the area of the Proposed Action, primarily in areas that are currently or have been previously disturbed. Because the facility design and footprints have not been finalized, it is assumed the entire 12 ha (30 ac) in the area of the Proposed Action could be disturbed during construction. The proposed facilities and/or additions are consistent with the City of Richland's Business/Research Park designation for the planned areas in its *Comprehensive Land Use Plan* (City of Richland 2013b) and DOE's designation of the area as Industrial in a DOE ROD for the HCP EIS (64 FR 61615).
Geology and soil	Adverse impacts to site geology are not expected. Geotechnical studies would be conducted prior to construction. Affected soil is generally stable and acceptable for standard construction requirements. Erosion prevention and sedimentation control management practices would be implemented and adverse impacts would be negligible.
Water resources	No surface water exists in the area of the Proposed Action. Stormwater at the new facilities would be collected and distributed in a series of infiltration trenches, drains, and catch basins. No impacts to groundwater are anticipated from construction activities or normal facility operations. Routine operations would not release process water to ground. Although groundwater use is not currently planned, the proposed facilities and/or additions may use 360 L/s (5,700 gpm) under one future development option for heating and cooling. This is a non-consumptive water use (WADOE 2008).
Air quality and noise	Construction would be phased and air emissions from exposed soils and construction equipment and traffic would be short-term, sporadic, and localized. Fugitive dust would be controlled to minimize emissions. Operation of natural gas-fired boilers and diesel-fired emergency generators would not create a condition of nonattainment with the National Ambient Air Quality Standards (NAAQS; 40 CFR Part 50). Air emissions from other facility operations would be minor and typically controlled within the facility. External effects would be minimal; however an air permit maybe required for a diesel generator. Minor increases in noise are anticipated during construction activities. Anticipated noise levels would be within Washington State noise regulation limits for residential, commercial, and industrial regions of influence.
Biological resources	No adverse impacts to biological resources are expected from the Proposed Action. Open spaces in the area of the Proposed Action consist primarily of landscaped vegetation. Measures would be implemented to avoid impacts to migratory birds during construction and operation.
Cultural resources	New construction activities are not anticipated to have adverse impact to known historic properties and no known archaeological resources would be affected. If artifacts of potential significance were found, work would stop, and the designated archaeologist would be notified.

Table 5.1. (contd)

Resource Area	Impact Summary
Socioeconomics	Minor positive employment and income impacts from construction would be realized. Total impact of employment would be less than a 1 percent increase of the current employment level. Potential minor positive fiscal impacts include increased revenue from property, real estate, or sales taxes associated with increases in construction employment. Similar minor positive impacts would result from additions of new research staff.
Environmental Justice	No disproportionate adverse health or environmental impacts would occur to any low-income or minority populations.
Transportation	Transportation impacts related to the construction of new and/or expanded facilities and proposed infrastructure are expected to be minor. Peak construction activities would result in 5 to 6 percent increase in average daily traffic on Horn Rapids Road. Increased construction traffic may result in a slight increase in the rate of traffic related accidents, but no increase in fatalities. The amount of existing and new research staff employed in the proposed facilities would not significantly increase traffic during operations.
Waste management	Approximately 321 m^3 (420 yd^3) of construction and demolition debris would be generated and disposed of at the Horn Rapids Sanitary landfill. Because construction activities would be staged over several years, no adverse impacts due to construction debris would likely occur. New facilities and/or additions would produce wastes typical of standard light industrial and research operations. The hazardous waste volume for the operation of the proposed new facilities and/or additions is estimated to be 2,700 kg, or an increase of 8 percent of PNNL's annual hazardous waste volume. This increase is within the capacity of PNNL's current waste-management system. Waste process water and sanitary sewage from new facilities and/or additions would be sent to the City of Richland's Publicly Owned Treatment Works for processing.
Human health and safety	Construction workers would be subject to the typical hazards and occupational exposures faced at other industrial construction sites. No unique occupational health and safety hazards would be expected from operation of the new facilities and/or additions.
Cumulative impacts	The Proposed Action would result in minimal incremental addition to the cumulative impacts of other PNNL operations and other projects in the vicinity and region.
Resource Commitments	The following resources would be irretrievably committed during the Proposed Action: • land: ~12 ha (~30 ac) • steel (i.e., rebar, metal joints, deck, and framing): 450 MT (500 tons) • concrete: 3,600 m^3 (4,700 yd^3) • diesel: 1,900 L (500 gal) • gasoline: 8,300 L (2,200 gal) • natural gas: 25,000 m^3/yr (900,000 ft^3)/yr • water for landscaping: 3.8 million L/ac/yr (1,000,000 gal/ac/yr) • electricity (operations): 3,250,000 kWh/yr

5.1 Environmental Impacts of the Proposed Action

As described previously, DOE-SC is proposing to construct new and/or expanded facilities and infrastructure in immediate proximity to the EMSL on the DOE PNNL Site. The final design of the facilities and/or additions and proposed infrastructure has not been completed; therefore, a bounding

analysis was used to determine the environmental impacts of construction and operation of the proposed facilities and/or additions and proposed infrastructure.

Potential environmental impacts as a result of implementing the Proposed Action are described in the following sections.

5.1.1 Land Use

As discussed in Section 3.1, implementing the Proposed Action would involve construction and operation of the proposed facilities and/or additions and proposed infrastructure for conducting R&D activities in immediate proximity to the EMSL on the DOE PNNL Site. For the most part, it is anticipated that the R&D activities planned for the proposed facilities are currently conducted in PNNL-occupied facilities located elsewhere at PNNL and would be relocated to the new facilities.

The planned location for construction of the proposed facilities and/or additions and proposed infrastructure is in immediate proximity to the EMSL on the DOE PNNL Site. The entire affected area was significantly disturbed during construction of the EMSL in the 1990s. The proposed facilities and/or additions and proposed infrastructure, including parking lots and landscaping, would be located on approximately 12 ha (30 ac) of federal land south of Horn Rapids Road. Subsequent disturbance for the Proposed Action would be minimal, and would conform to established land-use plans.

The affected area is owned by DOE-SC and the site is classified as Industrial in a DOE ROD for the HCP EIS (64 FR 61615). Although this area is no longer within the Hanford Site, establishing R&D operations at the proposed site would be consistent with the intent of the Industrial designation for that land, as provided for in the earlier DOE ROD.

The area of the Proposed Action is within the City of Richland's planned urban growth area boundary. It is designated as Business/Research Park in Richland's *Comprehensive Land Use Plan* (City of Richland 2013b). The proposed site is also identified as an Urban Growth Area by Benton County (Benton County Planning Department 2012). Although the federal government is not subject to local planning authority, the activities within the area of the Proposed Action would be consistent with adjacent land uses planned by the City of Richland and Benton County; therefore, no incompatibility issues would be anticipated.

5.1.2 Air Quality

Potential impacts on air quality due to construction and subsequent operation of combustion energy sources and R&D laboratory activities are described in this section. However, some or all of energy requirements may be met by electrical sources. Appendix C provides details of calculations used in this section.

Construction

Construction can be expected to generate the types and quantities of air pollutants typical for the construction of office buildings of similar size. The primary pollutant emissions would be from construction equipment diesel engines and potentially from dust during earthmoving activities and traffic over unpaved areas. Dust would be minimized by watering or other dust-control measures. No

substantial or unusual air-quality impacts would be expected. Construction emissions of criteria pollutants and GHGs are described in Appendix C.

Operations

Similar to existing site laboratory buildings, natural gas-fired boilers would be anticipated for space heating, humidification, or process steam should combustion sources be selected. Boilers would employ state-of-the-art clean-burning technology meeting applicable regulatory requirements, thereby minimizing emissions.

Diesel-fueled generator capacity may be required to provide electricity when utility power is not available. Generators would meet EPA New Source Performance Standards (40 CFR Part 60) for internal combustion engines and use ultra-low sulfur fuel.

Boiler and diesel generator capacities required for the proposed facilities and/or additions were scaled based on facility size compared to those required for recently constructed R&D laboratory buildings used for similar research.

Table 5.2 provides estimates of criteria pollutant emissions from the operation of the potential combustion sources and additional minor contributions from the R&D activities.

Table 5.2. Estimated Emissions of Criteria Pollutants that Result from Operations of the Proposed Facilities and/or Additions

Criteria Pollutant[(a)]	Release in tons per year[(b)]
NO_2	0.60
CO	0.86
SO_2	0.0036
(THC/VOC)	0.41
Particulates (total)	0.054
PM_{10}	0.054
Pb	5.0E-6

(a) NO_2 = nitrogen dioxide; CO = carbon monoxide; SO_2 = sulfur dioxide; THC = total hydrocarbons; VOC = volatile organic compounds; PM_{10} = particulate matter less than 10 micrometers diameter; Pb = lead
(b) To convert to MT multiply by 0.91

Short-term increases in ambient air concentrations would be expected to result primarily from fluctuations in the demand for boiler use for space heating, the use and testing of standby diesel-fueled electrical generators, and the natural variability of meteorological conditions.

Table 5.3 shows conservatively modeled air concentrations from operation of the proposed facilities and/or additions and compares them to the annual and short-term National Ambient Air Quality Standards (NAAQS; 40 CFR Part 50).

Table 5.3. Estimated Ambient Air Concentrations that Result from Operations of the Proposed Facilities and/or Additions Compared to the National Ambient Air Quality Standards

Criteria Pollutant[(a)]	NAAQS ($\mu g/m^3$)	Averaging Times	Concentration ($\mu g/m^3$)	Percent of Standard
CO	10,000	8-hour	184	1.8
	40,000	1-hour	208	0.52
Pb	0.15	Rolling 3-month average	0.00037	0.25
NO_2	100	Annual	0.96	1.0
	188	1-hour	13	6.7
PM_{10}	150	24-hour	3.9	2.6
$PM_{2.5}$	12	Annual	0.10	0.85
	35	24-hour	3.9	11.2
SO_x	196	1-hour	0.72	0.37

(a) CO = carbon monoxide; Pb = lead; NO_2 = nitrogen dioxide; PM_{10} = particulate matter less than 10 micrometers diameter; PM_{25} = particulate matter less than 2.5 micrometers diameter; SO_x = sulfur oxides

Based on these conservative estimates, emissions would not create a condition of nonattainment with the NAAQS. The calculations are described in Appendix C.

PNNL reported GHG emissions in FY12 for operations were 64,395 MTCO2e (PNNL 2012b). This number was calculated based on approximately 157,940 m^2 (1,700,000 ft^2) of facility space. GHG emissions, due to operations of the proposed facilities and/or additions, was calculated based on the addition of 9,000 m^2 (100,000 ft^2) of additional space, to the total existing federal facility square footage. The addition of 9,000 m^2 (100,000 ft^2) of research space could potentially increase GHG emissions by 3,796 $MTCO_2e$ (i.e., 2,234 $MTCO_2e$ for Scope 1 and 2 emissions and 1,562 MTCO2e for Scope 3 emissions). Additional GHG emissions are expected to be partially or fully offset by the future purchase of Renewable Energy Credits. Impacts associated with GHG emissions from operations of the proposed facilities and/or additions are expected to be minimal.

A wide range of additional chemicals would be used for research activities in the proposed facilities and/or additions. The research activities that would take place in the proposed facilities and/or additions would be similar to activities in existing facilities on the DOE PNNL Site. Therefore, these activities would be expected to result in the types and quantities of emissions typical of existing research facilities as well as teaching and research universities. Laboratory emissions from these types of facilities are not subject to federal or Washington State regulation. Therefore, only those chemicals subject to other regulations are tracked in the PNNL Chemical Management System and are available to estimate emissions based on usage.

Because the capabilities in the proposed facilities and/or additions would be similar to capabilities at existing PNNL facilities, estimates of the emissions of chemicals recognized as federal hazardous air pollutants were calculated by scaling emissions from a similar PNNL facility. While not applicable to noncommercial research laboratories (e.g., the proposed facilities and/or additions, the emissions were compared to the Washington State-acceptable source impact concentrations that apply to industrial sources). The emissions were conservatively modeled to calculate the ambient air concentrations. Appendix C lists the estimated annual usage of the chemicals that resulted in air concentrations of

1 percent or more of their acceptable concentrations. Hydrazine, at 11 percent, was the highest. The actual chemicals used and their quantities and emission rates can vary depending on the nature of the research being conducted.

5.1.3 Water Quality

Potential impacts on surface water and groundwater as a result of implementing the Proposed Action are described briefly in the following sections.

Surface Water

As noted in Section 4.4, no surface water exists on the federal land in immediate proximity to the EMSL. Stormwater at the proposed facilities and/or additions would be collected and distributed in a series of infiltration trenches, drains, and catch basins (regulated as injection wells under WAC 173-218) and no permanent impoundments would be expected. Sanitary and process wastewater would be disposed to the City of Richland sanitary sewer system under a City of Richland Industrial Wastewater Discharge Permit and would be similar to discharges from other PNNL facilities. Based on the above information, impacts on surface-water quality from implementing the Proposed Action would be expected to be minimal. Further discussion of liquid wastes is presented in Section 5.1.11.

Groundwater

Although not currently planned, the proposed facilities and/or additions could use groundwater for heating and cooling. The required flows, effectiveness, and cost of such a system would be evaluated during detailed design of the facilities. In one possible configuration, the heating and cooling system would pump groundwater through a closed-loop heat exchanger in which case only heat would be added to groundwater. In another possible configuration, the system would pump groundwater through a heat exchanger and return it to groundwater. Based on PNNL's current water right of 120 L/s (1,900 gpm; WADOE 2008), the proposed facilities could use as much as 360 L/s (5,700 gpm). Currently, the Biological Sciences Facility (BSF)/Computational Sciences Facility (CSF) uses groundwater for heating and cooling. This facility is located on private land adjacent to the area of the Proposed Action. Groundwater monitoring over the last 2 years has shown no noticeable change in groundwater temperature due to the ground source system at BSF/CSF. Based on operations of that system, it is not anticipated that there would be an adverse impact to the groundwater or the Columbia River from a ground source system in the area of the Proposed Action. If such a system were used, no releases of process water to ground would infiltrate and cause water-quality impacts to groundwater.

As noted above, stormwater would be collected and distributed to a series of infiltration drains, trenches, and catch basins and would constitute the only discharge reaching groundwater. Water consumption and evapotranspiration by foliage and vegetation used in landscaping would be expected to closely balance natural recharge and seasonal irrigation with no adverse consequences to groundwater.

5.1.4 Geological Resources

No impacts would be expected on geological resources, which consist principally of Rupert Sand and Burbank Loamy Sand, underlain by Ice Age Flood gravels, which are locally abundant. These soils are not considered "prime farmland" in this semi-arid climate. Although they might be suitable for some

crops if irrigated, no water rights are in place that would permit agricultural use on the DOE PNNL Site. It is anticipated that soil removed during excavations for footings, foundations, and basements would be used in landscaping.

5.1.5 Cultural and Historical Resources

In addition to a federal agencies responsibility under NEPA, Section 106 of the *National Historic Preservation Act* (16 USC 470 et seq.) requires federal agencies to take into account the effects of their undertakings on historic properties that are listed or eligible for listing on the National Register of Historic Places. In accordance with the *Pacific Northwest Site Office Cultural and Biological Resources Management Plan* (DOE/PNSO 2008), a cultural resource review has been conducted for the Proposed Action to comply with NEPA as well as the Section 106 process of the *National Historic Preservation Act of 1966 as amended*, specifically 36 CFR Part 800(3) to determine the potential of the Proposed Action to affect historical properties eligible for the National Register of Historic Places.

The Area of Potential Effect (APE) for the proposed project is approximately 12 ha (30 ac) in size (Figure 1.1). This APE has been defined by the location and extent of potential ground disturbance. The maximum depth expected for ground-disturbing activities throughout this area is approximately 12 m (40 ft) except in the case of wells, which will be drilled to groundwater.

A notification that described the APE for this project was sent to the Washington State Department of Archaeology and Historic Preservation and consulting parties by DOE-SC on April 9, 2013. On April 9, 2013, the Washington State Department of Archaeology and Historic Preservation concurred with this notification. Comments on the APE were received from the Confederated Tribes of the Umatilla Indian Reservation on April 27, 2013.

The cultural resource analysis for the proposed project included a literature review of cultural resources data and historical information, an analysis of geomorphologic data, the use of a geographic information system, and archaeological fieldwork. Geomorphologic research identified one sedimentary deposit within 500 m (1,640 ft) of the APE. The project area is located more than 400 m (1,312 ft) from the Columbia River. The literature review indicated that no known archaeological or historic sites exist within any portion of the APE. Based on available information, no previously identified traditional cultural properties exist within the APE.

A notification inviting consulting parties to participate in archaeological fieldwork survey was sent on April 9, 2013. An archaeological survey of the APE was conducted on April 15, 2013. The survey consisted of walking the current surface of the APE in its entirety. Due to the presence of buildings, roads, parking lots, and various other facilities, traditional survey techniques could not be used. All areas identified as previously disturbed were inspected to ensure the presence of disturbance. No cultural materials were observed during the survey.

A cultural resources review of the entire APE for the current proposed project was conducted in 1994 for the construction of the EMSL (Wright and Cadoret 1994; Nickens 1994). Investigations conducted during that review showed that the site had witnessed numerous disturbances in the past from activities associated with the installation of an irrigation canal, agricultural activities, and the construction of Camp Hanford. Cultural resource monitoring of excavations associated with the EMSL was conducted and no sensitive cultural materials were discovered (DOE/PNSO 2008).

Since previous Section 106 reviews have been conducted for the entire APE prior to the construction of the EMSL, all potential impacts to historic properties have been previously considered. The cultural resources review conducted for this project included a literature review, geomorphological analysis, and archaeological survey. The project area is located more than 400 m (1,312 ft) from the Columbia River. Based on available information, no previously identified traditional cultural properties are within the APE. No historic properties were identified within the APE. Access routes will be through existing roadways, parking lots, and walkways. The Section 106 review of the proposed project resulted in a finding of "No Historic Properties Affected." The proposed project would not have any impacts on cultural and historical resources.

The draft Section 106 review was sent to the State Historic Preservation Office and the Tribes on April 29, 2013. On April 29, 2013, the State Historic Preservation Office concurred with the finding of "No Historic Properties Affected" and requested the addition of a monitoring plan. A monitoring plan has been added to the review. Comments on this review were also received from the Yakama Nation Environmental Restoration Waste Management on June 3, 2013. The final Section 106 review addressed all comments. It was sent to the State Historic Preservation Officer and Tribes on July 12, 2013. The redacted final Section 106 review is in Appendix A.

5.1.6 Biological Resources

In accordance with the *Pacific Northwest Site Office Cultural and Biological Resources Management Plan* (DOE/PNSO 2008), a biological survey of federal land in immediate proximity to the EMSL was conducted on April 9, 2013 (Appendix B). Development of the proposed facilities and/or additions and proposed infrastructure would not impact any shrub-steppe habitat because none is known to occur within or adjacent to the area of the Proposed Action (see Section 4.6). Development of the area of the Proposed Action would also be unlikely to impact any other natural vegetation in adjacent areas (i.e., irrigated pasture and undeveloped fields) or any of the associated wildlife species identified in Section 4.6.

Development of the proposed facilities and/or additions and proposed infrastructure would impact planted lawn grass and ornamental trees and shrubs, and modify the exteriors of existing facilities, all of which may be used for nesting by the common bird species identified in Section 4.6. The birds, nests, and eggs of migratory birds are protected under the *Migratory Bird Treaty Act* (16 USC 703 et seq.). Nests may be constructed by migratory birds in the ornamental trees and shrubs or on the ground during the nesting season. In addition, construction activities may create new habitat conditions suitable for migratory bird nesting. For example, stockpiling soil with vertical or near-vertical surfaces creates potential bank swallow (*Riparia riparia*) nesting habitat (the species nests in holes it excavates in vertical dirt banks). Removal or re-use of such stockpiled soil during the nesting season could adversely impact bank swallows, if present. Ground-nesting species such as killdeer (*Charadrius vociferous*), although not observed during the survey, could nest in gravel, dirt, bark, or sparsely vegetated substrate, or at the margins of lawn areas. Project activities may disturb trees, shrubs, and/or ground. If project activities will occur during the nesting seasons, the area to be disturbed must undergo an ecological review prior to conducting work, in order to identify the active nests of migratory birds and measures must be put in place to avoid disturbing them. In addition, nesting deterrents may be used to discourage nest placement in trees, shrubs, or on the ground in areas that would be disturbed, in order to minimize the risk of project delays that could result from the occurrence of an active nest in a work area.

During development of the proposed facilities and/or additions and proposed infrastructure, these species could nest in similar adjacent habitats. In addition, some of the existing landscaped habitat that would be disturbed by development would subsequently be replaced in support of proposed facility and/or additions, and would provide future nesting habitat. Finally, avian surveys would precede development of the area of the Proposed Action that would take place during the nesting season. Specifically, measures would be implemented to avoid impacts to migratory birds during construction and operation (see Appendix B). Thus, the area of the Proposed Action would not cause noticeable declines in populations of these species.

Development of the proposed facilities and/or additions and proposed infrastructure may entail removal of some of the existing large trees (American sycamore [*Platanus occidentalis*]). This would not be expected to impact bald eagles that may occasionally use them for perching during winter (see Section 4.6), as there are many such large trees which, due to their proximity to the river, are preferentially used by bald eagles.

Because the non-native eastern gray squirrel (*Sciurus carolinensis*) is common in landscaped habitats throughout the local urban community and in developed areas of Washington State (WDFW 2013b), development of the area would not cause a noticeable decline in the populations of this species.

5.1.7 Impacts on Floodplains and/or Wetlands

There are no wetlands or floodplains on federal land in immediate proximity to the EMSL (see Section 4.6). Thus, there would be no impacts to such habitats from development of the proposed facilities and/or additions and proposed infrastructure.

5.1.8 Traffic and Transportation

Potential impacts on traffic and transportation associated with construction and operation of the proposed facilities and infrastructure are described in the following sections.

Construction

As described in Section 3.1, the precise design of the proposed facilities and/or new additions is not known, other than the construction of 9,000 m^2 (100,000 ft^2) of floor space. For purposes of this analysis, the Physical Sciences Facility EA (DOE 2007) was reviewed for its assessment of the likely transportation impacts expected from the initial construction of the PSF, immediately north of the area of the Proposed Action, and using the same access routes. The PSF initial construction was somewhat larger than the area of the Proposed Actions, thus the reported PSF impacts bound those analyzed in this EA.

Because the precise design of the facilities is not known, a reasonable approximation based on other, similar types of recent local construction was used. It was estimated that an average of approximately 25 to 50 construction workers would be employed during a given 2-year period with a peak force of approximately 100 workers. Construction materials would include approximately 3,600 m^3 (4,700 yd^3) of concrete, 450 MT (500 tons) of structural steel, 8,300 L (2,200 gal) of gasoline, and approximately 1,900 L (500 gal) of diesel fuel. These values are bounded by the impact estimates reported for the PSF initial construction.

Average daily traffic on Horn Rapids Road is currently approximately 1,200 vehicles per day at the intersection with George Washington Way and approximately 480 vehicles per day at the intersection with Stevens Drive (Peters 2103; see Table 4.1). At the height of construction, as many as 100 additional vehicles may travel to the construction site. Assuming the construction traffic would be distributed proportionally between the two ends of Horn Rapids Road, traffic counts could increase to approximately 1,270 and 510, respectively. This increase represents a 5 to 6 percent increase in average daily traffic on Horn Rapids Road at the peak of construction activities.

The impacts of construction material transport were considered in the context of the detailed shipments analysis performed for the PSF EA (DOE 2007). This implies that because the PSF initial construction activities were somewhat larger, impact estimates would bound those of the Proposed Action. The PSF EA found that materials shipments and related construction traffic would not result in traffic accidents, injuries, or fatalities. Thus, based on the smaller size of the expected construction project, no such impacts would be expected for the Proposed Action construction.

The impacts of traffic accidents involving workers traveling to and from the PSF construction site were calculated using traffic-accident statistics for the South-Central Region of Washington State compiled by the Washington State Department of Transportation (WDOT 2011). This document gives the accident, injury, and fatality rates for minor arterials in this region to be 1.264E-06 accident/km, 5.76E-07 injuries/km, and 3.136E-08 fatalities/km, respectively. It was assumed that 50 workers per day would travel an average distance of 19.2 km (12 mi) one way to the construction site. This distance encompasses most of the Tri-Cities region and it accounts for the fact that most of the workers would travel a shorter distance and that some would likely carpool. Assuming each worker makes the trip 250 days per year for 2 years, the total distance traveled would be approximately 960,000 km (600,000 mi). The impacts in terms of accidents, injuries, and fatalities are shown in Table 5.4.

Table 5.4. Impacts Associated with Construction Traffic Related to the Proposed Action

No. of Workers	Trips Per Day	Avg. Distance (km)	Days Per Year	No of Years	Total distance (km)	Accidents	Injuries	Fatalities
50	2	19.2	250	2	960,000	1 (1.21E+00)	1 (5.53E-01)	0 (3.01E-02)

As shown in Table 5.4, one accident involving workers commuting to the construction site may occur during the construction period, possibly resulting in injury; however, no fatalities would be expected.

Operations

It is anticipated that the proposed facilities and/or additions would employ some mix of existing and new research staff. Existing staff would be relocated from other operating facilities on the DOE PNNL Site and the number of new staff is not expected to be significant. It is likely some additional parking would be included in the development to address building access and relieve local congestion. As a result, local traffic impacts would likely be minimal.

5.1.9 Socioeconomics

Potential impacts on socioeconomics as a result of construction and operation of the proposed facilities and/or additions are described briefly in the following sections.

Construction

As described in Section 3.1, the precise design of the proposed facilities and/or additions is not known, other than the construction of 9,000 m^2 (100,000 ft^2) of floor space. Because the precise design of the facilities and/or additions is not known, reasonable approximations were made based on other, similar types of recent local construction. In addition, the PSF EA (DOE 2007) was reviewed for its assessment of the likely socioeconomic impacts expected from the initial construction of the PSF, immediately north of the Proposed Action. It was estimated that an average of approximately 25 to 50 construction workers would be employed over a given 2-year period with a peak force of approximately 100 workers.

Based on construction workforce estimates, the construction activities at the area of the Proposed Action would likely have little effect on the existing community. Total employment in Benton and Franklin counties is approximately 120,000, with a 2012 unemployment rate averaging approximately 9 percent (BLS 2013). Thus, even if construction creates additional service sector jobs, the total increase in employment likely would be well under 1 percent of the current employment level. Increases of less than 5 percent of an existing labor force have been determined to have little effect on an existing community (DHUD 1976).

Operations

It is anticipated that the proposed facilities and/or additions would employ some mix of existing and new research staff. Existing staff would be relocated from other operating facilities at PNNL and the number of new staff is not expected to be significant. Consequently, no impacts on socioeconomics or community infrastructure would be expected from operations associated with implementing the Proposed Action.

5.1.10 Resource Commitments

Construction

The quantities of concrete, steel, diesel fuel, gasoline, and propane committed to implementation of the Proposed Action would be typical of that required for a 9,000-m^2 (100,000-ft^2) facility and associated landscaping. Preliminary estimates include approximately 3,600 m^3 (4,700 yd^3) of concrete, 450 MT (500 tons) of structural steel, 8,300 L (2,200 gal) of gasoline, and approximately 1,900 L (500 gal) of diesel fuel. None of these resources is unique or regionally in short supply. Minimal impact would be expected as a result of commitment of these resources for the Proposed Action.

Operations

Research activities that would take place in the proposed facilities and/or additions would be similar to activities in existing facilities on the DOE PNNL Site, including the PSF, which is recent construction and reflects implementation of energy-efficiency measures. Therefore, resource commitments associated

with facility operation in the area of the Proposed Action are expected to result in similar types and quantities of resources as those characterized in the PSF EA (DOE 2007). The square footage of the PSF 3430 facility most closely approximates the square footage associated with the proposed facility and/or additions. Current annual electricity consumption of the PSF 3430 facility is approximately 3,250,000 kWh, which represents an average demand of 371 kW. The PSF EA estimated that peak demand of all PSF facilities would be 5 MW; thus, it is expected that about one-third of that (approximately 1.7 MW) would be represented by the PSF 3430 facility. The City of Richland has a 316 MW electrical-power capacity, of which a maximum of 129 MW is not used (City of Richland 2013b). Electrical requirements for the Proposed Action would represent just over 1 percent of the unused power capacity and, thus, have minimal impact on electrical power supply.

Approximately 25,000 m^3/yr (900,000 ft^3/yr) of natural gas at standard temperature and pressure would be consumed for humidification and supply of process steam needs and, in the event that a closed-loop air conditioning system was not employed, for boilers used in space heating. Minimal impact would be expected as a result of commitment of these resources for the Proposed Action. This level of consumption is bounded by that reported in the PSF EA (DOE 2007).

Potable water consumption for the proposed facilities and/or additions is estimated to be approximately 159,000 L/d (42,000 gpd). The current average production of the Richland Municipal Water Plant is approximately 57 ML/d (15 MGD) and its capacity is approximately 260 ML/d (70 MGD). Thus, requirements of the proposed facilities would amount to a negligible increase in demand, which would have minimal impacts on the local supply of potable water (City of Richland 2010). Because the proposed facilities and/or additions would be constructed in areas that are currently landscaped and irrigated, a net decrease in irrigated area would be expected. Thus, the increased demands from local water supplies for operations of the proposed facilities would be somewhat offset by the decrease in irrigation water demand.

5.1.11 Waste Generation and Disposition

DOE uses a comprehensive approach to implementing the requirements of Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance* (74 FR 52117) by integrating sustainability into the various phases of operations at PNNL. The PNNL sustainability program contains three focus areas: environmental stewardship, social responsibility, and economic prosperity. As part of the environmental stewardship focus area, the sustainability program focuses on components such as waste minimization, recycling, source reduction, energy-efficient building construction, and buying practices that give preference to products made from recycled materials. Waste-management activities associated with construction and operation of the proposed facilities and/or additions would be conducted in accordance with the PNNL sustainability program.

A majority of the construction waste and debris would be recycled; however, approximately 321 m^3 (420 yd^3) might be disposed of at the Horn Rapids Sanitary Landfill. The City of Richland notes that its 46-ha (114-ac) landfill could potentially be at capacity in 2018 and is evaluating the need to expand the existing space or utilize long-haul services to a regional landfill (City of Richland 2011).

PNNL has the capability to manage hazardous waste at PNNL. Offsite treatment, storage, and disposal of waste are contracted through permitted commercial treatment, storage, and disposal facilities. The types of waste generated in support of R&D operations in the proposed facilities under this action are

anticipated to be similar to those generated at the EMSL. Based on facility size (approximately 19,000 m^2 [200,000 ft^2] at the EMSL and 9,000 m^2 [100,000 ft^2] for proposed facilities and/or additions under this action), the hazardous waste volume from operation of the proposed facilities is estimated to be 2,700 kg. The volume of hazardous waste generated by PNNL in 2012 was 31,839 kg, as determined from the PNNL waste-management database. The proposed facilities and/or additions could potentially increase PNNL's hazardous waste volumes 8 percent annually. The design of proposed facilities and/or additions would incorporate areas to manage waste materials generated from R&D and operations.

Liquid wastes from proposed facilities and/or additions would consist of waste process water and sanitary sewage. Both of these wastewaters would be sent to the City of Richland's Publicly Owned Treatment Works for processing. Process water generated as a part of facility operations would be monitored to verify compliance with permitted pollutant concentrations in accordance with the City of Richland Pretreatment Program (City of Richland Code 17.30). Process wastewater from the proposed facilities and/or additions is anticipated to be similar in composition to the existing PNNL facilities, and past monitoring results (Duncan et al. 2012) demonstrate the ability for R&D and facility operations to maintain compliance with applicable wastewater permits. No net change in wastewater volumes to the City of Richland would be anticipated, as the work performed in the proposed facilities and/or additions would be transferred from other facilities currently connected to the City of Richland's wastewater system.

5.1.12 Human Health and Safety

This section presents potential impacts to the health and safety of the public from the Proposed Action.

Construction. Construction related to the Proposed Action would require between 180,000 to 210,000 labor hours. Based on DOE contractor/subcontractor construction experience from 2008 to 2012 (i.e., 1.2 cases of injury/illness per 200,000 labor hours; DOE 2012), approximately 1.2 cases of injury/illness could occur during construction from the Proposed Action.

Operations. Based on an average 75- to 100- person workforce, working 8 hours per day and 250 days per year, operation of the proposed facilities and/or additions and proposed infrastructure would reach approximately 150,000 to 200,000 total labor hours per year. Taking into account the PNNL average incidence of 0.84 cases of injury/ illness per 200,000 labor hours (DOE 2012; Section 4.10), less than 1 case would be expected per year.

No unique occupational health and safety hazards would be expected from construction and operation from the Proposed Action.

5.1.13 Noise Impacts

Construction activities would generate noise typical of using heavy equipment (modeled as the simultaneous use of two 300-HP diesel-fueled bulldozers) and transport of materials. Noise impacts are assessed by establishing regions of influence for residential, commercial, and industrial receptors and are presented briefly as follows.

The nearest residential area to the construction site would be the WillowPointe housing development, located approximately 0.8 km (0.5 mi) east of the area of the Proposed Action. The Washington State maximum permissible environmental noise levels (WAC 173-60) limit daytime noise to 60 dBA for residential locations.

The commercial limit of 65 dBA would apply to facilities on the DOE PNNL Site (WAC 173-60). The closest facilities to the area of the Proposed Action include PNNL's EMSL, PSF, BSF, CSF, and Information Sciences Building-I, National Security Building, Environmental Technology Building, Laboratory Support Building, and the Battelle Auditorium. In addition, an onsite guest house that accommodates up to 81 overnight visitors is located approximately 275 m (900 ft) southeast of the proposed facilities. Attenuation of noise by the walls and windows of proximate facilities would reduce inside noise levels, although episodic noise events or associated ground vibrations could disturb building occupants.

The Washington State maximum permissible environmental noise limit for industrial receptors is 70 dBA (WAC 173-60).

Sounds originating from temporary construction sites as a result of construction activities are exempt from Washington State maximum permissible noise provisions during the hours of 7:00 a.m. to 10:00 p.m. If construction were to occur between 10:00 p.m. and 7:00 a.m., the maximum permissible environmental noise levels would be reduced by 10 dBA for residential, commercial, and industrial receptors (WAC 173-60).

Ground vibrations from using heavy equipment might have some impact on operation of the Laser Interferometer Gravitational-Wave Observatory, located approximately 14 km (~9 mi) northwest of the DOE PNNL Site. Prior to construction, the Laser Interferometer Gravitational-Wave Observatory operators would be notified so that operators could take the extraneous ground vibrations from construction into account.

PNNL conducts R&D in facilities that are in close proximity to the proposed construction area. Construction activities that generate noise and vibrations have the potential to affect R&D and facility equipment. Construction efforts would be coordinated with building operations and research staff to minimize impacts to the ongoing operations. After construction is completed, routine operations at the proposed facilities and/or new additions and proposed infrastructure would not be expected to increase noise or vibration levels over current ambient external background levels.

5.1.14 Environmental Justice

Under Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (59 FR 7629), environmental justice is concerned with assessing the extent to which there may be a disproportionate and adverse impact from a Proposed Action among minority and low-income populations, in which the impacts are notable compared to those experienced by the rest of the population. Adverse impacts are defined as negative changes to the existing conditions in the natural environment (e.g., land, air, water, wildlife, or vegetation) or in the human environment (e.g., employment, health, or land use).

Operational impacts of the proposed facilities and/or additions and proposed infrastructure are expected to be similar to, or lower than, those from ongoing PNNL operations. Currently, there are no known impacts associated with PNNL operations that have been determined to affect any member of the public; therefore, operation of the proposed facilities and/or additions and proposed infrastructure is not expected to have the potential for high and disproportionate adverse impacts on minority or low-income groups as defined in Section 4.8.

5.1.15 Cumulative Impacts

This section provides discussion regarding potential cumulative impacts associated with implementing the Proposed Action.

In 40 CFR 1508.7, the Council on Environmental Quality (CEQ) defines cumulative impact as:

> …the impact on the environment from the incremental impact of the action when added to other past, present, and reasonably future actions regardless of what agency (federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

However, the CEQ cautioned that, "The continuing challenge of cumulative effects analysis is to focus on important cumulative issues…" (CEQ 1997).

As indicated in previous sections of this EA, impacts in all resource areas are projected to be minimal. Historically, potential radiological impacts on human health and safety, which are considered in terms of cumulative impacts, have been the environmental impact of most interest to the public. The area most likely to be influenced by the Proposed Action consists principally of the northern portion of the City of Richland and a rural area of Franklin County (located to the east, across the Columbia River from the area of the Proposed Action).

Past Hanford Site activities with the largest impact on the area of interest include fuel-fabrication facilities, production reactors, separations and product-finishing plants, and onsite R&D facilities supporting national defense programs. Principally, environmental impacts have been the result of releases of radioactive material to air, water, and ground that occurred during production of nuclear materials for national defense during World War II and the following Cold War era. The types and quantities of radioactive materials that would be used in the proposed facilities would be similar to those currently used in the EMSL. These materials include sealed radioactive sources, consumer products containing radioactive materials, NORM, and low activity research samples. Their use would be covered by existing air, waste, or water permitting. The incremental impact of the development activities in the area of the Proposed Action would not noticeably contribute to this cumulative effect.

Cumulative impacts were recently analyzed for this general area in the PSF EA (DOE 2007). As determined in the PSF EA, construction and operation of facilities would not result in significant adverse impacts to the environment, including biological resources (DOE 2007). Noise, vibration, dust, and traffic associated with the Proposed Action could contribute to cumulative impacts. However, as discussed in the preceding sections, these impacts will be minor and the incremental effect of the Proposed Action will be negligible. The Proposed Action would not noticeably contribute to the cumulative impacts considered. The specific cumulative impacts considered are discussed below. Other

ongoing or reasonably foreseeable future actions in the vicinity that might also have an impact on the same area of interest include those associated with the following operations:

- Operation of facilities at PNNL, including but not limited to the BSEL; BSF/CSF, a privately funded facility leased by PNNL for computational, biological, and nuclear magnetic resonance research; the EMSL; and the Life Sciences Laboratory II (LSLII), a Battelle-owned facility supporting analytical and vivarium capabilities.
- Proposed conveyance of approximately 664 ha (1,641 ac) of Hanford Site land to the Tri-City Development Council (TRIDEC) for the purposes of facilitating local economic development and assisting the local community in the transition away from an economy focused largely on DOE- and Hanford-related funding (77 FR 58112). This land lies adjacent to the western edge of the DOE PNNL Site. This action is being analyzed under an EA that includes 1,786 ha (4,413 ac) of land.
- Proposed connection of the Hanford Site Central Plateau with natural gas service via a new pipeline (77 FR 3255). The pipeline would deliver natural gas to support the several facilities on the Hanford Site. Alternative pipeline routes being evaluated would begin in Franklin County and may cross under the Columbia River in or near the Hanford 300 Area, near the Proposed Action. The proposed pipeline is estimated to be approximately 48 km (30 mi) in length.
- Proposed addition of PSF Phase II developments, including construction of research buildings and supporting infrastructure on a portion of the DOE PNNL Site. This action is being analyzed under a supplement analysis to the PSF EA.
- *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA; 42 USC 9601 et seq.) remediation projects, including cleanup of the 618-10 and 618-11 burial ground sites and the 300 Area and remediation of the river corridor in the southeastern portion of the Hanford Site.
- The Columbia Generating Station, a nuclear power plant located north of the 300 Area and operated by Energy Northwest.
- A nuclear-fuel-fabrication plant operated by AREVA (radiological).
- The AMEC Geo Melt Test Site (pilot tests of bulk waste vitrification).
- The Cold Test Facility (nonradiological testing of vitrification processes).
- PermaFix (low-level and mixed low-level radioactive waste treatment).
- Ferguson Distribution Center (commodity distribution).
- A titanium-zirconium processing center operated by International Hearth Melting.
- Meyer Plastics (industrial plastics producer).

At this time, DOE-SC has not identified additional planned facilities for the vicinity of the proposed facilities and/or additions and proposed infrastructure, beyond those listed above.

Impacts from construction activities (e.g., additional traffic and construction emissions) would be temporary and similar to those associated with any other commercial building of comparable size. Construction is not expected to affect resources that are unique, in short supply, or otherwise sensitive; therefore, cumulative impacts on such resources would be negligible.

Other types of impacts from activities related to the Proposed Action were found to be small and, in general, similar to those from current, nearby PNNL activities. Therefore, the Proposed Action would result in minimal incremental addition to cumulative impacts of other projects in the vicinity on the surrounding environment.

5.1.16 Intentional Destructive Acts

DOE is required to consider intentional destructive acts, such as sabotage and terrorism in each environmental impact assessment or EA that it prepares. PNNL has performed threat assessments on all currently operating buildings and would perform a threat assessment on all new buildings during the planning phase and then again after construction is complete. It is possible, but highly unlikely, that random acts of vandalism could occur. Access control using identification badges and proximity cards would be the same for the proposed facilities and/or additions as found in existing PNNL facilities. In addition, security in the proposed facilities and/or additions would be assured by vehicle patrols and routine facility walk downs by the PNNL security force. Because the proposed facilities and/or additions would not house high hazardous materials, intentional destructive acts, although unlikely, would not be expected to result in significant releases that would adversely affect human health or the environment.

5.1.17 Environmental Sustainability

With its comprehensive approach to fulfilling Executive Order 13514 (74 FR 52117), PNNL advances DOE's sustainability mission with a diverse, concentrated effort toward goals of the fiscal year 2020 and beyond. The *FY 2013 Site Sustainability Plan* (PNNL 2012b) includes practical actions to conserve energy, water, and financial resources; improve the comfort and productivity of our staff; and benefit the environment. PNNL has committed all new construction, major renovations, and alterations of buildings greater than 5,000 gross ft^2 will comply with the Guiding Principles for High Performance Sustainable Buildings found in Executive Order 13514 or equivalent certification methods. Planning for future facilities will include these requirements.

5.2 Environmental Impacts of the No-Action Alternative

Under the No-Action Alternative, DOE-SC would not construct new facilities and infrastructure and/or add to current facilities and infrastructure in immediate proximity to the EMSL on the DOE PNNL Site. Existing research laboratories would continue to function without the benefit of the additional research capabilities. The impacts from such action would be largely programmatic, resulting in delay or disruption of affected DOE-SC and other agency research programs. For the immediate future, other environmental impacts of this alternative would be similar to those from current PNNL operations in the area of the Proposed Action, which are described in Sections 4 and 5.1 of this document. The impacts would cease if and when current ongoing activities were ultimately shut down.

5.2.1 Adverse Impacts

PNNL's support of the nation's strategic goals in science, national security, energy, and the environment for DOE, National Nuclear Security Administration, Department of Homeland Security, National Institutes of Health, U.S. Department of Defense, U.S. Nuclear Regulatory Commission, and the EPA would be substantially limited.

5.2.2 Beneficial Impacts

Emissions, resource commitments, and noise from construction of the proposed facilities and/or additions and proposed infrastructure in immediate proximity to the EMSL on the DOE PNNL Site would not occur.

6.0 Environmental Permits and Regulatory Requirements

The following environmental permits are anticipated for the construction and operation of proposed facilities and/or additions and proposed infrastructure:

Industrial Wastewater Pretreatment Permit. The City of Richland Pretreatment Program sets forth uniform requirements for users of the City of Richland's Publicly Owned Treatment Works. The Publicly Owned Treatment Works discharges to the Columbia River under applicable Washington State and federal laws, including the *Clean Water Act* (33 USC 1251 et seq.) and the General Pretreatment Regulations (40 CFR Part 403).

Industrial wastewater discharges from the EMSL are currently permitted through a wastewater permit (Permit # CR-IU005) issued to PNSO under the City of Richland's Pretreatment Program. It is anticipated that any new industrial wastewater connections to the City of Richland could result in the need to obtain a modification to the existing EMSL permit.

Stormwater/Underground Injection Control Program. WAC 173-218, *Underground Injection Control Program* encompasses the discharge of water to the soil column. This program is focused on maintaining the quality of Washington State's groundwater and protecting public health and welfare. The design of stormwater conveyance systems will dictate whether the system must be registered as an injection point with the Washington State Department of Ecology (WADOE). Design of stormwater conveyance systems would be performed in accordance with the *Stormwater Management Manual for Eastern Washington* (WADOE 2004).

Hazardous Waste. Hazardous waste generated at PNNL is managed in accordance with the *Resource Conservation and Recovery Act* (42 USC 6901 et seq.) and WAC 173-303, *Dangerous Waste Regulations*. The DOE PNNL Site has been registered as a hazardous waste generator and assigned EPA identification number WAH000025124. Hazardous wastes generated as part of R&D and operations at proposed facilities and/or additions would be managed in accordance with the referenced regulations under the DOE PNNL Site identification number.

Nonradiological Air Pollutant Notice of Construction Approval Order. The Benton Clean Air Agency (BCAA) implements the requirements of WAC 173-400, *General Regulations for Air Pollution* Sources; WAC 173-401, *Operating Permit Regulations*; WAC 173-460, *Controls for New Sources of Toxic Air Pollutants*; and Benton Clean Air Agency Regulation 1 (BCAA 2011). Submittal of a Notice of Construction application to the BCAA and issuance of a permit may be required for the construction and operation of an emergency diesel generator depending on the final specification for emergency power capacity.

Ground Source Heating and Cooling. In evaluating energy-efficient designs and systems for the development of the proposed facilities, there may be the potential to use groundwater for heating and cooling of the facilities. Groundwater could be withdrawn through a series of wells, routed through heat exchangers (non-contact), and then injected back into same aquifer to manage the heating/cooling load of the buildings. If this method becomes viable and is pursued, the following permits and approvals would be required:

- In accordance with the Revised Code of Washington (RCW) 90.44, *Regulation of Public Groundwaters,* a water right application would be submitted to WADOE, and approval must be obtained prior to installing groundwater wells.
- In accordance with WAC 173-218, the discharge of non-contact heating/cooling water would have to be approved by WADOE prior to installation of the groundwater injection wells.
- A notice of intent to construct groundwater wells must be filed with WADOE in accordance with WAC 173-160, *Minimum Standards for Construction and Maintenance of Wells*.

Radioactive Air Emissions License. The Washington State Department of Health regulates radioactive air emissions under WAC 246-247, Radiation Protection – Air Emissions. The Washington State Department of Health has issued Radioactive Air Emission License (RAEL)-005 (WDOH 2010) for operations at the DOE PNNL Site. It is anticipated that any radiological work in the proposed facilities and/or additions would be covered under the existing license.

7.0 Agencies and Tribal Governments Consulted

Advance notice of DOE-SC's intent to prepare this EA and briefings as requested were provided to the following agencies and Tribal governments:

- Nez Perce Tribe
- Confederated Tribes of the Umatilla Indian Reservation
- Yakama Nation
- Confederated Tribes of the Colville Reservation
- Wanapum Tribe
- U.S. Environmental Protection Agency - Region 10
- U.S. Fish and Wildlife Service
- Federal and Washington State Congressional Representatives
- Washington State Department of Ecology
- Washington State Department of Health
- Washington State Department of Fish and Wildlife
- Washington State Historic Preservation Office
- Oregon Department of Energy
- Benton and Franklin Counties
- Port of Benton
- Cities of Richland, Pasco, Kennewick, and West Richland.

The notification for the draft EA was published on May 30, 2013. No public comments were received on the draft. During the public comment review for the draft South Federal Campus Development Environmental Assessment (EA), a title change was requested and has been implemented in this final EA. This change is administrative in nature and does not affect any technical aspect of the document—the purpose, need, and scope of this final EA are unchanged from those in the draft. No technical changes were made due to public comment review. The new title for the final EA is ***"Environmental Assessment for Future Development in Proximity to the William R. Wiley Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory, Richland, Washington."***

8.0 References

8.1 Federal Regulations, Notices, and Laws

8.1.1 **Code of Federal Regulations** (CFR; online at http://www.gpoaccess.gov/cfr/index.html)

10 CFR Part 1021. "National Environmental Policy Act Implementing Procedures." *Code of Federal Regulations*. U.S. Department of Energy.

36 CFR Part 800(3). "Protection of Historic Properties: Initiation of the Section 106 Process." *Code of Federal Regulations*. Advisory Council on Historic Preservation.

40 CFR Part 50. "National Primary and Secondary Ambient Air Quality Standards." *Code of Federal Regulations.* U.S. Environmental Protection Agency.

40 CFR Part 60. "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines." *Code of Federal Regulations.* U.S. Environmental Protection Agency.

40 CFR Part 403. "General Pretreatment Regulations for Existing and New Sources of Pollution." *Code of Federal Regulations*. U.S. Environmental Protection Agency.

40 CFR Part 1500-1508. "Council on Environmental Quality Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act." *Code of Federal Regulations*. U.S. Environmental Protection Agency.

8.1.2 **Federal Register Notices** (FR; online at http://www.gpo.gov/fdsys/browse/collection.action?collectionCode=FR)

59 FR 7629. "Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations." *Federal Register* (February 16, 1994). Online at http://www.epa.gov/fedrgstr/eo/eo12898.htm.

64 FR 61615. "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)." *Federal Register* (November 12, 1999). Online at http://www.gpoaccess.gov/fr/index.html.

74 FR 52117. "Executive Order 13514: Federal Leadership in Environmental, Energy, and Economic Performance." *Federal Register* (October 5, 2009). Online at http://www.whitehouse.gov/assets/documents/2009fedleader_eo_rel.pdf.

77 FR 3255. "Notice of Intent To Prepare an Environmental Impact Statement for the Acquisition of a Natural Gas Pipeline and Natural Gas Utility Service at the Hanford Site, Richland, WA, and Notice of Floodplains and Wetlands Involvement (DOE/EIS–0467)." *Federal Register* (January 23, 2012). Online at http://www.gpo.gov/fdsys/search/pagedetails.action?st=77+FR+3255&granuleId=2012-1139&packageId=FR-2012-01-23.

77 FR 58112. "Notice of Intent To Prepare an Environmental Assessment (EA) for the Proposed Conveyance of Land at the Hanford Site, Richland, WA and Notice of Potential Floodplain and Wetland Involvement." *Federal Register* (September 19, 2012). Online at http://www.gpo.gov/fdsys/granule/FR-2012-09-19/2012-23099/content-detail.html.

8.1.3 United States Code (USC; online at http://www.gpoaccess.gov/uscode/index.html)

16 USC 470 et seq. *National Historic Preservation Act of 1966*. Public Law 102-575, as amended.

16 USC 703 et seq. *Migratory Bird Treaty Act*. Public Law 86-732, as amended.

16 USC 1531 et seq. *Endangered Species Act of 1973*. Public Law 100-478, as amended.

33 USC 1251 et seq. *Clean Water Act*. Public Law 100-4, as amended.

42 USC 4321 et seq. *National Environmental Policy Act of 1969*. Public Law 91-190, as amended.

42 USC 6901 et seq. *Resource Conservation and Recovery Act of 1976*. Public Law 94-580.

42 USC 9601 et seq. *Comprehensive Environmental Response, Compensation, and Liability (Superfund) of 1980*. Public Law 107-118, as amended.

50 USC App. 601 et seq. *First War Powers Act of 1941*. 55 Stat. 838, as amended.

8.1.4 State of Washington Administrative Code (WAC; online at http://apps.leg.wa.gov/wac/)

WAC 173-60. "Maximum Environmental Noise levels." *Washington Administrative Code*, Olympia, Washington.

WAC 173-160. "Minimum Standards for Construction and Maintenance of Wells." *Washington Administrative Code*, Olympia, Washington.

WAC 173-218. "Underground Injection Control Program." *Washington Administrative Code*, Olympia, Washington.

WAC 173-303. "Dangerous Waste Regulations." *Washington Administrative Code*, Olympia, Washington.

WAC 173-400. "General Regulations for Air Pollution Sources." *Washington Administrative Code*, Olympia, Washington.

WAC 173-401. "Operating Permit Regulation." *Washington Administrative Code*, Olympia, Washington.

WAC 173-460. "Controls for New Sources of Toxic Air Pollutants." *Washington Administrative Code*, Olympia, Washington.

WAC 232-12-297. "Endangered, Threatened, and Sensitive Wildlife Species Classification." *Washington Administrative Code*, Olympia, Washington.

WAC 246-247. "Radiation Protection–Air Emissions." *Washington Administrative Code*, Olympia, Washington.

8.1.5 Revised Codes of Washington

RCW 90.44. "Regulation of Public Groundwaters." Revised Code of Washington. Accessed May 2, 2013, at http://apps.leg.wa.gov/rcw/default.aspx?cite=90.44.

8.1.6 City of Richland Code

City of Richland Code 17.30, *Richland Pretreatment Act*, revised 11/16/2010. http://www.codepublishing.com/wa/richland/html/Richland17/Richland1730.html.

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Appendix A

Cultural Resource Review

During the public comment review for the draft South Federal Campus Development Environmental Assessment (EA), a title change was requested and has been implemented in this final EA. This change is administrative in nature and does not affect any technical aspect of the document—the purpose, need, and scope of this final EA are unchanged from those in the draft. No technical changes were made due to public comment review. The new title for the final EA is ***"Environmental Assessment for Future Development in Proximity to the William R. Wiley Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory, Richland, Washington.*** Because the Section 106 process was initiated using the draft EA title "Environmental Assessment for Future Development on the South Federal Campus, Pacific Northwest National Laboratory, Richland, Washington," the original title for the draft EA remains in this cultural resources review.

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Appendix A

Cultural Resource Review

CULTURAL RESOURCES REPORT COVER SHEET

Author: Heather Hay, Keith Mendez, and Kate Clark, CH2M HILL

Title of Report: Redacted Cultural Resources Review for the South Federal Campus Development, Pacific Northwest National Laboratory, Richland, Washington (HCRC#2013-PNSO-012).

Date of Report: July 2013

County: Benton Section: 14 Township: 10N Range: 28E

Quad: Richland, WA 7.5' Acres: 29.05 acres

PDF of report submitted (REQUIRED) x Yes

Historic Property Export Files submitted? x No

Archaeological Site(s)/Isolate(s) Found or Amended? x No

TCP(s) found? x No

Replace a draft? x No

Satisfy a DAHP Archaeological Excavation Permit requirement? x No

DAHP Archaeological Site #:

_____
_____
_____
_____
_____
_____
_____
_____
_____

- Submission of paper copy is required.
- Please submit paper copies of reports ***unbound.***
- Submission of PDFs is required.
- Please be sure that any PDF submitted to DAHP has its cover sheet, figures, graphics, appendices, attachments, correspondence, etc., compiled into one single PDF file.
- Please check that the PDF displays correctly when opened.

Section 106 Review for the:

Redacted South Federal Campus Development, Pacific Northwest National Laboratory,

Richland, Washington

(HCRC#2013-PNSO-012)

Heather Hay, Keith Mendez, and Kate Clark CH2M HILL, Inc.

Submitted on behalf of Pacific Northwest National Laboratory

July 2013

HCRC#2013-PNSO-012

Introduction

This Cultural Resource Review is conducted in accordance with the National Historic Preservation Act, as amended and implementing regulations 36 CFR Part 800.

Project Location

USGS Quadrangle: Richland, WA, 7.5'
Township: 10 North, Range: 28 East
Section: 14

Project Description

The Pacific Northwest National Laboratory (PNNL) is a multi-program National Laboratory conducting research for DOE strategic objectives. To enable continued research support, DOE is proposing to construct new facilities and/or expand existing facilities and infrastructure on the South Federal Campus in Richland, Washington. The project that is being conducted includes construction and operation of up to 100,000 sq ft of state-of –the-art facilities and/or additions and associated infrastructure in the South Federal Campus, PNNL Site, Richland Washington. The scope includes the following:

Infrastructure:

- Water; Fire Protection, Potable, Irrigation
- Sanitary Sewer
- Electrical Power
- Communication
- Natural Gas
- Service Road
- Well drilling

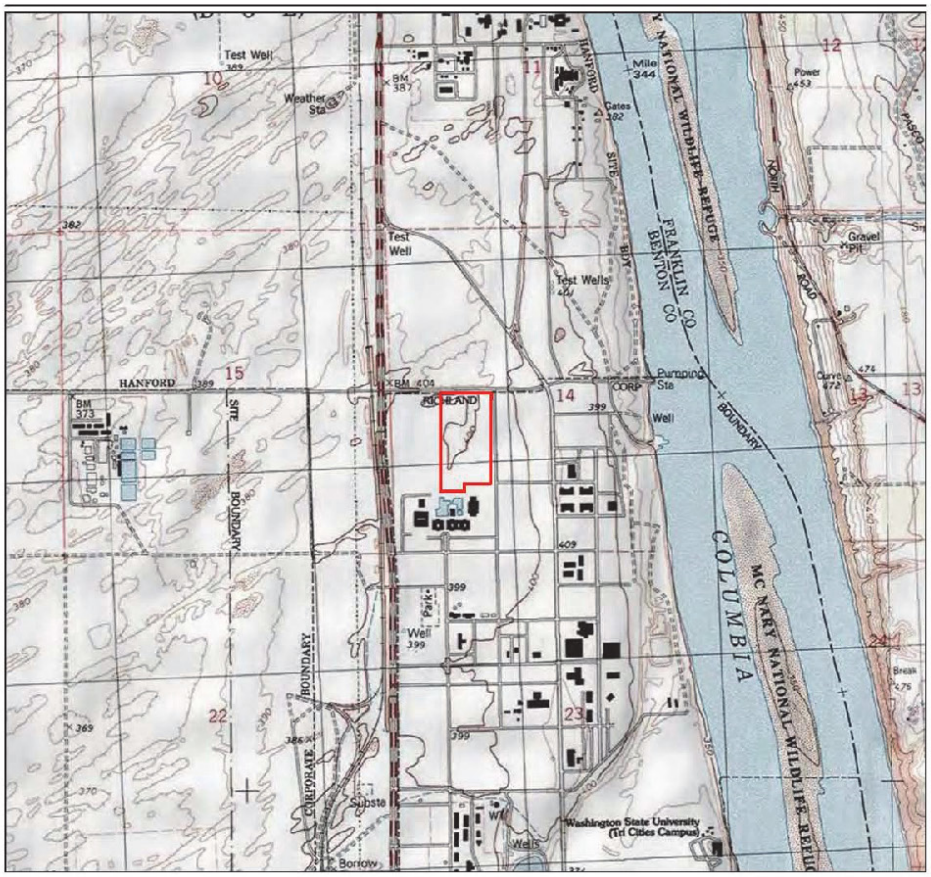
General Purpose Laboratories including:

- Chemistry laboratories
- Instrumentation laboratories
- Biology laboratories
- Other supporting facilities as needed

Area of Potential Effect (APE)

The Area of Potential Effect (APE) for this project is approximately 11.75 hectares (29.05 acres) in size (Figure 1). The APE is comprised of the footprint of the core south federal campus around the current EMSL facilities on the PNNL, Richland Campus (Figure 2). The APE has been defined by the location and extent of potential ground disturbance. The maximum depth expected for ground disturbing activities throughout the APE is approximately 12 meters (40 feet) except in the case of wells which will be drilled to groundwater.

HCRC#2013-PNSO-012



Legend

Area of Potential Effect (APE)

Richland, WA 7.5' USGS Quad
Township 10 N Range 28 E
Section 14

FIGURE 1
Area of Potential Effect (APE)
HCRC#2013-PNSO-012 | PNSC South Campus Development
Benton County, WA

Path: W:\PNL\HCRC#2013-PNSO-012_EA\2013-PNSO-012_EA_Fig1.mxd

2

HCRC#2013-PNSO-012

Legend

Area of Potential Effect (APE)

N

0 200 400 600 800 1,000 Feet

NOTES: ESRI Basemap, UC-G (Microsoft) 2010.

Path: W:\PNNL\HCRC#2013-PNSO-012_EA\2013-PNSO-012_EA_Fig2.mxd

FIGURE 2
Detail of Area of Potential Effect (APE)
HCRC#2013-PNSO-012 | PNSC South Campus Development
Benton County, WA

Section 106 Correspondence

The APE for this project was sent to the Washington State Department of Archaeology and Historic Preservation (DAHP) and Consulting Parties by the U. S. Department of Energy, Pacific Northwest Site Office (DOE/PNSO) on April 9, 2013. On April 9, 2013, DAHP concurred with the APE notification for this project (Appendix B). Comments on the APE were received from the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) on April 27, 2013 (Appendix A). On April 29, 2013, DAHP concurred with the finding of the CRR and requested the addition of a monitoring plan (Appendix C). A monitoring plan has been added per the request from DAHP and tribal consultants (Appendix D). Comments on the CRR were received from the Yakama Nation Environmental Restoration Waste Management (YN/ERWM) on June 3, 2013.

This proposed action is being evaluated for National Environmental Policy Act (NEPA) compliance through an Environmental Assessment (EA). Notification was sent to consulting parties on April 4, 2013. The draft EA was issued for public comment on May 30, 2013.

Environmental Setting

The project area is located in an area defined as the Columbia Basin, which occupies a large area ranging from the eastern slopes of the Cascade Range to the western slopes of the Blue Mountains. The area contains limited topographic relief, comprised predominantly of undulating or rolling hills. Steep slopes are only present in areas where the major regional rivers have eroded basalt deposits, creating canyons and buttes (Franklin and Dyrness 1973). The geology of this region is the result of Miocene basalt flows, glacial flood activities, and Mio-Pliocene fluvial/lacustrine sedimentary deposits.

The climate of the Columbia Basin is semi-arid with hot, dry summers and cool, moderately damp winters. The post-glacial climate ca. 13,000 - 9,000 years before present (B. P.) was cooler and wetter than today. Between 9,000 and 4,400 B.P., the climate changed to warmer and drier conditions. From ca. 4,400 to ca. 2,500 B. P., the climate was again cool and wet. Conditions from 2,500 B. P. to the present appear somewhat warmer and drier than the earlier warm phase and reflect current conditions (Morgan et al. 2001).

The general environmental setting of the Columbia Basin is defined as a combination of steppe and shrub-steppe. Vegetation in the region is consistent with the low-rainfall, semi-arid landscape, and is dominated by communities of perennial grasses and sagebrush. Typical native vegetation in the general vicinity includes shrubs such as sagebrush (*Artemesia sp.*), bitterbrush (*Purshia tridentata*); perennial grasses such as bluebunch wheatgrass (*Agropyron spicatum*), Idaho fescue (*Festuca idahoensis*), giant wildrye (*Elymus cinereus*), and needle and thread grass (*Stipa sp.*); and non-native vegetation such as cheatgrass brome (*Bromus tectorum*), bluegrass (*Poa sandbergii*), and medusahead wildrye (*Elymus caput-medusae*) (Franklin and Dyrness 1973). The vegetation present in and around the project area is mostly landscape shrubs and grasses. There are also a few areas near PSF dominated by cheatgrass (*Bromus tectorum*), an alien annual weed. Crested wheatgrass (*Agropyron cristatum*), an introduced species used to control soil erosion, is also present, as are native bunchgrasses such as Sandberg's bluegrass (*Poa sandbergii*), bulbous bluegrass (*Poa bulbosa*), pine bluegrass (*Poa scabrella*), Indian ricegrass (*Oryzopsis hymenoides*), and bottlebrush squirreltail (*Sitanion hystrix*).

Geomorphology

Geomorphologic data can be used to identify areas of higher or lower probability of containing subsurface cultural materials. All stratigraphic deposits which contain archaeological remains in North America are assigned to the Quaternary period. The Quaternary period dates from 1.8 million years to the present. The Quaternary period is subdivided into the Pleistocene epoch (>10,000 years B.P.) and the Holocene epoch (<10,000 years B.P.) (Waters 1992). On the Hanford Site archaeological sites dating to the Pleistocene epoch are very rare. Because of this, Pleistocene deposits are not expected to contain buried cultural materials except in very rare cases. Based on this knowledge a basic predictive model can be developed to predict the likelihood of a particular location containing buried cultural materials. It is possible for cultural materials to be present in Holocene deposits of any depth. However, if a location contains deep Holocene deposits there is a greater likelihood that cultural materials will be buried and therefore not available for visual inspection at the ground surface. If a location contains only very

shallow Holocene deposits it is more likely that cultural materials will be present at or very near the ground surface and therefore available for visual inspection. If a location is devoid of Holocene deposits it is very unlikely to contain buried cultural materials.

A Geological review was conducted online through the Washington State Department of Natural Resources (DNR) Washington State Geologic Information Portal electronic database. This review identified one sedimentary deposit of Pleistocene continental glacial, glaciolacustrine, and outburst flood deposits within the APE and within 500 m (1,640 ft) of the APE. This depositional context of the local deposits is that of sedimentary particles which have been transported by late Pleistocene glacial runoff from melting of continental ice sheet and Holocene post-glacial mainstream and sidestream alluvium (Fecht and Marceau 2006). This definition of the sedimentary deposit in this location refers to an undisturbed setting. Large portions of the APE are located within previously disturbed areas, as well as paved and graveled lots and therefore do not contain intact, undisturbed sediments.

Cultural Setting

The archaeological record of the Mid-Columbia Basin bears evidence of more than 12,000 years of human occupation. The arid climate provides favorable environmental conditions for preservation of materials that may otherwise decay more quickly. Regional development of hydro-electric dams, highways, commercial and residential real estate, and agriculture has obscured or destroyed much of this evidence. While there has been continual development in the region, there are still places that remain largely undisturbed. Within these undisturbed portions of the landscape there is a potential that evidence of past human behavior may be present in the archaeological record. The history of the Mid-Columbia Basin includes three distinct periods of human occupation; the Pre-Contact period, the Euro-American period, and the Manhattan Project period.

Columbia Plateau/Mid-Columbia Basin Pre-Contact Cultural Sequence

Archaeological investigations conducted on the Columbia Plateau enabled the creation of a cultural chronology dating back to the end of the Pleistocene. Table 1 summarizes the pre-contact cultural sequence for the PNNL Site area.

TABLE 1

Pre-contact Cultural Sequence at Hanford

Cultural Period	Years Before Present	Site Types	Architecture	Subsistence
General Columbia Plateau				
Windust Phase	11,000 – 8,000	Rock shelters, caves, game processing sites, lithic reduction sites; isolated lithic tools. Examples include: Marmes Rockshelter, Bernard Creek, Lind Coulee, Kirkwood Bar, Deep Gully, Granite Point, Fivemile Rapids, and Bobs Point	Rock shelters and caves; open habitation sites. No evidence of constructed dwellings or storage features	Large mammals supplemented with small mammals and fish. Toolset: Windust, Clovis, Folsom, and Scottsbluff points; contracting stemmed points and/or lanceolate points; cobble tools.
Mid-Columbia Region—Vantage Area				
Cascade / Vantage Phase	8,000 – 4,500	Lithic scatters, quarry sites, resource processing sites, temporary camps	Rock shelters and caves; open habitation sites.	Mobile, opportunistic foragers subsisting on fish, mussels, seeds, and mammals. Basalt leaf-shaped Cascade and stemmed projectile points, ovate knives, edge-ground cobble tools, microblades, hammerstones, core tools, and scrapers.
Frenchman Springs Period	4,500 – 2,500	Habitation sites along major rivers, confluences, tributaries, canyons, and rapids. Lithic scatters, quarry sites, resource processing sites, Seasonal round of upland to lowland travel for resource procurement; seasonal camps.	House dwellings, including semi-subterranean	As earlier, but with increased use of upland resources, seeds and roots. Groundstone and cobble tools, mortars, pestles, contracting stemmed, corner notched, and stemmed projectile points, hopper mortar bases and pestles, knives, scrapers, and gravers. Wider tool material variety.

TABLE 1

Pre-contact Cultural Sequence at Hanford

Cultural Period	Years Before Present		Site Types	Architecture	Subsistence
Cayuse Phase	I	2,500 – 1,200	Habitation sites at major rivers, confluences, tributaries, canyons, and rapids. Lithic scatters, quarry sites, resource processing sites, seasonal round camps. Ideological and spiritual sites.	Pithouses with wall benches	Reliance on riverine resources, fish, and botanicals; basal-notched and corner-notched projectile points (most corner - notched); variety of tools including groundstone, scrapers, lanceolate and pentagonal knives, net weights, cobble tools, drills, etc.
	II	1,200 – 900	Same as Cayuse Phase I	Pithouses without wall benches	Same as Cayuse Phase I
	III	900 – 250	Increased mobility and hunting ability due to horse introduction. Large village habitation sites along rivers, seasonal round camps. Same site types as Cayuse Phases I & II	Pit longhouse village sites	Decrease in corner notched points, increase in stemmed and side-notched projectile points, fine pressure flaked tools. Increase in trade goods.
Sources: Morgan et al. (2001); Walker (1998); Sharpe and Marceau (2001a); Swanson (1962); Nelson (1969); Galm et al. (1981); Benson et al. (1989); Thoms et al. (1983); Green (1975); Rice (1980)					

Ethnographic Period

Ethnographically, the Sahaptin speaking Cayuse, Walla Walla, Palouse, Nez Perce, Umatilla, Wanapum, and Yakama utilized the project area. During this period, local residents relied on a pattern of seasonal rounds that included semi-permanent residences in villages along major waterways during the winter months. With the arrival of spring, small groups living in temporary camps would travel into the canyons and river valleys to gather roots. Seasonal camps were utilized in the inland areas during the spring and early summer months. By late summer or early fall, seasonal rounds focused on ripening berries in the mountains. It was this time of the year when the acquisition of food came to an end and families returned to the winter villages (Bard and McClintock 1996, Dickson 1999, Chatters 1980, and Galm et al. 1981).

Euro-American Period

The Lewis and Clark expedition of 1805 began the Euro-American exploration and settlement of the region. The explorers sought trade items from Native Americans and trade routes were established. Gold miners, livestock producers, and homesteaders soon followed. By the 1860s, the discovery of gold north and east of the mid-Columbia region resulted in an influx of miners traveling through the area. Ringold, White Bluffs, and Wahluke were stops along the transportation routes used by miners and the supporting industry. Numerous features created by Euro-American and Chinese are believed to be gold mining related, and remain along the shoreline of the Hanford Reach (Sharpe 2000). The mining industry created a demand for beef, and the Columbia Basin turned out to be ideal for livestock production.

An increase in Euro-American settlement began in eastern Washington in the late 1800s. The initial permanent settlement of non-Indians into the area began slowly with livestock producers who discovered that the area was very suitable for the production of cattle. Pasture was abundant and free for the taking. Ranchers relied on the abundant bunch grass and open rangeland to graze thousands of cattle and later sheep and horses. The open range lasted from the 1880s to ca. 1910 when homesteaders settled the area and plowed the rangeland to plant crops. However, livestock remained an important economic commodity to the area's agricultural producers. Cattle became confined by fences, while sheep pastured on remaining open range of Rattlesnake Mountains and Horse Heaven Hills (Fridlund 1985). Agricultural producers gradually replaced the open-range livestock operations that had dominated the area in the latter part of the 1800s and early 1900s.

Homesteaders removed unwanted sagebrush and bunchgrass and plowed the land. The Homestead Act of 1862 enabled legal land ownership to those 21 years of age or older who were willing to live on and develop the land (DOE-RL 1997). Circa 1900, homesteaders moved west, travelling by railroad to the Columbia Basin area. Local

transportation systems were very limited at that time; many of the Hanford area settlers arrived by river transportation. Steamboat and ferry service were the primary transportation systems on the Columbia River in the homesteading era (Sharpe 2001). New agricultural towns of Hanford and White Bluffs as well as small communities of Allard-Vernita, Wahluke, and Fruitvale, and local rural residents relied almost exclusively on river transportation during the early development of the area.

The southern Columbia Basin area was unique because it produced ripe agricultural crops and orchard fruit two to three weeks ahead of surrounding areas, resulting in higher profits. In the early 1900s, dryland wheat and livestock were the primary agricultural commodities in Benton County. As farming increased, water resources other than rainfall were needed to produce higher crop yields. Many irrigation projects began; most were privately and insufficiently funded. Land speculators began constructing large-scale irrigation canals to supply water to thousands of acres in the White Bluffs, Hanford, Fruitvale, Vernita, and Richland areas (Sharpe 1999). However, poor economic conditions associated with the Great Depression of the 1930s created economic hardships on local residents. The hardship continued until the government took over the area under the Wars Power Act (Marceau et.al. 2003).

Manhattan Project Era

In 1942, the area around Hanford, Washington was selected by the Federal government as one of the three principal Manhattan Project sites. Occupying portions of Grant, Franklin, and Benton Counties, the Hanford Site was created to support the United State's plutonium-production effort during World War II. Plutonium production, chemical separation, and research and development focused on process improvement were the primary activities during the Manhattan Project, as well as the subsequent Cold War Era. The industrial components of the Manhattan Project and Cold War Era are located in discrete areas throughout the site. Reactors in the 100 Areas were used to irradiate uranium fuel to produce plutonium. The 200 Areas are where the chemical separation facilities used to extract the plutonium from the irradiated fuel were located. The 300 Area was where the uranium fuel was manufactured prior to being delivered to the reactors in the 100 Area for advanced power plants. The 600 Area is a broad expanse between the production areas that contained the infrastructure such as roads and rail systems that served the entire site. The 700 Area was the administration area in Richland (Marceau 1998).

Literature Review

A literature review was conducted by Heather Hay on April 11, 2012, through the DOE/PNSO Cultural and Historic Resources Program (CHRP) Records and Cultural Resource GIS Database and online through the Washington State Department of Archaeology and Historic Preservation (DAHP) Washington Information System for Architectural and Archaeological Records Data (WISAARD) electronic database.

The literature review identified that 18 Cultural Resources Reviews (CRRs) have been conducted within a 500 meter (1,640 foot) radius of the APE (Table 2, Figure 3). Of the 29 CRRs, three have been conducted within the APE (Table 2). Information obtained from the WISAARD GIS Database is not provided on Figure 3.

TABLE 2
Cultural Resource Reports Within 500 Meters (1,640 feet) of the APE

HCRC#	Title	Reference	Within APE
HCRC#89-300-023	*Cultural Resources Review of the Proposed Environmental and Molecular Sciences Laboratory.*	Chatters 1990	
HCRC#89-300-026	*Cultural Resources Review of the Proposed Horn Rapids Irrigation Pipeline.*	Cadoret 1989	
HCRC#89-300-027	*Cultural Resources Review of the HEHF-EHS Facility.*	Minthorn 1990a	
HCRC#90-300-025	*Cultural Resources Review of the Molecular Sciences Research Laboratory: Site Selection.*	Gard 1990	x
HCRC#90-600-012	*WPSS Fiberoptic Telecommunications Cable.*	Minthorn 1990b	

TABLE 2
Cultural Resource Reports Within 500 Meters (1,640 feet) of the APE

HCRC#	Title	Reference	Within APE
HCRC#93-300-063	Review could not be located at the Department of Energy Cultural and Historic Resources Library.		
HCRC#94-3000-002	*The Cultural Resources Investigation of Site 6 for the Environmental Molecular Sciences Laboratory on the Hanford Site.*	Wright & Cadoret 1994; Nickens 1994	x
HCRC#95-300-056	*300 Area Survey*	Cadoret 1995	
HCRC#95-600-008	*Cultural Resources Report Narrative Horn Rapids Landfill Cap.*	Wright 1994	
HCRC#97-1100-003	*Assessment of the 1100 Area Archaeological Sites.*	Cadoret et al. 1999	
HCRC#2003-300-013	*Cultural Resources Review of PNNL Capability Replacement Laboratories Construction Site.*	Prendergast-Kennedy 2004	
HCRC#2011-PNSO-003	*Cultural Resources Review of Upgrades to the Physical Sciences Facility Trailer Graveled Parking Area on the Pacific Northwest National Laboratory Site, Benton County, Washington.*	Hughes 2011a	
HCRC#2012-300-009	*Cultural Resources Review for the City of Richland 300 Area Electrical Service Project, Hanford Site, Richland, Washington.*	Mendez et al. 2012a	
HCRC#2012-PNSO-003	*Cultural Resources Review for the Installation of an External Vestibule at the North End of Corridor 1011 of the Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory, Richland, Washington.*	Mendez 2012a	
HCRC#2012-PNSO-014	*Blanket Cultural Resources Review for Routine Maintenance and Minor Facility Upgrades to the Physical Sciences Laboratory (PSF) and the Environmental Molecular Sciences Laboratory (EMSL) Facilities, Pacific Northwest National Laboratory, Richland, Washington.*	Mendez et al. 2012b	x
HCRC#2012-PNSO-019	*Cultural Resources Review for the Installation of Five Water Flow Meters, Pacific Northwest National Laboratory Site, Benton County, Washington.*	Hay et al. 2012	
HCRC#2013-PNSO-002	*Blanket Cultural Resources Review of Routine Maintenance and Minor Facility Upgrades to the Pacific Northwest National Laboratory South Campus, Benton County, Washington.*	Hay et al. 2013	
NADB#1682940	*Cultural Resources Assessment of the Port of Benton Technology and Business Campus George Washington Way Sidewalk Project.*	Stapp & Knobbs 2012	

The location of the EMSL was chosen with extensive research, archaeological testing, and Tribal consultation. The report *The Cultural Resources Investigation of Site 6 for the Environmental Molecular Sciences Laboratory on the Hanford Site* (Wright & Cadoret 1994) documents the research, testing, and consultation with Tribes (Appendix C) that has occurred within the project area. Below is a short summary of that research, testing, and consultation.

In 1990, a Section 106 review was completed for the original construction location for the Environmental Molecular Sciences Laboratory (EMSL), *Cultural Resources Review for the Molecular Science Research Laboratory: Site Selection, HCRC#90-300-025* (Gard 1990). At that time it was determined that no cultural or historic properties existed within the project area.

This review identified previously recorded cultural resources within a 500 meter (1,640 foot) radius of the APE. No cultural resources are located within the APE. Based on available information there are no previously identified Traditional Cultural Properties (TCPs) within the APE. The APE is located more than 400 meters (1,312 feet) away from the Columbia River. The nearby cultural resources are identified and described below in Table 3.

Research Design

The literature review and cultural context provided a basis to develop a research design for this project. The research design includes investigation of existing cultural resource and historical information, analysis of

geomorphological data, the use of Geographic Information Systems (GIS) and archaeological fieldwork to address potential effects to cultural resources.

Geographic Information Systems (GIS) Data

To support field work for this project, existing GIS data were requested from the MSA CHRP database. GIS data showed areas previously surveyed for cultural resources as well as existing site boundaries and associated attribute data (e.g. Smithsonian trinomials). Once received, this information was overlaid upon the APE map. This information was used to support the literature review, field activities, and aid in the interpretation of potential site boundaries, site chronology, and site functions.

Objectives

The objectives of the Cultural Resource Review were to comply with the Section 106 process of the NHPA of 1966 as amended, specifically CFR 800(3) to determine if there is a potential to cause effects to NRHP eligible historic properties.

Expectations

The literature review indicated that no known archaeological or historic sites exist within any portion of the APE. Because there are no archaeological or historic sites within the APE, the undertaking is not expected to have an effect on NRHP eligible historic properties. For an undertaking to have an *adverse* effect it must be demonstrated that the undertaking may alter any of the characteristics of a historic property which qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. The information presented in this review will be used to assess whether or not project activities will affect historic properties.

Field Methods

An archaeological survey was conducted as part of this Section 106 Review on April 15, 2013. The survey was conducted by Heather Hay (CH2M HILL). The survey consisted of walking the current surface of the APE in its entirety. Due to the presence of buildings, roads, parking lots, and various other facilities traditional survey techniques could not be utilized. All areas identified as previously disturbed were inspected to ensure the presence of disturbance.

Survey Results

The APE is located within the previously disturbed footprint of the EMSL facilities and associated infrastructure. The APE currently contains paved sidewalks, roads, parking lots, buildings, engineered landscaping and various other facilities (Photographs in Appendix B). Weather conditions were clear and sunny. No natural ground surface exists within the APE. Access to the APE was confirmed and will be through existing roadways, parking lots, and walkways. No cultural materials were observed during the survey.

Findings

The research conducted for this project includes a literature review of cultural resources data and historical information, an analysis of geomorphologic data, the use of GIS, and archaeological fieldwork. Geomorphologic research identified one sedimentary deposit within the APE and within 500 meters (1,640 feet) of the APE. The project area is located more than 400 meters (1,312 feet) away from the Columbia River. Based on available information there are no previously identified TCPs within the APE. The literature review and archaeological fieldwork identified 18 CRRs and cultural resources within 500 meters (1,640 feet) of the APE. Based on the literature review and fieldwork, no cultural resources or historic properties exist within the APE. A cultural resources review was conducted in 1994 for the construction of the EMSL facility (Wright and Cadoret 1994; Nickens 1994). Investigations conducted during that review showed that the site had witnessed numerous disturbances in the past from activities associated with the installation of an irrigation canal, agricultural activities, and the construction of Camp Hanford. Findings of the report state that "following the completion of a baseline

field survey, subsurface excavation, soil depth probes, soil conductivity, and ground penetrating radar tests, it has been determined that construction of EMSL will not adversely affect any cultural resources that are eligible or potentially eligible for listing on the National Register of Historic Places." Cultural resource monitoring of excavations associated with the EMSL site was conducted and no sensitive cultural materials were discovered (DOE/PNSO 2008).

Conclusion

This project includes the construction of new facilities and infrastructure or additions to existing facilities on the South Federal Campus in Richland, Washington. The project includes construction and operation of up to 100,000 sq ft of state-of-the-art facilities and associated infrastructure. Activities associated with this project will take place within areas that have been previously disturbed during the construction of the EMSL facilities and their associated infrastructure. Since previous Section 106 reviews have been conducted for the construction of the EMSL facilities all potential impacts to historic properties have been previously considered. The cultural resources review conducted for this project included a literature review, geomorphological analysis, and archaeological survey. The project area is located more than 400 meters (1,312 feet) away from the Columbia River. Based on available information there are no previously identified TCPs within the APE. No historic properties were identified within the APE. Access routes will be through existing roadways, parking lots, and walkways. Based on the results of this Section 106 Review this project, as proposed, will result in a finding of "No Historic Properties Affected."

This request was prepared by Heather Hay and approved by Keith Mendez, who meets the Secretary of the Interior's Standards for Professional Archaeologists.

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Appendix A
APE Correspondence

DEPARTMENT OF
ARCHAEOLOGY &
HISTORIC PRESERVATION
Protect the Past. Shape the Future

Allyson Brooks Ph.D., Director
State Historic Preservation Officer

April 9, 2013

Ms. Theresa Aldridge
Department of Energy
Pacific Northwest Site Office
Richland, WA 99352

RE: South Federal Campus Development Project
HCRS # 2013-PNSO-012
Log No.: 040913-09-DOE

Dear Ms. Aldridge:

Thank you for contacting our department. We have reviewed the materials for the proposed *South Federal Campus Development Project* at the Pacific Northwest Laboratory, Richland Campus, Benton County, Washington.

We concur with your determination of the Area of Potential Effect (APE). We look forward to the results of your cultural resources survey, consultations with the concerned tribes, and determination of effect.

We would appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

These comments are based on the information available at the time of this review and on the behalf of the State Historic Preservation Officer in conformance with Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800.

Should additional information become available, our assessment may be revised. In the event that archaeological or historic materials are discovered during project activities, work in the immediate vicinity must stop, the area secured, and this department notified. Thank you for the opportunity to comment and a copy of these comments should be included in subsequent environmental documents.

Sincerely,

Robert G. Whitlam, Ph.D.
State Archaeologist
(360) 586-3080
email: *rob.whitlam@dahp.wa.gov*

State of Washington • **Department of Archaeology & Historic Preservation**
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Appendix B
Photographs

HCRC#2013-PNSO-012

Photograph 1. APE north of EMSL and south of Horn Rapids Road. Aspect: West

Photograph 2. APE east of EMSL and west of Innovation Blvd. Aspect: North

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Photograph 3. APE between EMSL and CSF. Aspect: North

Photograph 4. APE between EMSL and BSF. Aspect: Southeast

HCRC#2013-PNSO-012

Photograph 5: The western APE boundary is near the left hand edge of the road. Aspect: North

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Appendix C
CRR Correspondence

HCRC#2013-PNSO-012

DEPARTMENT OF ARCHAEOLOGY & HISTORIC PRESERVATION
Protect the Past. Shape the Future.

Allyson Brooks Ph.D., Director
State Historic Preservation Officer

April 29, 2013

Ms. Theresa Aldridge
Department of Energy
Pacific Northwest Site Office
Richland, WA 99352

Re: South Federal Campus Development Project
HCRS # 2013-PNSO-012
Log No.: 040913-09-DOE

Dear Ms. Aldridge;

Thank you for contacting our department. We have reviewed the professional archaeological survey report for the proposed *South Federal Campus Development Project* at the Pacific Northwest Laboratory Site, Benton County, Washington.

We concur with your determination of No Historic Properties Affected. We request a professional archaeological monitoring plan. Please provide the draft plan when available.

We would appreciate receiving any correspondence or comments from concerned tribes or other parties that you receive as you consult under the requirements of 36CFR800.4(a)(4).

In the event that archaeological or historic materials are discovered during project activities, work in the immediate vicinity must stop, the area secured, and this department notified.

These comments are based on the information available at the time of this review and on the behalf of the State Historic Preservation Officer in conformance with Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations 36CFR800. Should additional information become available, our assessment may be revised. Thank you for the opportunity to comment and a copy of these comments should be included in subsequent environmental documents.

Sincerely,

Robert G. Whitlam, Ph.D.
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Appendix D
Monitoring Plan

HCRC#2013-PNSO-012

South Federal Campus Development, Pacific Northwest National Laboratory, Richland, Washington (HCRC#2013-PNSO-012)

Introduction

A Section 106 Review has been conducted for the South Federal Campus Development Project. In response to a request from DAHP and tribal consultants, cultural resources monitoring is recommended for ground-disturbing activities that will take place within the APE. Monitoring will consist of a single visit to the project area once surface clearing activities have reached native soils. The purpose of the monitoring is to verify the results of investigations conducted during initial construction.

Pre-Project

To assure monitoring is conducted as recommended, the cultural resources monitor (monitor) must be notified in a timely manner prior to the start of project-related activities. Cultural resources staff must be given enough time to notify the State Historic Preservation Officer (SHPO), area Tribes, and interested parties and allow for participation by Tribal members.

Prior to the initiation of project activities, all personnel will be given a cultural resources awareness briefing to assure they understand the roles and responsibilities of the monitor, the limitations being placed on the work to be conducted, and the procedures to follow in the event of a discovery.

Monitoring Procedures

It is recommended that a monitor is present during the initiation of ground-disturbing activities in the APE to inspect the subsurface sediments to determine if the inferences regarding previous disturbance and lack of cultural bearing deposits are accurate. The monitor will be given adequate opportunity to inspect all portions of the work area or disturbed surface for the presence of cultural materials. The monitor will be present to inspect cleared ground and excavated areas for signs of previously undiscovered archaeological resources. The monitor will maintain monitoring notes describing the field conditions, type of equipment being used, progress, and activities, and record any finds of archaeological material for each day that he or she is present. The monitor will keep daily field notes and take photographs. Photographic documentation of all monitored activities will include photographs before, during, and after ground-disturbing activities.

Post Review Discoveries

The monitor will follow 36 CFR 800.13(b)(3) in the event of a post-review discovery. In the event archaeological materials are encountered during monitoring, the monitor will stop project-related activities within the immediate vicinity of the discovery. The monitor will evaluate whether significant cultural resources are present and, if so, whether or not they will be adversely affected by continuing operations. The types of cultural resources that may be encountered include prehistoric artifacts (e.g., grinding stones, fire-cracked rock, shell fragments, projectile points, lithic materials, bone, and cobble tools). Historic artifacts may include glass bottles, ceramic objects, metal objects, building foundations, bricks, concrete, or other indicators. The monitor will be responsible for directing project-related activities away from the newly identified cultural resources.

The area of the discovery will be delineated using flagging tape, rope or some other means to assure project activities do not continue in the area of the discovery. The monitor will notify the field construction manager and contact the DOE cultural resources manager or designee and the SHPO. Excavation in the immediate vicinity of the discovery will remain stopped to avoid any additional impacts to the discovery until significance is determined and an appropriate treatment can be identified and implemented through consultation between the project manager, DOE, SHPO, and the Tribes. During this period, excavation activities outside the find area will continue.

If the newly identified cultural resources are determined to be either an isolate or a site, the monitor or designated cultural resources specialist will document the discovery and prepare an isolate or site form and request a Smithsonian trinomial from SHPO. Isolate discoveries will be collected and remediation will continue. Isolate finds will be reported in a final project monitoring report. If the discovery is a site, an evaluation will be conducted to determine if it requires further testing or other mitigation measures. Site avoidance will be the

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preferred method of dealing with cultural resources during remediation activities. Site avoidance will include the placement of fencing around the site to maintain a physical boundary.

Evaluation of the site will consist of assessing the integrity of the site, inventorying artifacts, conducting test investigations either by shovel test units or test excavation units to determine whether the site is eligible for listing in the National Register of Historic Places. If the site is determined to be not eligible, then project activities may proceed. If the site is determined to be eligible, mitigation may be necessary. Mitigation measures will be determined through consultation with DOE, SHPO and the Tribes.

Discovery of Human Remains

If ground-disturbing activities encounter human skeletal remains during the course of construction, then all activity must cease that may cause further disturbance to those remains and the area of the find must be secured and protected from further disturbance. In addition, the finding of human skeletal remains must be reported to the county medical examiner/coroner and local law enforcement in the most expeditious manner possible. The remains should not be touched, moved, or further disturbed.

The county medical examiner/coroner will assume jurisdiction over the human skeletal remains and make a determination of whether those remains are forensic or non-forensic. If the county coroner determines the remains are non-forensic, then they will report that finding to the Department of Archaeology and Historic Preservation (DAHP) who will then take jurisdiction over the remains and report them to the appropriate cemeteries and affected Tribes. The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report that finding to any appropriate cemeteries and the affected Tribes. The DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains.

Cultural Resource Monitor

The monitor will have, at a minimum, an undergraduate degree in anthropology, archaeology, historic archaeology, or a related field and at least one (1) year of professional archaeological experience or equivalent specialized training. The monitor's actions and activities will be reviewed on a daily basis by a cultural resource professional meeting the Secretary of Interior standards for professional archaeologists.

Monitoring Report

A monitoring report will be prepared following the completion of monitoring for each phase of the project. The report will include text and photographs of the monitored activities. The report will be submitted to DOE/PNSO and DAHP upon completion.

Appendix B

Biological Resource Review

During the public comment review for the draft South Federal Campus Development Environmental Assessment (EA), a title change was requested and has been implemented in this final EA. This change is administrative in nature and does not affect any technical aspect of the document—the purpose, need, and scope of this final EA are unchanged from those in the draft. No technical changes were made due to public comment review. The new title for the final EA is ***"Environmental Assessment for Future Development in Proximity to the William R. Wiley Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory, Richland, Washington.*** Because the biological resource review in this appendix was finalized using the draft EA title "Environmental Assessment for Future Development on the South Federal Campus, Pacific Northwest National Laboratory, Richland, Washington" and no technical changes were made due to public comment review, the original title for the draft EA remains in this biological resource review.

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Appendix B

Biological Resource Review

Pacific Northwest
NATIONAL LABORATORY

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April 15, 2013

Mr. Joe Cruz
Pacific Northwest Site Office
P.O. Box 999, MSIN J2-33
Richland, WA 99352

Dear Mr. Cruz:

BIOLOGICAL REVIEW FOR THE SOUTH CAMPUS DEVELOPMENT PROJECT ENVIRONMENTAL ASSESSMENT (SCD EA), PNSO SITE, ECR #2013-PNSO-012

Project Description:

The Pacific Northwest National Laboratory (PNNL) is a multi-program national laboratory conducting research for DOE strategic objectives. To enable continued research support, DOE is proposing to construct new facilities and infrastructure on the South Federal Campus in Richland, Washington. The project includes construction and operation of up to 100,000 square feet of state-of–the-art facilities and associated infrastructure on the South Federal Campus, PNNL Site, Richland, Washington. The scope includes the following:

infrastructure:
- water -- potable water, irrigation, and fire protection
- sanitary sewer
- electrical power
- communication
- natural gas
- service road

general purpose laboratories, including:
- chemistry laboratories
- instrumentation laboratories
- biology laboratories
- other supporting facilities as needed

Survey Objectives:

Determine occurrence within the area of potential effect (APE) (Figure 1) of any plant or animal species protected under the federal Endangered Species Act (ESA) including

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candidates for such protection; species listed as threatened, endangered, candidate, sensitive, or monitor, by the state of Washington; and species protected under the Migratory Bird Treaty Act (MBTA).

Evaluate and quantify the potential impacts of disturbance on priority habitats and protected plant and animal species identified in the survey.

Survey Methods:

Pedestrian and visual reconnaissance of the APE for the South Campus Development project was performed by J. M. Becker April 9, 2013. Direct and indirect wildlife observations and observations of habitats and plant species were recorded.

Lists that document Washington State priority habitats and species of concern are maintained by the Washington Department of Fish and Wildlife (2008, 2013) and Washington State Department of Natural Resources (2012). Lists documenting the plant and animal species with federal endangered, threatened, proposed, or candidate status are maintained at 50 CFR 17.11 and 50 CFR 17.12. A listing of migratory birds protected under the MBTA is maintained by the US Fish and Wildlife Service (2012).

Survey Results:

Habitat

The habitats and plant species in the project APE are all ornamental and were established for landscaping purposes. Habitat consists of extensive areas of lawn that is dissected by walkways, roads, and parking lots that are bordered by rows of different varieties of ornamental trees (e.g., American sycamore [*Platanus occidentalis*], Japanese Zelkova [*Zelkova serrata*]) and shrubs (e.g., red twig dogwood [*Cornus sericea*]).

Wildlife

Wildlife observed consisted of species known to use developed, landscaped habitats. Black-billed magpies (*Pica pica*) were the most abundant wildlife species that was directly or indirectly observed, followed by the rock dove (*Columbia livia*), American robin (*Turdus migratorius*), and American goldfinch (*Spinus tristis*).

The below nests noted as being old (constructed during the last or a previous year) were assumed to be so based on the absence of birds during a brief period of observation during the survey. Thus, while it appeared that the nests were old, it is not known with certainty that the nests were not new (constructed during this year).

Two old magpie nests were observed in the sycamore trees that line the south margin of Horn Rapids Road on the north side of the Environmental Molecular Sciences

Laboratory (EMSL). One old magpie nest was observed in the sycamore trees that line the west margin of Innovation Boulevard on the northeast side of EMSL. One old magpie nest was observed in the trees in the (only) alcove located at the southwest corner of EMSL. Two new magpie nests in use by four adult magpies were observed in the Zelkova trees in the second alcove located at the southeast corner of EMSL (Figure 2). It was not determined whether these two nests were active (contained eggs or young) or not. Two old magpie nests were observed in the Zelkova trees in the third alcove located at the southeast corner of EMSL (Figure 2). The beginning of a magpie nest was observed in the Zelkova trees in the fourth alcove located at the southeast corner of EMSL (Figure 2). It could not be determined with certainty whether the small amount of nest material observed in the fourth alcove was from this or a previous year. Adult magpies were observed in the trees and on the lawn in the southeastern corner of the APE.

One old nest of an unidentified bird species was observed in the trees in the alcove located at the southwest corner of EMSL. One old nest of an unidentified species was observed in a tree near the southeast entrance to EMSL. One old nest of an unidentified species was observed in a tree in the first alcove located at the southeast corner of EMSL (Figure 2). One old nest of an unidentified species was observed in a Zelkova tree on the east side of the bike path across from the second alcove located at the southeast corner of EMSL (Figure 2). One old nest of an unidentified species was observed in a Zelkova tree on the east side of the bike path across from the fourth alcove located at the southeast corner of EMSL (Figure 2).

Rock doves were observed on the EMSL roof, and evidence of previous use by rock doves was observed above the loading dock on the west side of EMSL. Perching and nesting deterrents have been used above the loading dock, and this location was not in use by rock doves during the survey.

An American robin was observed perching in the sycamore trees that line the western margin of Innovation Boulevard on the northeast side of EMSL.

An American goldfinch was observed perching in maple trees (*Acer* sp.) located in the parking lot at the north end of EMSL.

No other wildlife or evidence of wildlife use was observed during the survey.

Considerations and Recommendations:

- No plant or animal species protected under the ESA, candidates for such protection, or species listed by the state of Washington as threatened or endangered were observed in the APE.

- The birds, nests, and eggs of the above-noted species, except for the rock dove, are protected under the MBTA. Although unlikely, the nests noted above as

being old or unoccupied during the survey may become occupied during the nesting season (generally March 1 through July 31). Additional nests may be constructed by these or other species in the ornamental trees and shrubs or on the ground in the APE during the nesting season. Ground-nesting species such as killdeer (*Charadrius vociferous*), although not observed during the survey, could nest in gravel, dirt, bark, or sparsely vegetated substrate, or at the margins of lawn areas. Project activities may disturb trees, shrubs, and/or ground. Thus, if project activities occur during the nesting season, they may disturb the active nests of migratory birds. If project activities will occur during this (2013) or subsequent nesting seasons, the area to be disturbed must undergo a subsequent ecological review prior to conducting work, in order to identify the active nests of migratory birds and put measures in place to avoid disturbing them. In addition, nesting deterrents may be used to discourage nest placement in trees, shrubs, or on the ground in areas that would be disturbed, in order to minimize the risk of project delays that could result from the occurrence of an active nest in a work area. Subsequent ecological reviews should be coordinated by contacting Amanda Stegen (National Environmental Policy Act [NEPA] SME) at 372-4511.

- Assuming compliance with the above recommendations, no adverse impacts to protected species, priority habitats, or other biological resources of concern are expected to result from the proposed action.

Sincerely,

James M. Becker

James M. Becker
Pacific Northwest National Laboratory
Ecology Group

LB:jmb
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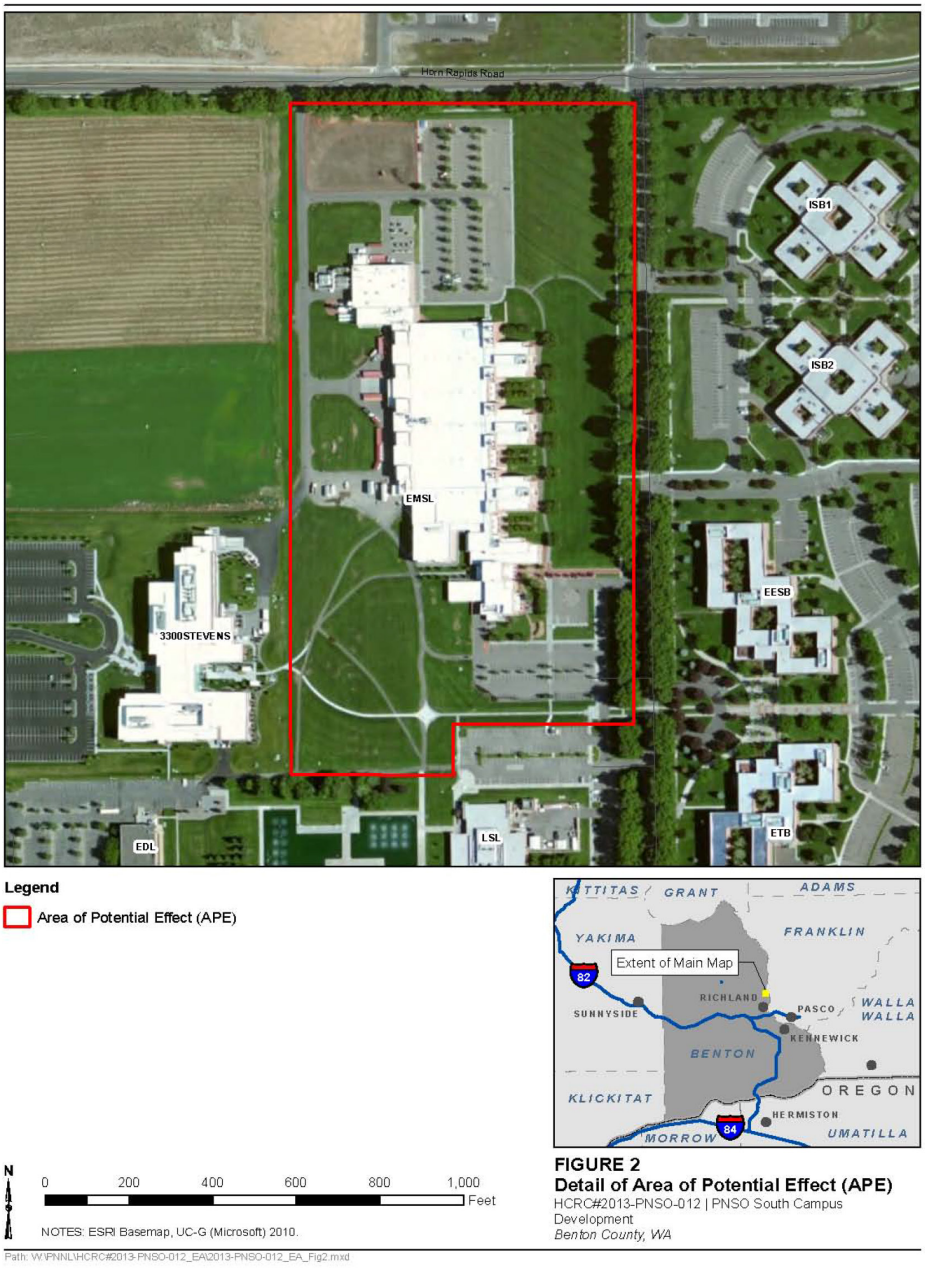

Figure 1. South Campus Development Project area of potential effect (APE).

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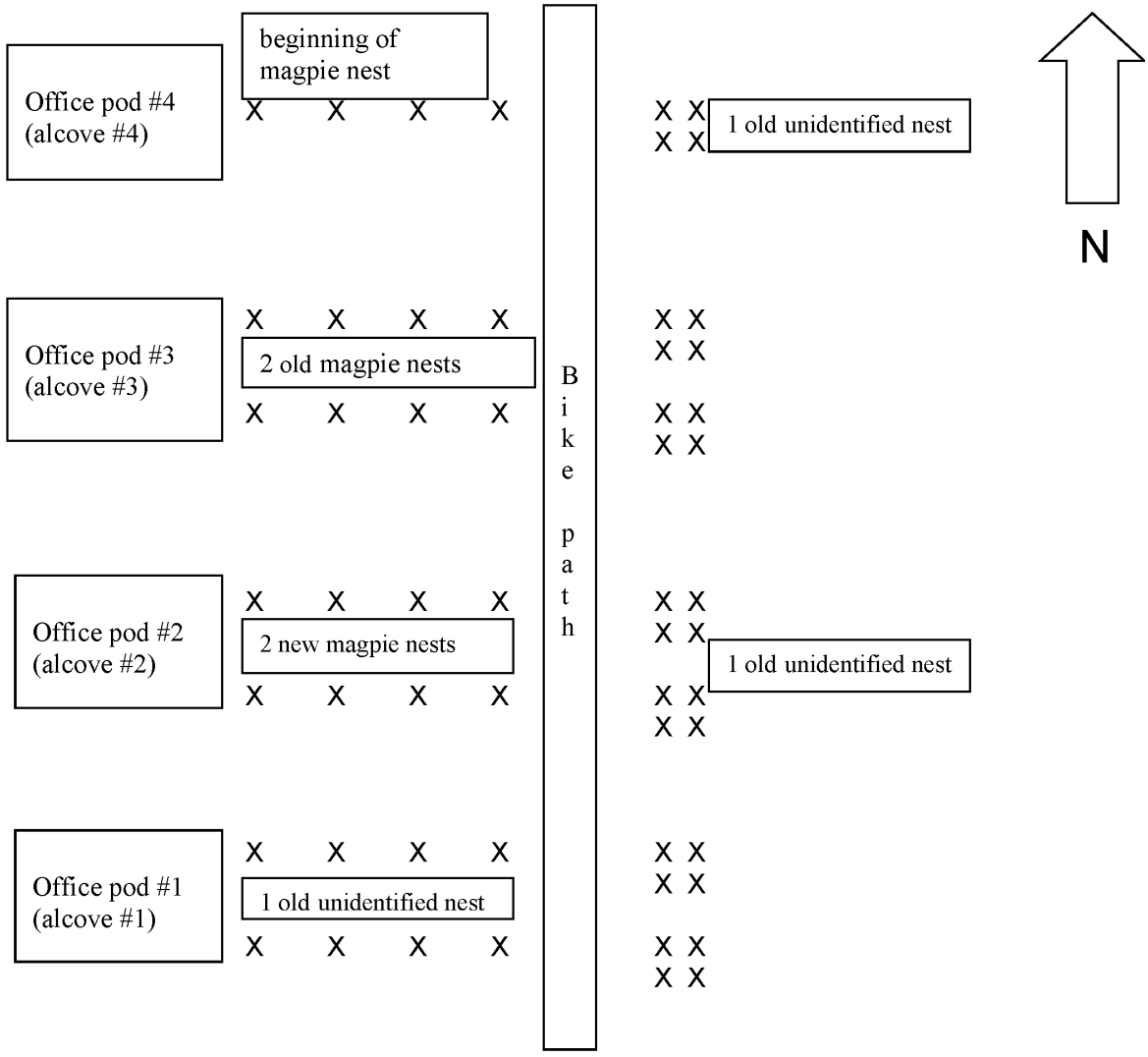

Figure 2. Locations of bird nests in Zelkova trees (X) in and around alcoves on the southeastern side of the EMSL.

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Appendix C

Air Emissions and Concentration Calculations

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Appendix C

Air Emissions and Concentration Calculations

This appendix describes the method used to estimate emissions and ambient air concentrations of the criteria air pollutants from operation of the proposed facilities and/or additions and proposed infrastructure as described in Section 5.1.2. It also contains estimates of the criteria air pollutants due to construction. Emissions and air concentrations of the federal hazardous air pollutants are compared to Washington State-acceptable source impact levels applicable to industrial sources.

C.1 Estimated Releases and Concentrations of Criteria Pollutants

The criteria pollutant emission rates from the boilers, shown in Tables 5.1 and C.1, were calculated based on the projected average natural gas consumption (90,000 therms/yr) adjusted to account for an extreme winter based on historical heating degree data. The boiler emission factors were based on vendor emission factors for nitrogen oxides (NOx), HC & CO for low-NOx (30 ppm) condensing boilers, the nominal sulfur content in natural gas, and EPA AP-42 emission factors for the other pollutants (EPA 2011).

Table C.1. Criteria Pollutant Annual and Peak Emission Rate Estimates for the Proposed Facilities and/or Additions and Proposed Infrastructure

	Natural Gas Boiler Emissions			Diesel Generator Emissions			R&D Emissions	Total
	Emission[(a)] Factors (lb/MMscf)	Annual Emissions (tpy)	Peak Emission rates (lb/hr)	Emission[(b)] Factors (lb/hr)	Annual Emissions (tpy)	Peak Emission rates (lb/hr)	Annual Emissions (tpy)	Annual Emissions (tpy)
NO_x	61.2	0.32	0.51	3.8	0.28	3.8	0.00104	0.60
SO_2	0.60	0.0031	0.0050	0.0063	0.00047	0.0063	5.8E-7	0.0036
CO	112	0.59	0.94	3.3	0.24	3.3	0.0241	0.86
PM	7.6	0.040	0.064	0.19	0.014	0.19	0	0.054
PM_{10}	7.6	0.040	0.064	0.19	0.014	0.19	0	0.054
VOC	10.2	0.053	0.085	3.8	0.28	3.8	0.076	0.41
Pb	5.0E-4	2.6E-6	4.2E-6	NA	NA	NA	2.4E-6	5.0E-6
	Max Gas Use, MMscf	10.46/yr	8.4E-3/hr	Max Operating Hours	150/yr			

(a) Manufacturer data and EPA AP-42 (EPA 2011)

(b) EPA Tier 3 emission standards (EPA 2011)

NA: no emission factor available

NO_x = nitrogen oxides; CO = carbon monoxide; SO_2 = sulfur dioxide; VOC = volatile organic compounds; PM_{10} = particulate matter less than 10 micrometers diameter; Pb = lead

Criteria pollutant emissions from the generator were calculated based on the projected required generator output and maximum hours of operation (i.e., 356 ekw and 150 hr/yr). The emission factors used were the U.S. Environmental Protection Agency (EPA; 40 CFR Part 89). Tier 3 nonroad engine emission standards.

Example calculations follow:

Natural gas boiler annual and maximum hourly emissions:
61.2 lb NOx/MMscf × 10.46 MMscf/yr × 1 ton/2000 lb = 0.32 tons per year (tpy)
61.2 lb NOx/MMscf × 0.0084 MMscf/hr = 0.51 lb/hr.

Diesel Generator Annual and Maximum Hourly Emissions:
3.8 lb NOx/hr × 150 hr/yr × 1 ton/2000 lb = 0.28 tpy
3.8 lb NOx/hr × 1 hr/yr = 3.8 lb/hr.

Air concentrations for comparison to the National Ambient Air Quality Standards (NAAQS; 40 CFR Part 50) were estimated using the Breeze® AERSCREEN dispersion model (Trinity Consultants 2013). NO_2 concentration calculations incorporated the Oxygen Limiting Model approach in AERSCREEN. AERSCREEN is an EPA model that is formulated to provide conservative estimates of the air concentration for all pollutants.

The annual criteria pollutant emissions from research and development in the proposed facilities and/or additions and proposed infrastructure were calculated based on historical usage in existing similar laboratories and scaled to the proposed facilities on the basis of square footage. The estimated usage was based on the most recent 3 years of data contained in the PNNL Chemical Management System database. To estimate the emissions, release fractions of 100 percent for gases, 10 percent for volatile liquids, 0.1 percent for liquids, and 0.0001 percent for solids were applied to the usage. No emission controls were assumed to be in place.

The resulting annual and short-term emission rates (see Table 5.2 and Table C.1) were used with the AERSCREEN model to estimate the ambient air concentrations at the nearest point of potential public exposure.

C.2 Estimated Releases and Air Concentrations of Other Chemicals

The emissions of federal hazardous air pollutants from research activities were estimated and their ambient air concentrations modeled with AERSCREEN. The chemicals that were 1 percent or more of the Washington State-acceptable source impact levels (i.e., concentrations) are ranked from highest (hydrazine at 11 percent) to lowest in Table C.2.

Table C.2. Research Chemicals Predicted to Yield the Highest Percentages of Washington State-Acceptable Source Impact Concentrations in the Proposed Facilities and/or Additional Facilities and Proposed Infrastructure

Chemical	Annual Usage (kg)	Percent of Acceptable Impact Levels
Hydrazine	0.11	11
Chloroform	7.9	4
Chlorine	0.018	2
Carbon tetrachloride	2.0	2
1,3-butadiene	0.04	2
Mercury	0.34	1
Ethylene dichloride	1.5	1

Ethylene oxide	0.028	1

Chemical usage was estimated from PNNL Chemical Management System data based on the volume of the chemical containers removed from inventory plus one-half of the volume of the containers still in inventory. Release fractions of 100 percent for gases, 10 percent for volatile liquids, 0.1 percent for liquids, and 0.0001 percent for solids were applied to the usage to estimate the emissions. No emission controls were assumed to be in place.

C.3 Estimated Emissions of Criteria Pollutants and Greenhouse Gases from Construction Equipment

Table C.3 lists the major types, number, sizes, and operating hours for construction equipment expected to be required during construction of the proposed facilities and/or additions and proposed infrastructure.

Table C.3. Construction Equipment Emissions

Major Construction Sources	Number in Use	Size (hp)	Total Engine (hr/yr)	CO (tons)	Total Organic Carbon (tons)	SOx (tons)	NOx (tons)	PM-10, (tons)
Portable lighting units	3	50–100	270	0.09	0.03	0.03	0.42	0.03
Portable generators	1	50–100	600	0.20	0.07	0.06	0.93	0.07
Backhoe/loader	1	50–100	600	0.20	0.07	0.06	0.93	0.07
Forklift	2	50–100	1,200	0.40	0.15	0.12	1.86	0.13
Asphalt paver	1	100–175	24	0.01	0.01	0.00	0.07	0.00
Asphalt roller	1	100–175	24	0.01	0.01	0.00	0.07	0.00
Vibratory compactor	1	100–175	60	0.04	0.01	0.01	0.16	0.01
Concrete pumper	1	100–175	30	0.02	0.01	0.01	0.08	0.01
Water tanker	1	100–175	96	0.06	0.02	0.02	0.26	0.02
Excavator	1	100–175	60	0.04	0.01	0.01	0.16	0.01
Bulldozer	1	175–300	24	0.02	0.01	0.01	0.11	0.01
Motor grader	1	175–300	60	0.06	0.02	0.02	0.28	0.02
Wheel loader	1	175–300	24	0.02	0.01	0.01	0.11	0.01
Crane – 35 ton	1	175–300	600	0.60	0.22	0.18	2.79	0.02
Concrete truck	1	175–300	30	0.03	0.01	0.01	0.14	0.01
Scraper	2	300–600	48	0.10	0.04	0.03	0.45	0.03
Dump truck	2	300–600	120	0.24	0.09	0.07	1.12	0.08
Crane – 50 ton	1	300–600	144	0.29	0.11	0.09	1.34	0.10
			Total	2.4	0.9	0.7	11	0.8
EPA AP-42 Emissions Factors, lb/hp-hr[(a)]				6.7E-03	2.5E-03	2.0E-03	3.1E-02	2.2E-03

(a) EPA 2011

The anticipated annual emissions of criteria pollutants were estimated using the EPA AP-42 emission factors (EPA 2011) for small diesel engines shown in the bottom row of Table C.3. Emissions were calculated using the horsepower at the high end of the typical range to maximize the estimates for each

equipment type as shown in the below example calculation. Therefore, it is expected that the actual emissions would be less than those shown in Table C.3.

Portable lighting units (50-100 hp) CO emissions:
6.68×10^{-3} lb of CO/hp-hr × 100 hp × 270 hours × 1 ton/2000 lb = 0.09 tons

Emissions of the greenhouse gas (GHG) CO_2 during construction were estimated using the CO_2 emission rates for construction equipment diesel engines (Gallivan et al. 2010) shown in Table C.4. Emissions were calculated by multiplying the MT of CO_2 per hour for each type of equipment times the estimated total hours of engine use during construction. Total emissions are estimated to be 155 MT (170 tons). Diesel combustion also emits methane and nitrous oxide. However, these GHG emissions only add approximately 1 percent in terms of the CO_2-equivalents and, therefore, are not listed.

Table C.4. Greenhouse Gas Emission from Construction Equipment

Major Construction Sources	Total Engine (hr/yr)	Emission Rates[(a)] (MT CO_2/100/hr)	CO_2 Emitted (MT)
Portable lighting units	270	0.474	1.3
Portable generators	600	0.83	5.0
Backhoe/loader	600	1.34	8.0
Forklift	1,200	1.35	16
Asphalt paver	24	3.81	0.91
Asphalt roller	24	3.07	0.74
Vibratory compactor	60	0.367	0.22
Concrete pumper	30	0.621	0.19
Water tanker	96	27.08	26
Excavator	60	5.77	3.5
Bulldozer	24	27.03	6.5
Motor grader	60	6.58	3.9
Wheel loader	24	7.82	1.9
Crane – 35 ton	600	4.6	28
Concrete truck	30	27.08	8.1
Scraper	48	12.41	6.0
Dump truck	120	27.08	32
Crane – 50 ton	144	4.6	6.6
		Total MT CO_2	155

(a) Source: Gallivan et al. 2010

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