DOE/EA-2025

Final Environmental Assessment

Pacific Northwest National Laboratory Richland Campus Future Development

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

U.S. DEPARTMENT OF ENERGY | Office of Science

SUMMARY

To meet the long-term federal agency mission need to enable discovery and advance science, the U.S. Department of Energy (DOE) needs to provide laboratory space and associated infrastructure for research and development capabilities at the Pacific Northwest National Laboratory (PNNL) Campus located in Richland, Washington. This environmental assessment (EA) provides information and analysis of potential DOE activities associated with the next 20 years of buildout of the PNNL Richland Campus. Information contained in this EA will be used by the DOE to determine if the Proposed Action represents a major federal action that would significantly affect the quality of the human environment.

Proposed Action. Under the Proposed Action evaluated in this EA, the new facilities and infrastructure envisioned in the current PNNL Richland Campus Master Plan would be constructed and operated on the 269 ha (664 ac) PNNL Richland Campus. The PNNL Richland Campus Master Plan provides a bounding scenario for those facilities that ultimately may be constructed and operated on the PNNL Richland Campus. PNNL would continue to occupy and maintain existing facilities, and would refurbish existing facilities if reasonable and economical. The decision to build new facilities or refurbish existing ones would be based on mission needs, overall lifecycle costs, and expected return on investment. The Proposed Action includes potential decontamination and demolition of buildings that DOE determines no longer support mission needs. Portions of the campus could be leased to other entities for development compatible with the PNNL Richland Campus Master Plan. Under the Proposed Action, no activities would occur within the preservation designated area except the continued use of the existing Navy haul road, ongoing DOE activities, and actions to protect, preserve, and perpetuate cultural and biological resources. The preservation and enhancement activities authorized on the preservation designated area would not impede or affect other facets of the proposed action or PNNL operations. Non-Tribal public access within the preservation designated area would not be allowed with the exception of emergency services.

Affected Environment. The PNNL Richland Campus is located next to the Columbia River at the northern end of the City of Richland in Benton County. The DOE Hanford Site and a mix of light industrial, agricultural, business, school, and residential areas are located in the vicinity of the campus. The campus consists of research and development facilities, roads and infrastructure, landscaping, irrigated pasture, and undeveloped native shrub-steppe habitat. Based on 2013 U.S. Census American Community Survey population data, the population residing within 80 km (50 mi) of the site was about 480,000, and the region contained some concentrations of minority and low-income populations. About 9 ha (22 ac) of existing soils on the PNNL Richland Campus are classified as “prime farmland if irrigated,” and about 5 ha (12 ac) are classified as “farmland of statewide importance.” No scarce geological resources, surface waterbodies, floodplains, or wetlands are within the boundaries of the PNNL Richland Campus. Biological resources on the campus consist of a mix of desert-adapted shrubs and grasses as well as a variety of mammals and birds that inhabit those environments. During recent biological surveys, no federal or state threatened or endangered species, species proposed for listing, or critical habitats were observed. Cultural and historic resources have been identified within some portions of the campus, and appropriate measures for their management have been established. No soil contamination that would require remedial action has been identified on the campus. Groundwater in the campus area is routinely monitored for contaminants originating from waste sites located off-campus.

Environmental Impacts of the Proposed Action. Table S.1 summarizes potential impacts associated with the 20-year potential buildout of the PNNL Richland Campus.

Table S.1. Potential Environmental Impacts Associated With the 20-year potential buildout of the PNNL Richland Campus

Resource Area	Impact Summary
Land Use	The activities within the PNNL Richland Campus would be consistent with adjacent land uses planned by the City of Richland and Benton County.
Air Quality	Emissions from construction activities would be intermittent and occur over months, and as a result would not be expected to cause any air-quality standards to be exceeded. The future potential buildout of the PNNL Richland Campus would result in minimal increases in PNNL staffing levels. Consequently, there may be a minimal increase in vehicle or other emissions from the Proposed Action.
Soils and Geological Resources	About 9 ha (22 ac) of soils classified as “prime farmland if irrigated” and about 5 ha (12 ac) of soils classified as “farmland of statewide importance” could be affected by construction. No surface soils would be mined for offsite uses and no offsite materials would be required.
Water Resources	Future development is anticipated to replace existing structures, with minimal increase in PNNL staffing levels and minimal change to the PNNL water use for non-irrigation purposes. Irrigation water requirements are expected to be somewhat reduced from current levels by increasing the proportion of the campus using xeriscaping or rock landscaping. Excavations for new facilities are not expected to extend into the groundwater.
Cultural and Historical Resources	Protective requirements and associated mitigation options to resolve potential adverse effects to National Register of Historic Places-eligible properties from the Proposed Action would be addressed in a parallel NHPA Section 106 process. The National Register of Historic Places-eligible traditional cultural property, *Shu Wipa,* would be directly and indirectly impacted by construction activities occurring outside of the preservation designated area and would require mitigation. Construction and operations-related activities occurring outside of the preservation area would impact the Yakama Nation traditional cultural property. The parallel NHPA Section 106 process will mitigate for the anticipated adverse impacts to both of these traditional cultural properties.
Biological Resources	Development in the project area would remove native shrub-steppe habitats. Wildlife present west of George Washington Way could suffer direct mortality, disturbance, and displacement. A mitigation action plan would be implemented to mitigate for habitat loss and potential impacts to wildlife, including migratory birds.
Wetlands and Floodplains	There are no wetlands or floodplains in the project area.
Socioeconomics	Based on construction workforce estimates, construction activities would likely have little effect on the existing community. The new facilities would house existing research staff and a minimal number of new research staff. Consequently, no impacts on socioeconomics or community infrastructure would be expected from operations.
Environmental Justice	The Proposed Action, when considered with mitigation, would not result in disproportionately high and adverse effects on minority or low-income populations.
Transportation and Traffic	Potential increases in traffic during peak construction represent an approximately 23 to 31 percent increase over current average daily traffic on Horn Rapids Road. During non-peak construction periods, the increase over current average daily traffic on Horn Rapids Road would be about 12 to 15 percent.
Human Health and Safety	The radiological impact to construction workers would be negligible and would be similar to that of members of the public in the vicinity of the PNNL Richland Campus. There would be no appreciable difference in operational impacts on human radiological health and safety.

Table S.1. (contd)

Resource Area	Impact Summary
Visual Resources	Development would be consistent with the visual resource goals of the City of Richland Comprehensive Land Use Plan.
Noise and Vibration	Construction activities would generate noise typical of using heavy equipment and transport of materials. The commercial limit of 65 dBA would apply to facilities on campus.
Utilities and Infrastructure	Additional water, electrical, communication and other infrastructure may have to be constructed to support new facilities.
Waste Generation and Disposition	Effluents and wastes generated during construction would be minimized to the extent practicable and would be managed using existing facilities. New and replacement facilities would result in minimal increases in industrial waste streams (e.g., liquid wastewater, radioactive and mixed waste volumes).
Accidents	Accidents in new facilities are unlikely. However, two accidents associated with hydrogen gas storage (i.e., a vapor cloud explosion and vapor cloud fire) were considered. Consequences could affect nearby onsite workers, but impacts would not pose undue risk to members of the general public.
Intentional Destructive Acts	Although an intentional act is unlikely, an intentional destructive act targeting the PNNL Richland Campus is possible. However, the Proposed Action would not increase the likelihood of an intentional destructive act or the resulting consequences.
Cumulative Impacts	The contribution of the Proposed Action to the cumulative impacts from other past, present, and reasonably foreseeable future actions in the vicinity of the PNNL Richland Campus would be low.

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ACRONYMS AND ABBREVIATIONS

ac	acre(s)
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
AEC	Atomic Energy Commission
AIRFA	American Indian Religious Freedom Act
ANSI	American National Standards Institute
AQCR	Air Quality Control Region
ASIL	Acceptable Source Impact Level
Battelle	Battelle Memorial Institute
BLM	Bureau of Land Management
BPA	Bonneville Power Administration
BRR	biological resources review
BSEL	Bioproducts, Sciences, and Engineering Laboratory
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CGS	Columbia Generating Station
Ci	curie(s)
CO	carbon monoxide
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
DAHP	(Washington State) Department of Archaeology and Historic Preservation
dB	decibel(s)
dBA	A-weighted decibel(s)
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
DOE-SC	U.S. Department of Energy, Office of Science
EA	environmental assessment
EDNA	environmental designation for noise abatement
EERE	Energy Efficiency and Renewable Energy
EIS	environmental impact statement
EMSL	(William R. Wiley) Environmental Molecular Sciences Laboratory
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESCP	Energy Sciences Capability Project
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FPPA	Farmland Preservation Policy Act
FR	Federal Register

ft	foot/feet
ft^2	square feet
ft^3	cubic feet
FY	fiscal year
g	gram(s)
gal	gallon(s)
GHG	greenhouse gas
^3H	tritium
ha	hectare(s)
HPS	Health Physics Society
in	inch(es)
IDPs	Inadvertent Discovery Plans
km	kilometer(s)
kW	kilowatt(s)
kWh	kilowatt hour(s)
L	liter(s)
LA	Limited Area
LCF	latent cancer fatality
LD	lethal dose
LESA	Land Evaluation and Site Assessment
LFL	lower flammability level
LIGO	Laser Interferometer Gravitational-Wave Observatory
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
MAR	material at risk
MATH	Mathematics Building
MEI	maximally exposed individual
MeV	million electron volts
MGD	millions of gallons per day
mg/kg	milligram of medication per kilogram
mi	mile(s)
mi^2	square mile(s)
MOA	Memorandum of Agreement
mrem	millirem
MW	megawatt(s)

NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NCRP	National Council on Radiation Protection and Measurements
NEPA	National Environmental Policy Act of 1969, as amended
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOx	nitrogen oxides
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O_3	ozone
OCA	Offsite Consequence Analysis
Pa	Pascals
Pb	lead
PDA	preservation designated area
PDLW	Process Development Laboratory West
PM	particulate matter
PNNL	Pacific Northwest National Laboratory
PNSO	(DOE) Pacific Northwest Site Office
PPA	Property Protection Area
ppm	parts per million
PSD	Prevention of Significant Deterioration
PSF Complex	Physical Sciences Facility Complex
psi	pound per square inch
psig	pounds per square inch gage
PSL	Physical Sciences Laboratory
Pu-239	plutonium-239
Pu-239E	plutonium-239 equivalent
R&D	research and development
RAEL	Radioactive Air Emissions License
RCRA	Resource Conservation and Recovery Act
ROB	Research Operations Building
RTL	Research Technology Laboratory
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
TCP	traditional cultural property
TED	total effective dose
TNT	trinitrotoluene
TRC	total recordable case

TRIDEC	Tri-Cities Development Council
UIC	underground injection control
VOC	volatile organic compound
VRM	Visual Resource Management
WA Ecology	Washington State Department of Ecology
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDOH	Washington State Department of Health
WSU	Washington State University
yd^3	cubic yard(s)

DEFINITION OF TERMS

Background radiation. Radiation from (1) cosmic sources, (2) naturally occurring radioactive materials, including radon (except as a decay product of source or special nuclear material), and (3) global fallout as it exists in the environment (e.g., from the testing of nuclear explosive devices).

Collective dose. The sum of the total effective dose equivalent values for all individuals in a specified population. Collective dose is expressed in units of person-rem.

Corrosive. A chemical that causes visible destruction of, or irreversible alterations in, living tissue by chemical action at the site of contact.

Cumulative effect. The impact on the environment from the incremental impact of the Proposed 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.

Curie (Ci). A unit of radioactivity equal to 37 billion disintegrations per second; also a quantity of any radionuclide or mixture of radionuclides having 1 curie of radioactivity.

Direct effects. Effects caused by the action and that occur at the same time and place.

Dispersible. Can separate and scatter.

Hazardous chemical. Any chemical that is a physical or health hazard.

- *Physical hazard* – any chemical for which there is scientifically valid evidence that it is a
  - flammable or combustible liquid
  - compressed gas
  - explosive
  - flammable solid
  - oxidizer
  - peroxide
  - pyrophoric
  - unstable (reactive) or water-reactive substance.
- *Health hazard* – any material for which there is statistically significant evidence that acute or chronic health effects may occur in exposed individuals. Such materials include the following:
  - carcinogens
  - mutagens
  - teratogens
  - toxic or acutely toxic agents
  - reproductive or developmental toxins
  - irritants
  - corrosives
  - sensitizers
  - liver, kidney, and nervous system toxins
  - agents that act on the blood-forming systems
  - agents that damage the lungs, skin, eyes, or mucous membranes.

Hazardous waste. Waste that contains chemically hazardous constituents regulated under Subtitle C of the Resource Conservation and Recovery Act, as amended (42 U.S.C. § 6901 et seq.) and regulated as a hazardous waste and/or mixed waste by the U.S. Environmental Protection Agency (40 CFR Part 261).

Highly toxic. To be classified as "highly toxic," a chemical must meet the following criteria: oral lethal dose (LD)-50 in white rats equal to or less than 50 mg/kg; dermal LD-50 in white rabbits equal to or less than 200 mg/kg; or inhalation lethal concentration (LC)-50 in white rats equal to or less than 200 ppm (for gases or vapors) or 2 mg/L (for dusts, fumes, or mists).

Indirect effects. Effects caused by the action that are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate and related effects on air and water and other natural systems, including ecosystems.

Latent cancer fatality (LCF). Death from cancer as a result of, and occurring sometime after, exposure to ionizing radiation or other carcinogens.

Limited Area (LA). Security area designated for the protection of classified matter and certain types of special nuclear material.

Low-level (radioactive) waste. Radioactive waste that is not high-level waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in Section 11e[2] of the Atomic Energy Act of 1954, as amended [42 U.S.C. § 2011 et seq.]), or naturally occurring radioactive material.

Maximally exposed individual (MEI). A hypothetical member of the public residing near the PNNL Richland Campus who, by virtue of location and living habits, could receive the highest possible radiation dose from radioactive effluents released from the PNNL Richland Campus.

millirem. A unit of radiation dose equivalent that is equal to 1/1,000 of a rem.

Non-dispersible. Cannot separate and scatter.

Nuclear Hazard Category. U.S. Department of Energy (DOE) Hazard Categories for nuclear facilities are defined in DOE-STD-1027-92 (DOE 1997). Nuclear facilities are further designated as Nuclear Hazard Category 1, 2, or 3, depending on the level of risk associated with facility operations and the quantities of radioactive materials in the facility. Table A.1 in Attachment 1 of the standard specifies the threshold quantities of radioactive materials for Nuclear Hazard Category 2 and 3 facilities.

- **Nuclear Hazard Category 1** facilities include those where the hazard analysis indicates the potential for significant offsite consequences. Those facilities typically include larger reactors (designated as Category A reactors, or those that operate at a steady-state thermal power greater than 20 MW) and other facilities identified by DOE as having the potential for more severe accidents.
- **Nuclear Hazard Category 2** facilities include those where the hazard analysis indicates the potential for significant onsite consequences from accidents (including the potential for criticality) or other events, and which require onsite emergency planning.
- **Nuclear Hazard Category 3** facilities include those where the hazard analysis indicates the potential for only significant localized consequences. Hazard Category 3 nuclear facilities contain quantities of hazardous radioactive materials that meet or exceed Hazard Category 3 threshold values as identified in DOE-STD-1027 (DOE 1997), Table A.1, but are less than Hazard Category 2 threshold values. The maximum inventories for Category 3 facilities were established to exclude facilities that would be likely to have a significant radiological impact outside the facility.

> **Note:** Radiological facilities include those containing quantities of radioactive materials that do not meet or exceed the thresholds defined for Category 3 facilities in DOE-STD-1027 (DOE 1997). Radiological facilities are associated with the lowest risks to workers or members of the public and typically house activities involving small quantities of dispersible radioactive materials.

Oxidizer. A chemical that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

Person-rem. A unit of collective or population dose that is based on the sum of the total effective dose equivalent values for all individuals in a specified population.

Physical Sciences Facility Complex. A research complex on the north side of Horn Rapids Road.

PM_{10}. Particles having an aerodynamic diameter less than or equal to a nominal 10 micrometers.

$PM_{2.5}$. Particles having an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.

PNNL Richland Campus. One of four PNNL geographic areas designated for PNNL operations. The PNNL Richland Campus refers to the collection of real property including the PNNL Site and Battelle-owned land and facilities approved for PNNL use. PNNL Richland Campus does not include the PNNL Marine Sciences Laboratory, the Hanford 300 Area, or PNNL other areas.

PNNL Site. U.S. DOE-owned land, reserved for PNNL use, located partly in Richland, Washington, but wholly in Benton County, Washington, and in proximity to the Hanford Site 300 Area and Battelle-owned land and facilities in Richland. The PNNL Site includes 41 ha (102 ac) of a preservation designated area which is not available for development. DOE-SC is the Cognizant Secretarial Office. All facilities on this land are federally owned. The PNNL Site was developed from multiple separate land parcel acquisitions and reassignments.

Pollution prevention. The use of materials, processes, and practices that reduce or eliminate the generation and release of pollutants, contaminants, hazardous substances, and waste into land, water, and air. For DOE, this includes recycling activities.

Preservation designated area (PDA). An approximately 41 ha (102 ac) limited access area in the northern portion of the PNNL Site along the Columbia River north of Horn Rapids Road managed for protection of cultural and biological resources.

Property Protection Area (PPA). Access-controlled facilities established to protect government-owned property against damage, destruction, or theft.

Pyrophoric. Materials that spontaneously ignite in air at or below a temperature of 54.5°C (130°F).

rem. A unit of radiation total effective dose (TED) based on the potential for impact on human cells.

Risk. The product of the probability of occurrence of an event or activity and the consequences resulting from that event or activity. For example, an accident that is expected to occur once in 100 years and result in a 1 in 1,000 probability of LCF in the affected population would be associated with a risk of $(0.01\ y^{-1}) \times (0.001\ LCF) = 0.00001\ LCF/y$, or a risk of LCF equal to 1 in 100,000 per year of operation.

Total effective dose (TED). The sum of the effective dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures). TED is expressed in units of rem.

Toxic. To be classified as toxic, a chemical must meet the following criteria: oral LD-50 in white rats greater than 50 mg/kg but less than 500 mg/kg; dermal LD-50 in white rabbits greater than 200 mg/kg but less than 1,000 mg/kg; or inhalation LC-50 in white rats greater than 200 ppm but less than 2,000 ppm (for gases or vapors) or greater than 2 mg/L but less than 20 mg/L (for dusts, fumes, or mists). Chemicals that have a higher LD-50 or LC-50 are considered to be nontoxic for the purposes of monitoring.

Toxic air pollutant. Any State of Washington Class A or Class B toxic air pollutant listed in Washington Administrative Code (WAC) 173-460-150 and 173-460-160. The term "toxic air pollutant" may include particulate matter and volatile organic compounds if an individual substance or a group of substances within either of these classes is listed in WAC 173-460-150 and/or 173-460-160. The term "toxic air pollutant" does not include particulate matter and volatile organic compounds as generic classes of compounds.

Transuranic waste. Radioactive waste containing more than 100 nanocuries (3,700 becquerels) of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for the following:

- high-level radioactive waste
- waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the U.S. Environmental Protection Agency, does not need the degree of isolation required by the 40 CFR Part 191 disposal regulations
- waste that the U.S. Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61.

Unstable (reactive). A chemical that in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shock, pressure, or temperature.

Water reactive. A chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

Xeriscaping. Landscaping in a style that requires little or no irrigation.

METRIC CONVERSION CHART

Into metric units			Out of metric units		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	Millimeters	Millimeters	0.03937	inches
inches	2.54	Centimeters	Centimeters	0.393701	inches
feet	0.3048	Meters	Meters	3.28084	feet
yards	0.9144	Meters	Meters	1.0936	yards
miles (statute)	1.60934	Kilometers	Kilometers	0.62137	miles (statute)
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.09290304	square meters	square meters	10.7639	square feet
square yards	0.8361274	square meters	square meters	1.19599	square yards
square miles	2.59	square kilometers	square kilometers	0.386102	square miles
acres	0.404687	Hectares	Hectares	2.47104	acres
Mass (weight)			**Mass (weight)**		
ounces (avoir.)	28.34952	Grams	Grams	0.035274	ounces (avoir.)
pounds (avoir.)	0.45359237	Kilograms	Kilograms	2.204623	pounds (avoir.)
tons (short)	0.9071847	tons (metric)	tons (metric)	1.1023	tons (short)
Volume			**Volume**		
ounces (U.S., liquid)	29.57353	Milliliters	Milliliters	0.033814	ounces (U.S., liquid)
quarts (U.S., liquid)	0.9463529	Liters	Liters	1.0567	quarts (U.S., liquid)
gallons (U.S., liquid)	3.7854	Liters	Liters	0.26417	gallons (U.S., liquid)
cubic feet	0.02831685	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.7645549	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Energy			**Energy**		
kilowatt hour	3,412	British thermal unit	British thermal unit	0.000293	kilowatt hour
kilowatt	0.94782	British thermal unit per second	British thermal unit per second	1.055	kilowatt
Force/Pressure			**Force/Pressure**		
pounds (force) per square inch	6.894757	Kilopascals	Kilopascals	0.14504	pounds per square inch
torr	133.32	Pascals	Pascals	0.0075	torr

06/2001

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE, Third Ed., 1993, Professional Publications, Inc., Belmont, California.

1.0 INTRODUCTION AND BACKGROUND

The National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. § 4321 et seq.) requires federal agency officials to consider the environmental consequences of their proposed actions before decisions are made. The U.S. Department of Energy (DOE) adheres to Council on Environmental Quality (CEQ) regulations (Title 40 of the Code of Federal Regulations [CFR] Parts 1500-1508) and DOE's own NEPA-implementing regulations (10 CFR Part 1021) in pursuit of NEPA compliance. This environmental assessment (EA) provides information and analyses of DOE activities associated with the next 20 years of potential buildout of the Pacific Northwest National Laboratory (PNNL) Richland Campus (campus) located in Richland, Washington, (Figure 1.1). This EA discusses the purpose and need for the Proposed Action, description of the Proposed Action, alternatives to the Proposed Action that were identified but not discussed in detail, the No Action Alternative, affected environment, and the potential environmental impacts of both the No Action Alternative and the Proposed Action.

PNNL is managed by the Pacific Northwest Site Office (PNSO) for the DOE Office of Science (DOE-SC). The 269 ha (664 ac) PNNL Richland Campus (Figure 1.2) is located in Benton County in southeastern Washington State, 275 km (171 mi) east-northeast of Portland, Oregon; 270 km (168 mi) southeast of Seattle, Washington; and 200 km (124 mi) southwest of Spokane, Washington. It is located at the northern boundary of the City of Richland and south of the DOE-Richland Operations Office's (DOE-RL's) Hanford Site 300 Area. The campus north of Horn Rapids Road extends eastward to the Columbia River high-water mark. The PNNL Richland Campus is located southeast of an area recently conveyed from DOE-RL to the Tri-Cities Development Council (TRIDEC). In 2016, TRIDEC conveyed this land to the City of Richland, Port of Benton, and Energy Northwest for purposes of industrial development (Figure 1.2; Tangent 2017).

Under the Proposed Action, future development of the PNNL Richland Campus could provide an additional 1 million square feet in a number of state-of-the-art facilities and associated infrastructure. As envisioned, these facilities would allow DOE to meet its strategic research objectives over the next 20 years. Specific facility locations and final facility designs for the potential buildout are speculative and still being determined; therefore, this EA provides bounding analyses of the Proposed Action. The data used for the analyses in this EA were developed using actual data from recently built and currently operating facilities at PNNL (e.g., the William R. Wiley Environmental Molecular Sciences Laboratory [EMSL] and the Physical Sciences Facility Complex [PSF Complex]) (DOE 2013a).

Information contained in this EA will be used by DOE to determine if the Proposed Action represents a major federal action that 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) would be required to proceed with the action. If the Proposed Action is determined to not be a major action that could result in significant environmental impacts, a Finding of No Significant Impact (FONSI) would be issued, and the action could proceed.

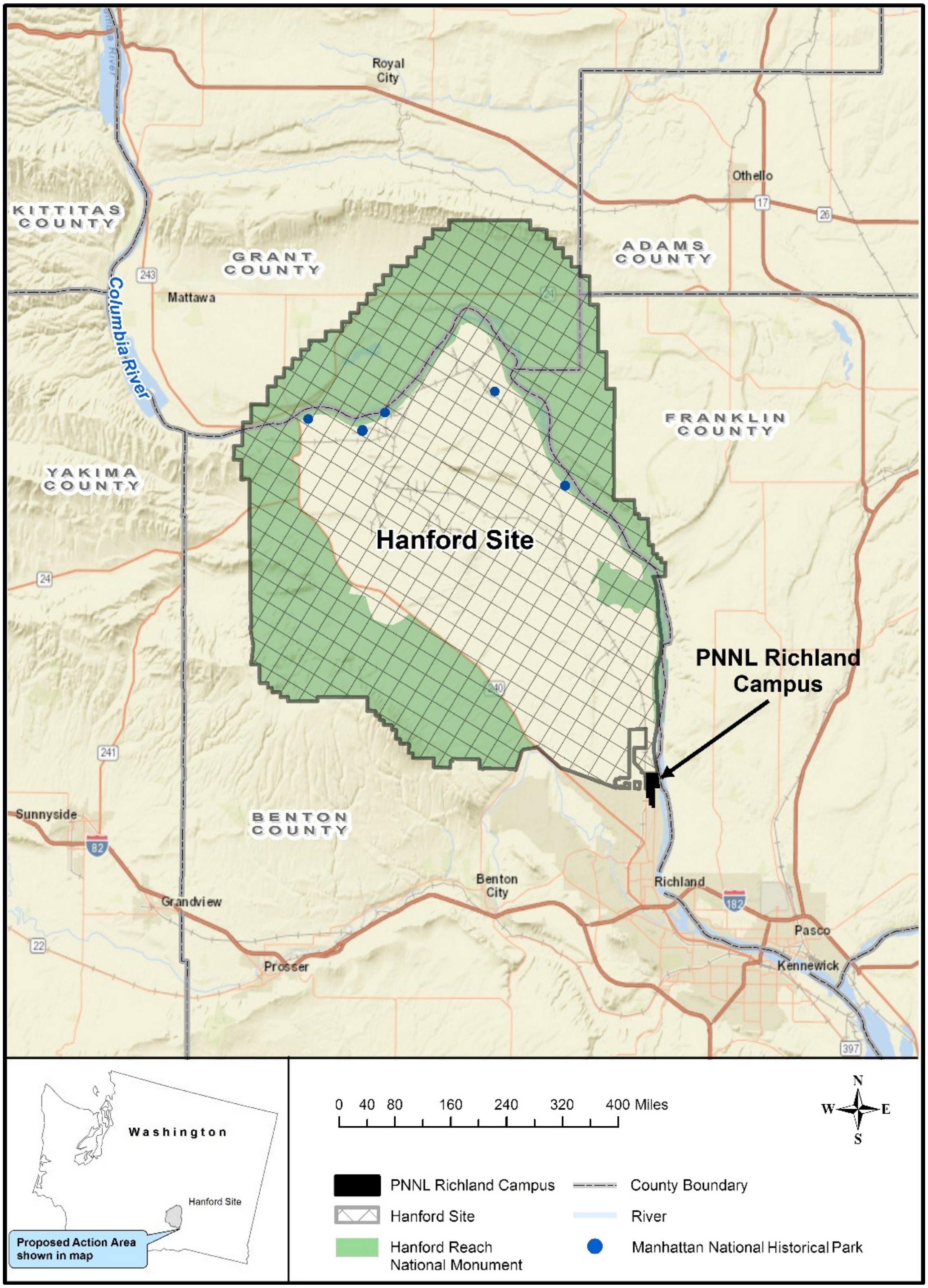

Figure 1.1. PNNL Richland Campus Location Map

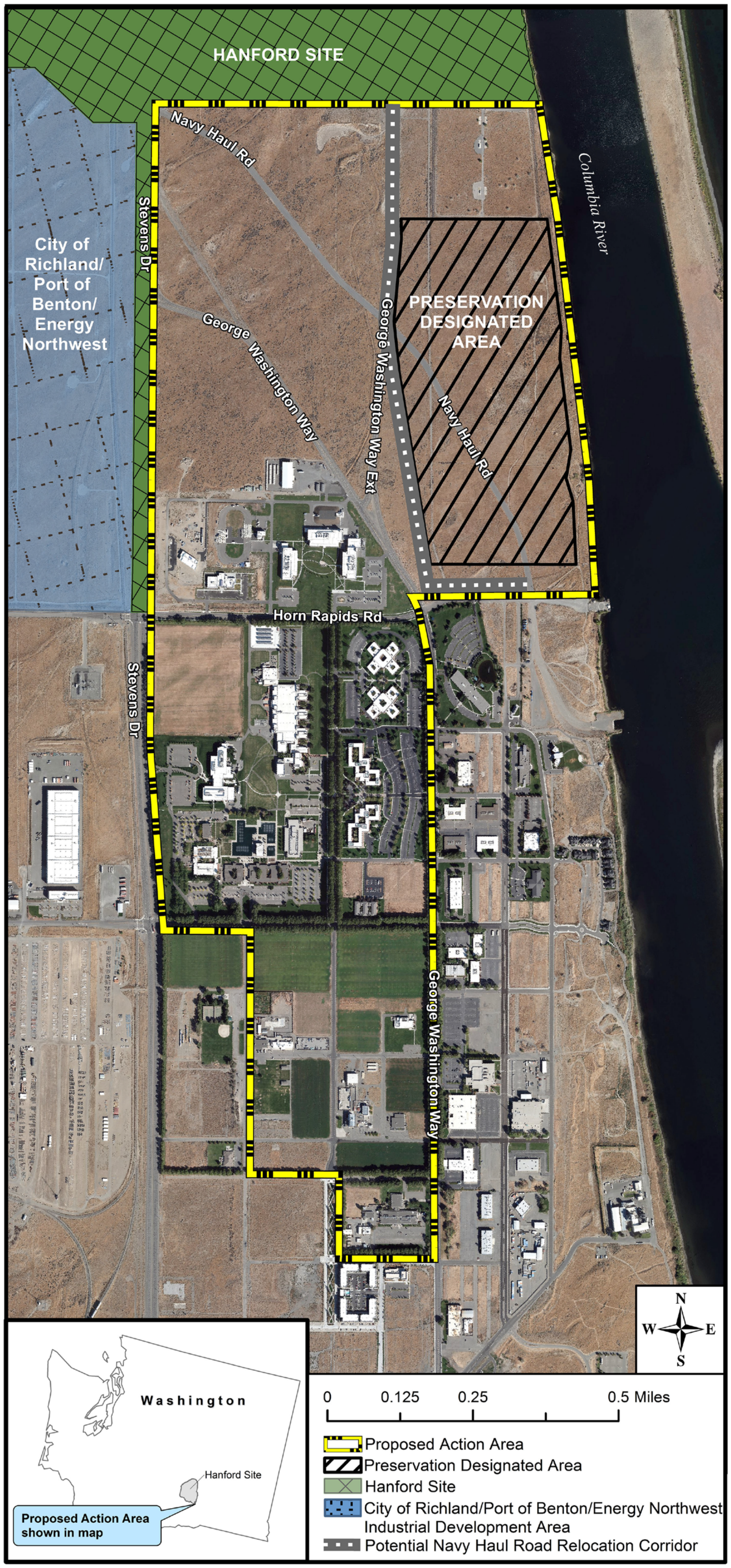

Figure 1.2. Proposed Action Area

1.1 Background

As one of 10 DOE-SC national laboratories, PNNL is a multi-program facility that conducts research in the areas of energy and environment, fundamental and computational science, and national security. Operated by Battelle Memorial Institute (Battelle) under contract to DOE, PNNL also performs work for a diverse set of clients including the National Nuclear Security Administration; U.S. Department of Homeland Security; U.S. Nuclear Regulatory Commission; U.S. Environmental Protection Agency (EPA); other DOE Offices such as Environmental Management, Nuclear Energy, and Energy Efficiency and Renewable Energy (EERE); and many others. PNNL has more than 4,400 staff members and a 5-year average annual total operating cost of $880 million.

DOE development in and around the PNNL Richland Campus was previously addressed in the following NEPA documents:

- *Environmental Assessment for the Resiting, Construction, and Operation of the Environmental and Molecular Sciences Laboratory at the Hanford Site, Richland, Washington*, DOE/EA-0959 (DOE 1994)
- *Construction and Operation of a Physical Sciences Facility at the Pacific Northwest National Laboratory, Richland, Washington*, DOE/EA-1562 (DOE 2007)
- *Supplement Analysis to Final Environmental Assessment of Construction and Operation of a Physical Sciences Facility at the Pacific Northwest National Laboratory, Richland, Washington*, DOE/EA-1562-SA-1 (DOE 2013b)
- *Environmental Assessment for Future Development in Proximity to the William R. Wiley Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory, Richland, Washington*, DOE/EA-1958 (DOE 2013a)
- *Proposed Conveyance of Land at the Hanford Site, Richland, Washington*, DOE/EA-1915 (DOE 2015a).

2.0 PURPOSE AND NEED FOR AGENCY ACTION

To meet the long-term federal agency mission need to enable discovery and advance science, DOE needs to provide laboratory space and associated infrastructure for existing research and development (R&D) capabilities at the PNNL Campus located in Richland, Washington. In addition, DOE would require facilities to support new research capabilities. To accomplish its scientific mission, PNNL requires a variety of facilities and equipment, including radiological and other specialized laboratories, advanced computational facilities, and office space. New and replacement facilities would be needed that could be adequately and appropriately secured, and that could be efficiently managed for the potential public risks associated with operations. New and replacement facilities should be constructed for efficient conduct of DOE’s R&D mission, with considerations of minimizing energy use, life-cycle cost, and project uncertainty. The continuity of federal ownership and control should be considered in the siting and ownership of new and replacement facilities and infrastructure, along with the varying regulatory burdens associated with siting options.

3.0 PROPOSED ACTION DESCRIPTION AND ALTERNATIVES

3.1 Proposed Action

DOE proposes to develop the PNNL Richland Campus (campus) to allow PNNL to meet its current and anticipated future R&D needs. DOE proposes to construct and operate multiple buildings on the campus, including research laboratories, office space, support buildings, and associated infrastructure. The boundaries of the 269 ha (664 ac) campus are shown in Figure 1.2. PNNL would continue to occupy and maintain existing facilities, and would refurbish existing facilities if reasonable and economical. The decision to build new facilities or refurbish existing ones would be based on mission needs, overall lifecycle costs, and expected return on investment.

Under the Proposed Action evaluated in this EA, the facilities and infrastructure envisioned in the current *Pacific Northwest National Laboratory Richland Campus Master Plan* (PNNL 2017a) provide a bounding scenario for those that ultimately may be constructed and operated on the PNNL Richland Campus. While specifics presented in the PNNL Richland Campus Master Plan are intended to be notional, development would be consistent with the PNNL Campus Development Strategic Objectives. As stated in the PNNL Richland Campus Master Plan, PNNL will continually make proactive campus investments to acquire new and/or renew PNNL's existing facility and infrastructure assets for *long-term value* and adaptability that support the following objectives:

- Deliver current and future mission alignment by providing the physical environment that meets current and emerging research needs required to deliver vital mission impacts in energy resiliency and national security.
- Optimize the functionality, reliability, utilization, and operating costs of facility and infrastructure capabilities to enable research operations.
- Embrace the guiding principles for developing a modern, collaborative, flexible, and sustainable campus by providing or incorporating the following:
  - state-of-the-art space and infrastructure to promote creativity, develop technical leaders, and encourage staff members to be bold in their research
  - a connected campus to enable institutional and individual collaborations and research operations that accelerate high-impact research
  - flexibility in design and space use to rapidly respond to changing research needs
  - consideration for environmental, social, and economic costs in the design, construction, allocation, and use of space to optimize energy and materials usage while enabling research.
- Balance the intentions for long-term value from a mission-aligned, functional, reliable, fully utilized, modern, collaborative, flexible, and sustainable campus with what's reasonable and achievable given available time, investment, and operational resources.

The Proposed Action also includes potential decontamination and demolition of buildings that DOE determines no longer support mission needs. Portions of the campus could be leased to other entities for development compatible with the PNNL Richland Campus Master Plan.

Under the Proposed Action, no activities would occur within the PDA except for continued use of the existing Navy haul road, ongoing DOE activities, and actions to protect, preserve, and perpetuate cultural and biological resources. The preservation and enhancement activities authorized on the PDA would not impede or affect other facets of the proposed action or PNNL operations. Non-Tribal, public access within the PDA would not be allowed with the exception of emergency services.

An evaluation will be performed prior to the implementation decision for each new proposed development project to determine whether the scope and any associated impacts would be bounded by the scope and impacts described in this EA. Additional NEPA actions shall be conducted if it is determined that a new development proposal does not fall within the EA proposed action area (Figure 1.2), the development scope is different than that described in the following subsections of Section 3.1, or the environmental impacts are different than those described in Section 5.2.

3.1.1 PNNL Richland Campus Description

The PNNL Richland Campus comprises land and facilities that are federally-owned as well as land and facilities that are currently owned by Battelle but may be acquired by DOE. Based on current building density, the campus has a carrying capacity of approximately 2 million square feet of new laboratory and office space. Of this carrying capacity, approximately 1 million gross square feet could be developed to replace capacity lost from exiting existing leases, replace capacity lost from vacating end-of-life facilities throughout the campus, and to support expanding research activities. The mix of types of new facilities would generally match the following existing mix of PNNL's facility use:

- 40 percent – chemistry and biology laboratory facilities. Laboratories in these facilities are capable of analytical chemistry and biological research, typically performed at benchtop scale.
- 20 percent – computational and dry laboratory spaces.
- 20 percent – office buildings.
- 15 percent – radiological laboratory facilities. Laboratories in these facilities are capable of working with small amounts of dispersible radioactive material and sealed radioactive sources.
- 5 percent – warehouses, high-bay areas, storage areas, shops, and other support structures.

New buildings constructed in the next 20 years on the campus would typically be one or two stories high and constructed using a combination of brick/metal sided and glass fronts with earth-tone color combinations, similar to the exterior of the current PNNL buildings. New facilities with high bays could extend as tall as 15 m (50 ft) to accommodate relocated or new R&D projects. With the exception of exhaust stacks or potential new or replacement communication towers, no structures would be so high as to require nighttime lighting or any form of guy wires or tie downs. Some buildings may be constructed with basements; in those cases, the maximum excavation depth would be 15 m (50 ft). New infrastructure necessary to support the potential buildout includes extension of service roads and utilities such as water (e.g., fire protection, potable, and irrigation), sanitary and process sewer, electrical power, communications, and natural gas.

While the actual construction schedule would be driven by funding availability, the plan could include continuous construction of smaller (< 1,860 m^2 [20,000 ft^2]) buildings, with the construction of an occasional larger (5,570 to 18,600 m^2 [60,000 to 200,000 ft^2]) building, for a total buildout of up to 92,900 m^2 (1.0 million ft^2). For purposes of impact assessment in this EA it is assumed that one to three buildings totaling approximately 6,970 m^2 (75,000 ft^2) could be under construction every year over the next 20 years, with an average construction time of 14 to 16 months per building whereas the larger buildings would take 2 to 3 years to complete. During this buildout period, PNNL staff would continue to use existing office and laboratory space until replacement capacity became available.

3.1.2 Building and Infrastructure Footprint

The impact analysis in this EA assumes that construction would occur in phases over the 20-year potential buildout period. At times during this process, land clearing and grading could occur simultaneously with building construction, post-construction landscaping, and operations and maintenance. Some existing buildings could be undergoing decontamination and demolition over the same period. Due to requirements such as infrastructure installation and foundation engineering, the entire campus (with the exception of the PDA north of Horn Rapids Road) could be impacted at some time during the 20-year potential buildout process. The amount of disturbed area at any one time would be dependent upon funding; however, at no time is it envisioned that the entire campus would be under construction in any given year. The current operational footprint and the operational footprint of the potential 20-year buildout assumed in this EA is presented in Table 3.1. Impact discussions in Chapter 5 include any resource-specific bounding assumptions regarding operation footprint acreages, land uses, or ecological habitat areas and values may differ from those in Table 3.1.

Table 3.1. Current and Assumed Future Operational Footprints within the PNNL Richland Campus[(a)]

Component	Operational Footprints		Assumed Future Buildout
	Current PNNL Facilities	Assumed 20-Year Additions	
Buildings, including, for example, proximate loading docks and cooling towers	15 ha (37 ac)	Increase of 10–12 ha (25–30 ac)	25–27 ha (62-67 ac)
Roads and parking lots	29 ha (72 ac)	Increase of 20–22 ha (50–55 ac)	49–51 ha (122–127 ac)
Sidewalks	2 ha (4 ac)	Increase of 2 ha (3–4 ac)	3 ha (7–8 ac)
Irrigated area requiring a maximum water use of ~1 million gal/ac/y, if planted in grass[(b)]	75 ha (185 ac)	Decrease of 14–18 ha (35–45 ac)	57–61 ha (140–150 ac)
Non-irrigated open-space [(c)]	148 ha (366 ac)	Decrease of 14–18 ha (35–45 ac)	130–134 ha (321–331 ac)

(a) Estimated acreages and conversions rounded for convenience.
(b) Includes lawn/grass and agricultural fields.
(c) Acreage includes undisturbed areas on the campus.

Three specific new facilities being considered by DOE as part of the 20-year campus potential buildout are two high-bay facilities and the Energy Sciences Capability Project (ESCP). Preliminary designs are discussed below as examples of new buildings that would be constructed as part of the potential buildout. Final design and siting decisions for these facilities would depend on mission requirements, funding, and available siting options at the time of construction.

To meet the mission of the DOE's Bioenergy Technologies Office, PNNL conducts R&D of methods to convert bio-oil to liquid hydrocarbon fuels that could serve as gasoline, jet, and diesel blendstocks. As part of this program, the hydrotreater/distillation column is a capability developed by the Energy Processes and Materials Division at PNNL that produces a range of petroleum products from bio-oil feedstock.

PNNL's current hydrotreater/distillation column is a skid-mounted unit installed in a dedicated enclosure (about 9 m [30 ft] × 5 m [17 ft]) inside of the Process Development Laboratory West (PDLW) Facility high-bay work area. The hydrotreater/distillation column operates under high temperatures (typically up to 400°C) and pressures (typically up to 2,000 psig). During hydrotreatment, deoxygenation of bio-oil takes place to produce hydrocarbon products that are similar to gasoline, diesel, and jet fuel blendstock. Hydrotreatment is accomplished by adding hydrogen (supplied via a high-pressure compressor, storage bottles, and a distribution system) as feed along with the bio-oil in the presence of a catalyst. Distillation is then used to obtain the specific gasoline, diesel, and jet fuel blendstocks from the hydrotreated product. DOE is considering constructing a new approximately 650 m^2 (7,000 ft^2) facility in the undeveloped portion of the campus north of Horn Rapids Road (PNNL 2016a) to house the existing hydrotreater and future pilot-scale hydrotreaters. The new high-bay facility would include passive ventilation, hydrogen supply, nitrogen supply, electrical distribution, compressed air, and a water supply for a mist system. Facility safety setbacks would be developed based on a hazard assessment.

PNNL also has the need for a high-bay facility to support DOE's Wind and Water Power Technologies Office investments in Water Power Technologies to improve the biological performance (i.e., fish passage) of hydropower turbines, hydrokinetic devices, and related structures. The approximately 929 m^2 (10,000 ft^2) Water Power Technologies facility in the portion of the campus north of Horn Rapids Road (PNNL 2016a) would consolidate equipment currently located throughout PNNL that involves testing sustainable hydropower systems (e.g., fish respirometer; fish-turbulence test; fish strike, shear, and barotrauma test platforms; turbine test loop; and hydraulic testing capability) and have sufficient space and utilities to fully support testing of large (i.e., 1:25-scale) test beds, small hydro systems, and bioacoustics tag and tracking tools.

The ESCP Complex would contain a minimum of 40 laboratories and 152 office support spaces in a 120,000 square foot, multi-story building located on the campus, north of the Biological Sciences Facility. This complex would provide laboratory infrastructure to support catalysis research, including chemistry laboratories for chemical and nanomaterials synthesis, engineering process scale-up efforts, and high-resolution microscopy. Site construction for these facilities would include extension of electricity, water, sewer, communication, and other site utilities, and installation of road access, parking, sidewalks, and landscaping.

Some existing buildings on the PNNL Richland Campus, primarily south of Battelle Boulevard could undergo deactivation, decontamination, decommissioning and demolition during the 20-year potential buildout of the campus. Demolition activities within the scope of the River Corridor Project are included in the removal action work plan selected by the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA; 42 U.S.C. § 9601 et seq.), DOE/RL-2010-22, Revision 1 (DOE 2013c), *Action Memorandum for General Hanford Site Decommissioning Activities* (TPA-CN-0738).

Impacts from construction, operation and potential accidents are discussed in Chapter 5.0.

3.1.3 Radiological Facilities

No new facilities constructed during the 20-year potential buildout would be designated as a Hazard Category 1, 2, or 3 nuclear facility. In the potential new radiological facilities, dispersible and non-dispersible (e.g., sealed sources) radioactive materials used in research would remain consistent with types currently authorized under PNNL's Radioactive Air Emissions License (RAEL) 005. Such facilities would require a notice of construction (e.g., permit) from the Washington State Department of Health (WDOH). The current published list of radioactive materials handled or potentially handled at the campus can be found in the PNNL Campus Radioactive Air Emissions

DOE Nuclear Hazard Categories (Source: DOE 2007)

DOE Hazard Category 1, 2, and 3 facilities, as defined in DOE-STD-1027-92 (DOE 1997) are normally referred to as "nuclear facilities."

Hazard Category 1 facilities consist of those assigned the highest relative hazard levels (e.g., larger nuclear reactors). Category 1 facilities are associated with potential accidents that could produce significant consequences beyond the site boundary.

Hazard Category 2 facilities may involve work with significant quantities of dispersible radioactive materials. Category 2 facilities are associated with potential accidents that could produce significant consequences only within the site boundary.

Hazard Category 3 facilities involve work with smaller quantities of dispersible radioactive materials relative to those associated with Category 2 facilities. Category 3 facilities are associated with potential accidents that could only produce significant localized consequences.

Radiological facilities contain less than Hazard Category 3 quantities of radioactive materials. Radiological facilities typically house activities involving small quantities of dispersible radiological materials.

Report (Duncan et al. 2016). New radioisotopes are added to the license as necessary to meet changing DOE mission requirements.

The design and operations of the potential new radiological facilities would be governed by federal and state standards, such as but not limited to the following, from PNNL (2012):

- RAEL-005 would be updated for any new radiological emission points.
- Emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive, in any year, an effective dose equivalent of 10 mrem/y (40 CFR Part 61 Subpart H, 61.92).
- Emissions of radionuclides in the air shall not cause a maximum effective dose equivalent of more than 10 mrem/y to the whole body to any member of the public (Washington Administrative Code [WAC] 173-480).

The monitoring requirements for emission from the new radiological facilities would be dictated under both federal and state regulations, such as but not limited to the following:

- EPA amended 40 CFR Part 61, Subpart H and 40 CFR Part 61, Appendix B Method 114.
- As referenced in Subpart H, the American National Standards Institute/Health Physics Society (ANSI/HPS) Standard N13.1-2011, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities* (ANSI/HPS 2011) requirements for major and minor emission points when new permitting actions are approved.
- WDOH amended WAC 246-247, *Radiation Protection—Air Emissions.*

Most, if not all, of the possible radiological-capable facilities would have sufficiently low limits on their radionuclide inventories such that active monitoring of their emissions would not be required. Total radioactive emissions from a facility can be categorized by their maximum potential dose impact to a public receptor. Potential impact categories are given a ranking from 1 to 5, with lower category numbers having greater potential impacts. New campus facilities would be a potential impact category 4, equivalent to a potential-to-emit of ≤0.001 mrem/y. At this level, the monitoring and sample analysis requirements would be limited to annual administrative review of building uses to confirm absence of radioactive materials in forms and quantities not conforming to prescribed specifications and limits (PNNL 2012).

Depending on mission requirements a portion of the buildings using radiological materials could be rated as potential impact category 2 facilities with potentials-to-emit of >0.1 and ≤5 mrem/y, requiring continuous sampling for record of emissions, with retrospective, offline periodic analysis. These facilities could have exhaust stacks as high as 11 to 14 m (35 to 45 ft), depending on whether the building is one or two stories, and require additional emission-control systems (e.g., high-efficiency particulate air filters and scrubbers and active monitoring systems) (PNNL 2012). The annual possession quantity and physical form of the radionuclides that could be used in a new radiological facility would be determined under a Notice of Construction Application to the WDOH, which would later be added to the campus radiological air emissions license (RAEL-005). As an estimate, Table 3.2 provides a representative inventory of radioactive materials by module, normalized to ^{239}Pu equivalent or tritium (^{3}H) equivalent curies (Ci), based on materials in use at the PSF Complex (DOE 2007).

Wastewater from radiological facilities are normally below the regulated levels for radioactive material content, but do have the potential for contamination in the event of a failure of an engineered barrier or administrative control. Current PNNL radiological facilities implement a retention process sewer system that collects wastewater from laboratory spaces where research with radioactive materials is performed.

The wastewater is pumped into multiple retention tanks located in a mechanical room of the building. When a tank becomes full, a representative sample is collected and tested to verify the tank contents are below the screening criteria established in WAC 246-221-190 and Table III of WAC 246-221-290. If the analytical results indicate that the concentration is below the screening criteria, the wastewater is released to the City of Richland's sanitary sewer system via the building's process sewer system. If the results indicate the wastewater did not meet the screening criteria, the contents of the tank is transported to a waste treatment facility authorized or permitted to receive radiological material (Duncan et al. 2016). New radiological facilities would be expected to utilize a comparable system for wastewater discharge.

Table 3.2. Representative PSF Complex Radioactive Material Inventory by Module (Inventory values in Ci Equivalent of ^{239}Pu or ^{3}H) (DOE 2007)

PSF Complex Module[(a)]	Sealed Source ^{239}Pu Equivalent (Ci)	Dispersible ^{239}Pu Equivalent (Ci)	Dispersible ^{3}H Equivalent (Ci)
Chemistry and Processing	0.00166	0.0158	0.00115
Materials Science & Technology	0.0	0.00937	162
Subsurface Science	0.0	0.266	0.0161
Radiation Detection	70.9	0.388	3.33
Certification and Dosimetry	51.1	0.225	27.7
Ultra-Trace	0.0	0.204	1.55
Total	122	1.19	195

(a) No "Shielded Operations" of DOE 2007 were implemented in actual PSF Complex operations, so were excluded from reporting here. A review of January 2017 PSF Complex inventories indicates the total inventories above remains conservative (overestimating).

3.1.4 Chemical and Biological Laboratories

Of the likely future development, slightly less than half of the potential square footage could be allocated to chemistry/biology laboratory facilities. Based on a 2017 review of the PNNL Chemical Management System database, the assumed chemical inventory that could be present on campus is provided in Table 3.3. The types and quantities of chemicals present in any facility and their usage rates would be expected to vary over time according to programmatic needs; however, because new facilities are intended to replace or consolidate existing facilities, current chemical usage provides a reasonable estimate of average inventories over the next 20 years. The quantities of hazardous chemicals present in the new facilities would be managed within applicable limits specified by the applicable National Fire Protection Association Code or the International Building Code (e.g., ICC 2014 or current standard) (DOE 2007). Explosives are managed in accordance with a DOE-approved site plan.

Biomedical research is currently conducted at PNNL in support of federal agencies' research missions. This research is typically conducted in laboratories with biosafety containment levels specified by the Department of Health and Human Services' Centers for Disease Control and Prevention and the National Institutes of Health manual *Biosafety in Microbial and Biomedical Laboratories* (CDC and NIH 2009). Biosafety containment levels are ranked from one to four and are selected based on the agents or organisms used in the research. DOE does not currently operate any microbiological laboratory facilities at the PNNL Richland Campus above biosafety level 2 (BSL-2). New facilities constructed during the 20-year potential buildout of the PNNL Richland Campus may include additional BSL-2 laboratory space. The Proposed Action does not include the construction or operation of laboratories on the PNNL Richland Campus with BSL-3 or BSL-4 containment. Development of BSL-3 or BSL-4 research laboratories on campus would require a separate NEPA evaluation.

Table 3.3. PNNL Richland Campus Hazardous Chemical Inventory[(a)]

Chemical Hazard Group	Estimated Inventory
Flammable	
Gases (e.g., hydrogen)	1,138 kg (2,509 lb) (1,166 containers)
Solids (e.g., sodium sulfide)	1,236 kg (2,725 lb) (2,306 containers)
Liquids (e.g., alcohols)	2,399 kg (5,289 lb)
Liquefied Gas (e.g., propane)	1,586 kg (3,502 lb) (498 containers)
Oxidizing	
Gases (e.g., oxygen)	2,589 kg (5,707 lb) (430 containers)
Solids (e.g., nitrates)	453 kg (999 lb)
Liquids (e.g., hydrogen peroxide)	685 kg (1,511 lb)
Corrosive	
Gases (e.g., ammonia)	52 kg (114 lb) (102 containers)
Solids (e.g., silver nitrate)	4,112 kg (9,066 lb) (4,836 containers)
Liquids (e.g., acids)	19,673 kg (43,373 lb) (7,646 containers)
Unstable (Reactive)	
Gases (e.g., acetylene)	204 kg (451 lb)
Solids (e.g., calcium hypochlorite)	90 kg (199 lb)
Liquids (e.g., styrene)	114 kg (251 lb)
Water Reactive	
Solids (e.g., sodium)	239 kg (526 lb)
Liquids (e.g., trichlorosilane)	680 kg (1,500 lb)
Toxic	
Gases (e.g., nitric oxide)	62 kg (136 lb) (47 containers)
Solids (e.g., arsenic)	1,652 kg (3,642 lb) (3,375 containers)
Liquids (e.g., bromine)	1,142 kg (2,518 lb) (2,071 containers)
Highly Toxic	
Solids (e.g., sodium cyanide)	74 kg (163 lb) (700 containers)
Liquids (e.g., parathion)	100 kg (221 lb) (417 containers)
Pyrophoric	
Solids (e.g., lithium)	6 kg (12 lb) (102 containers)
Liquids (e.g., methyldichlorophosphine)	6 kg (12 lb) (126 containers)
Explosives or Blasting Agents (e.g., black powder)	10 kg (23 lb) (145 containers)
Organic-Peroxide	
Solids (e.g., benzoyl peroxide)	23 kg (50 lb)
Liquids (e.g., acrylic resins)	10 kg (22 lb)

(a) Inventory quantities are totals for each hazard group, based on data in the PNNL Chemical Management System database as of February 2017. Specific chemicals listed are examples of the types of chemicals included in each group. Numbers have been rounded.

3.1.5 Site Preparation

Typical site preparation would consist of clearing and grubbing surface vegetation, installing soil-erosion controls, and removing superficial fill materials. Backfill materials would consist of crushed stone and structural fill, dense-graded aggregate, or other materials placed and compacted to levels recommended by the geotechnical engineer. Excavated soils would be stockpiled adjacent to building sites and would be re-used onsite to the maximum extent practical.

3.1.6 Utilities and Infrastructure

The utilities required to support the new facilities would be extensions of the current systems supplying the campus and would include the following:

- potable water distribution systems
- irrigation systems
- sewers, possibly including additional sewage lift station(s)
- natural-gas service, including mains and distribution system
- electrical service, including conduits, duct banks, vaults, switches, and services
- ductwork to provide fiber optic, telephone, and other communications connections
- possible upgrades to an existing substation or construction of a new substation.

The estimated energy and water needs at full buildout are provided in Table 3.4.

Table 3.4. Energy and Water Estimates for Full Buildout

Type of Building	Estimated Annual Electric Usage (kWh)	Estimated Average Monthly Demand (kW)	Estimated Annual Natural Gas Usage (Therms)[(a)]	Estimated Annual Water Usage (m^3 [10^6 gal])
R&D facilities and offices	27,599,435	3,151	375,891	140,000 (36.9)

(a) Therms – frequently used gas utility measure of gas consumption defined as 100,000 British thermal units.

The City of Richland would supply water, sewer, and electrical utilities for the potential buildout. The current City of Richland electrical infrastructure that provides power to PNNL would need to be expanded over time to meet the projected future demand increase. Electrical infrastructure expansion may include an additional substation and/or additional transmission lines.

Sanitary wastes from restrooms, lunchrooms, and building mechanical spaces would be discharged to the City of Richland sewer system. Permitting is not required for these sanitary streams. Process wastewater from laboratory spaces would also be discharged to the City of Richland wastewater system and would meet City of Richland wastewater permitting limits. Process and sanitary wastewater systems would typically be segregated within each facility as part of the design process; thus, they are not combined. PNNL currently has permits with the City of Richland and a similar permit(s) would be obtained for the future developments, or all could be incorporated into the existing PNNL permits.

Water needed during the March through September irrigating season would be Columbia River water from the Columbia River withdrawal system under existing water rights. The irrigated area on the PNNL Richland Campus is expected to decrease by 14 to 18 ha (35 to 45 ac) due to development of currently irrigated agricultural fields and increased use of xeriscaping and rock landscaping (see Table 3.1).

Based on current operations the buildout could also include standby diesel- or natural-gas-fueled generators to provide emergency backup power to meet mission critical needs. Any generator would normally operate no more than 50 hours annually for operational readiness and maintenance checks, and consume less than 200 gal/y.

3.1.7 Access Roads and Parking Lots

Under the Proposed Action, as construction gradually extends north, the portion of George Washington Way from Horn Rapids Road to Stevens Drive could be eliminated to accommodate the buildout. Traffic flow on George Washington Way to the expanded campus and the Hanford Site would be rerouted to another main artery that would route traffic back to Stevens Drive. Future rerouting decisions would be coordinated with the City of Richland and DOE-RL when the need for this routing change arises.

George Washington Way would likely be the typical access route for construction deliveries into the new tracts as development progressed, until the buildout necessitated route relocation. At that time, deliveries would be made off Horn Rapids Road into the site until another intersection would be developed north of Horn Rapids Road on Stevens Drive to access the northern part of the future buildout area.

New service access roads and loading docks would be located to minimize traffic hazards on the main roadways. Support functions would be located in the same general vicinity as the main service courtyard area of new facilities because of the similar functional requirements for truck access and storage requirements. Parking areas would be sized to provide one parking space per employee, and additional visitor parking would amount to approximately 10 percent of the total employee parking. Parking spaces for disabled individuals would be provided in both the visitor and employee parking lots as required.

3.1.8 Navy Haul Road

As shown on Figure 1.2, a gravel road currently traverses the campus from southeast to northwest, beginning at the Port of Benton, crossing the undeveloped PDA, and then merging onto Stevens Drive. This route has been used since the 1980s to haul decommissioned, defueled Naval reactor compartment packages from barge transport to the 200 East Area Burial Grounds, Trench 94 disposal site.

Under the Proposed Action, the Navy would continue to use this haul road as needed into the foreseeable future. Transit time across the campus is typically less than one hour, occurring on weekends to the extent possible to minimize traffic disruption on the Hanford Site. Typically, one to five days prior to shipment the road would undergo minor maintenance and watering.

Pending a decision to proceed with the potential buildout based on this EA, other DOE decision criteria, and future Navy mission requirements, there may be a need to relocate the Navy haul road within the boundaries of the campus. Because such a relocation decision would need to be based on factors such as final building layout designs, safety considerations, and other operation factors which are not available at this time, no specific route or alternatives for a new haul route are currently proposed. Although not part of the Proposed Action in this EA, the potential relocation of the Navy haul road in the campus north of Horn Rapids Road is considered one of the potential future site uses in the buildout of the campus. To preserve options for relocating the Navy haul road in the future, DOE would reserve an approximate 31 m (100 ft) wide corridor along the southern and western boundary of the PDA as a possible relocated route (see Figure 1.2). Other routes on undeveloped areas outside of the PDA, may be chosen depending on future Navy mission requirements, safety considerations, and the configuration of DOE facilities and roads at the time of relocation. Future relocation, expansion, or upgrade of the Navy haul road would be subject to DOE approval and would be assessed in a separate future NEPA review. The impacts of any relocation of the Navy haul road outside of the boundaries of the campus are considered as part of the cumulative impacts.

3.1.9 Post-Construction Reclamation

After each phase of building construction, all disturbed areas would be reclaimed with a combination of native and adaptive vegetation with limited areas of lawn grasses. Landscaping would transition from the manicured and ornamental characteristics found in the developed area of the current campus, to drought-tolerant native landscaping (i.e., use of indigenous plant materials that are low maintenance and require minimal watering).

While it is important to maintain some of the existing landscape character of the campus, future development on the campus would incorporate more drought-tolerant native landscape practices to improve campus sustainability. Increased use of xeriscaping and native and adaptive vegetation would reduce water consumption beyond an initial establishment period. Use of native landscaping is a commitment in the PNSO Cultural and Biological Resources Management Plan (DOE/PNSO 2015). Low-water irrigation systems may be installed for an establishment period only. Irrigated lawn areas would be limited to high-traffic areas that develop the spatial character of the campus and could double as amenity spaces for passive recreation and large events (PNNL 2017a).

3.1.10 Workforce

At the assumed rate of 1 to 3 buildings under construction every year, and based on recent construction experience on the campus, it is estimated that the peak construction workforce would be approximately 350 workers at any given time during the 20-year potential buildout. The total buildout is assumed to house approximately 1,500 to 2,000 staff. The transition into new facilities would occur slowly with an average of 25 to 75 staff per year relocated from old to new facilities, with a potential peak of approximately 250 staff per year, if a larger sponsor-funded facility was constructed.

3.1.11 Traffic

In addition to the maximum estimated workforce of approximately 350 construction workers at periods of peak construction, during some periods of construction there could be an additional 10 to 15 concrete trucks/day contributing to peak-hour traffic.

Because PNNL staffing is assumed to remain fairly flat under the Proposed Action, there would not be a noticeable increase in traffic due to changes in staffing levels at the PNNL Richland Campus. However, if some or all of the currently occupied privately owned and/or leased space near the campus is back-filled with new tenants, there could be an increase in traffic in the vicinity of the campus over the next 20 years.

3.1.12 Water Runoff and Spill Management

Under the Proposed Action, stormwater runoff from the new buildings, roads, and parking areas would be collected and discharged onsite to ground using a combination of surface swales, underground percolation beds, and underground injection control (UIC) wells. UIC wells used for discharge of stormwater to ground would be registered with Washington State Department of Ecology (WA Ecology). No additional stormwater would enter the City of Richland system.

Spill containment measures would be employed at laboratory facility loading dock areas to prevent contamination of stormwater. Such measures would include installation of spill containment trenches, staff training on spill prevention and response, and transporting chemicals or wastes in secondary containment. Overfill prevention systems and spill containment measures would also be provided at the fueling area for the diesel standby generator(s) (DOE 2007).

3.1.13 Pollution Prevention and Waste Minimization

Consistent with the requirements and guidance of regulations and Executive Orders (EOs), including the Pollution Prevention Act of 1990 (42 U.S.C. § 13101) and Planning for Federal Sustainability in the Next Decade (Executive Order 13693; 80 FR 15871), DOE incorporates pollution prevention, waste-minimization practices, and sustainability goals in construction and operation of all facilities. Pollution prevention is defined as the use of materials, processes, and practices that reduce or eliminate the generation and release of pollutants, contaminants, hazardous substances, and wastes into land, water, and air. Pollution prevention includes practices that reduce the use of hazardous materials, energy, water, and other resources along with practices that protect natural resources through conservation or more efficient use. Within DOE, pollution prevention includes all aspects of source reduction as defined by the EPA and incorporates waste minimization by expanding the EPA definition of pollution prevention to include recycling. Pollution prevention is applied to all DOE pollution-generating activities, including laboratory research, development, and demonstration projects.

Pollution prevention in construction and operation of the new facilities would be achieved through the following best practices:

- equipment or technology selection or modification, process or procedure modification, reformulation or redesign of products, substitution of raw material, waste segregation, and improvements in housekeeping, maintenance, training, and inventory control
- efficiency in the use of raw materials, energy, water, or other resources
- recycling to reduce the amount of waste and pollutants destined for release, treatment, storage, and disposal (DOE 2007).

3.1.14 Emergency Preparedness

The PNNL Emergency Management Plan is written in accordance with state and federal regulations to protect workers, public health and safety, and the environment in the event of an emergency affecting PNNL (2016b). For new facilities, building emergency procedures would be developed to describe types of hazards and operations associated with the facility as well as any administrative controls or engineered systems in place to mitigate the consequences of accidents or other off-normal events. Those controls would be commensurate with the level of risk associated with facility operations (DOE 2007).

PNNL-occupied facilities located on the campus north of Horn Rapids Road and southwest of George Washington Way are within the City of Richland, and emergency services are provided by the city. Emergency services for the undeveloped area north of Horn Rapids Road and George Washington Way are provided by the Benton County Sherriff's Department and the Hanford Fire Department.

3.1.15 Safeguards and Security

In accordance with requirements in DOE Order 470.4B, Change 2, *Safeguards and Security Program* (DOE 2017a), and implementing guidance, PNNL currently maintains a comprehensive safeguards and security program. PNNL employs a graded physical protection program that is systematically planned, executed, evaluated, and documented as described in a safeguards and security plan. Under this approved program, DOE assets are appropriately protected from malevolent acts (e.g., theft, diversion, and sabotage) and from other events (e.g., natural disasters and civil disorder) by considering site and regional threats, protection-planning strategies, and protection measures (DOE 2007).

Based on threat assessments and protection-planning strategies, new facilities would be designed to provide the appropriate level of physical protection required by DOE for Property Protection Areas (PPAs) and Limited Areas (LAs). PPAs would be established where required to protect government-owned property against damage, theft, or intentional destructive acts. Access control to PPAs would be implemented to protect employees, property, and facilities. Access control includes automated access control systems (i.e., proximity card readers and/or lock systems). Signs prohibiting trespassing would be posted around the perimeter and at each entrance to the PPA. Physical barriers (e.g., fences, walls, and doors) may be used to identify the boundary of the PPA.

LAs are security areas designated for the protection of classified matter and certain types of special nuclear material. LAs are defined by physical barriers encompassing the designated space and access controls to ensure that only authorized personnel are allowed to enter and exit the area. Physical barriers (e.g., fences, walls, and doors) may be used to identify the boundary of the LA. PNNL protection strategy for LAs typically consists of exterior and/or interior walls of commercial-grade construction, with the only criteria that the interior walls extend from the "true" floor to the "true" ceiling. General Services Administration-approved security containers would be used to store classified matter and some special nuclear materials.

PNNL would implement special security measures when warranted by an increased threat of intentional destructive acts or other events. The types and frequency of measures implemented would depend on the declared threat level and would employ a graded approach that involves actions by staff, onsite security personnel, and community emergency response agencies as applicable (DOE 2007).

3.2 No Action Alternative

Under the No Action Alternative, PNNL would continue to occupy and maintain existing facilities, and would refurbish these facilities if reasonable and economical. However, PNNL would not obtain replacement facilities for outdated existing facilities or provide new facilities for PNNL staff and existing and future research missions. Without new state-of-the-science facilities, under the No Action Alternative, at some time during the next 20 years PNNL would be unable to provide the scientific research required to meet DOE's future mission needs.

3.3 Alternatives Evaluated but Dismissed from Detailed Analysis

To meet the future mission needs of DOE, the aging offices and laboratories currently occupied by PNNL must be updated and new facility space must be constructed. As part of its evaluation process DOE evaluated two additional siting alternatives:

- using existing federally owned facilities and land at or near the campus
- using existing privately owned facilities at or near the campus.

As explained in the following sections, because neither of these alternatives was determined to be a reasonable alternative to the proposed campus buildout, the environmental impacts were not evaluated in detail.

3.3.1 Using Existing Federally Owned Facilities

To meet future mission needs, DOE considered the option of relocating PNNL technical capabilities to other existing DOE-owned facilities in the vicinity of the PNNL Richland Campus. Because there is not enough existing facility space at the Hanford Site 300 Area to accommodate future DOE's mission needs, other facilities dispersed across the Hanford Site were considered.

This alternative would not result in optimum co-location of technical capabilities on the campus to promote collaboration and efficient use of unique or common resources needed by different programs because it would result in fragmentation of the laboratory and isolation of research staff from other resources in existing PNNL facilities (DOE 2007). Older buildings at the Hanford Site were constructed for different purposes than DOE's current mission needs and would require extensive upgrades to meet current building standards and mission requirements. Renovations would be costly and operations would be more limited and inefficient than in new purpose-built facilities. Current mission requirements may also conflict with ongoing remediation activities at the Hanford Site. The dispersed nature of Hanford Site facilities would also complicate security considerations associated with some of PNNL's proposed R&D activities.

3.3.2 Using Existing Privately Owned Facilities

Leasing facilities outside the PNNL Richland Campus could potentially meet DOE's need for additional facility space. However, DOE considers this option to have considerable uncertainty because of the number of leased facilities required to accommodate space needs and the lack of federal control over leased space. Renovations may be required to convert existing space to meet DOE's mission needs, and DOE's investment in these improvements would be lost on the expiration of the lease. In addition, the use of privately owned facilities may co-locate research activities with potential public risk with other public-use facilities. Further, privately owned facilities may be subject to regulatory restrictions in addition to those on federally owned land.

This alternative also would not result in optimum co-location of technical capabilities to promote collaboration and efficient use of unique or common resources needed by different programs because it would result in fragmentation of the laboratory and isolation of research staff from other resources in existing PNNL facilities.

4.0 AFFECTED ENVIRONMENT

The PNNL Richland Campus that would be developed under the Proposed Action is shown in Figure 1.2. Aspects of the site and its environs that might be affected by the development of the campus over the next 20 years are described in this section.

4.1 Land Use

The PNNL Richland Campus includes developed industrial areas and undeveloped land. The campus is a relatively level parcel of land covering about 269 ha (664 ac). The undeveloped area north of Horn Rapids Road (51 ha [127 ac]) is covered with a mix of desert-adapted shrubs and grasses. The balance of the campus has been developed with PNNL facilities, with the exception of some remaining agricultural tracts. The portion of the campus north of Horn Rapids Road was designated as Industrial in a 1999 DOE Record of Decision (64 FR 61615) for the *Hanford Comprehensive Land-Use Plan EIS (HCP EIS)* (DOE 1999). With the exception of the PDA, which is designated as natural open space, the entire campus is within the City of Richland urban growth area (Benton County Washington 2015a) and designated by the City of Richland as a Business Research Park (City of Richland 2017a).

Land uses on the campus and in nearby areas (within 1.6 km [1 mi] of the campus) include the following:

- 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 uses.
- Willow Pointe, a community of residences along the Columbia River, south of Battelle Boulevard.
- The Port of Benton docking facility, located east of the campus on the Columbia River, used for transferring Naval reactor compartment packages and other materials destined for the Hanford Site. A haul road connecting the barge facility to Stevens Drive traverses the undeveloped area north of Horn Rapids from southeast to northwest.
- The Washington State University (WSU)-Tri-Cities branch campus, Hanford High School, and residential areas, located to the south and east.
- Occupied and undeveloped Hanford Site land.
- Industrially and agriculturally developed land located to the west and southwest (all zoned Industrial by the City of Richland) including the Horn Rapids Sanitary Landfill (closed).
- Innovation Center, a 40 ha (100 ac) business park, home to The Lofts at Innovation Center apartments, the University Square retail area, and other commercial sites.
- City of Richland/Port of Benton/Energy Northwest Industrial Development Area to the northwest.

4.2 Air Quality

The PNNL Richland Campus is in Benton County. Benton County, along with Franklin, Kittitas, Klickitat, Walla Walla, and Yakima Counties, are part of the South Central Washington Intrastate Air Quality Control Region (AQCR) (40 CFR 81.189). An AQCR is an area designated by the EPA for the attainment and maintenance of National Ambient Air Quality Standards (NAAQS). The EPA has set NAAQS for six “criteria” pollutants, including carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM), and sulfur dioxide (SO_2). All counties within the South Central Washington Intrastate AQCR are listed as “unclassified/attainment” or “better than national standards” for all criteria air pollutants (40 CFR 81.348). In general, air quality within this region is good, with some exceptions caused by blowing dust. Atmospheric dispersion also tends to be good; however, periods of stagnation can occur during the winter months.

4.2.1 Radiological Air Emissions

Federal regulations (40 CFR Part 61, Subpart H) require the measurement and reporting of radionuclides emitted from DOE facilities and the resulting offsite dose from those emissions. Those regulations impose a dose standard of 10 mrem/y to a maximally exposed individual (MEI) of the public, which is not to be exceeded. Washington State has adopted the 10 mrem/y federal dose standard (WAC 246-247-040(1)), but also requires inclusion of dose contributions from fugitive emissions, radon, and non-routine events (WAC 246-247-040(6)). Washington State, in addition to the MEI dose standard, also requires calculating the dose at the point of maximum annual air concentration in an unrestricted area where any member of the public may be (WAC 173-480).

Table 4.1 lists the total radiological MEI dose from PNNL Richland Campus radionuclide emissions for the past five years, including fugitive emissions, radon, and non-routine events (Anderson 2016). The MEI doses are well below the 10 mrem/y standard (see campus MEI dose, Table 4.1). PNNL also operates facilities that may emit radionuclides to the air (predominantly, Building 325 and Building 331, but also Building 318 and Building 361) north of the campus in the 300 Area of the adjacent Hanford Site. Total radiological MEI doses from these facilities are up to 0.28 mrem/y (see Hanford Site MEI dose, Table 4.1), and although higher than the PNNL Richland Campus MEI doses, are still significantly less than the 10 mrem/y standard.

Table 4.1. PNNL Operations Offsite MEI Doses (mrem/y) for 2011 through 2015

Year	PNNL Richland Campus MEI Dose (mrem/y)	Percent of 10 mrem/y Standard	PNNL on Hanford Site MEI Dose (mrem/y)	Percent of 10 mrem/y Standard
2011	0.00002	< 0.01	0.024	0.2
2012	0.00001	< 0.01	0.025	0.3
2013	0.00002	< 0.01	0.13	1.3
2014	0.00003	< 0.01	0.28	2.8
2015	0.00026	< 0.01	0.13	1.3

Ambient air monitoring for radionuclides is required by Washington State (RAEL-005). At this time, PNNL maintains and operates five ambient air sampling stations. Four stations are on the campus, and one background station is located in Benton City, Washington.

Several privately or publicly owned facilities capable of generating airborne radioactive emissions are located within 29 km (18 mi) of the PNNL Richland Campus, including other sources on the Hanford Site, a low-level waste burial site operated by U.S. Ecology on the Hanford Site 200 Area plateau, the Energy Northwest Columbia Generating Station (CGS), the Test America laboratory, AREVA Federal Services LLC, Perma-Fix Northwest, Inc., and the Unitech Services, Inc. Radionuclide emissions from these facilities are separately regulated as required by applicable regulations.

4.3 Soils and Geological Resources

Soil survey information, including soil maps, are available for the majority of the United States via the Natural Resources Conservation Service (NRCS) Web Soil Survey (NRCS 2016a). Soil mapping in NRCS (2016a) is available only for the southern portion of the PNNL Richland Campus (the 40 percent of the campus area that lies south of Horn Rapids Road). Soils on the northern portion of the campus (and the Hanford Site itself) have not been mapped to date by the NRCS. About 70 percent of soils south of Horn Rapids Road map to the Burbank loamy fine sand unit, which has a farmland classification of “not prime farmland" (NRCS 2016a). Associated with the dominant Burbank loamy fine sand unit are areas of Finley fine sandy loam soils, classified as "prime farmland if irrigated" (NRCS 2016a). The Finley fine sandy loam unit occurs over about 20 percent of the southern portion of the PNNL Richland Campus, with the majority of these soils (about 9 ha [22 ac]) occurring in the irrigated fields south of Battelle Boulevard. About 7 percent of the southern campus soils are Quincy loamy sand, classified as "farmland of statewide importance" (NRCS 2016a), which designates land that does not meet the criteria for prime farmland, but is still valuable for production. The majority of these soils (about 5 ha [12 ac]) occur in the fields immediately south of Horn Rapids Road and east of Stevens Drive. Quincy loamy sand is the dominant soil unit west of the PNNL Richland Campus. The Farmland Preservation Policy Act (FPPA) requires federal agencies to consider the impacts of federal actions on areas classified as prime farmland, unique farmland, or farmland of statewide importance. However, the portion of the campus south of Horn Rapids Road is defined as an Urban Developed Area on the most recent U.S. Census Bureau maps (USCB 2010), and is therefore exempt from the FPPA (7 CFR 658).

Duncan (2007) describes the characterization and distribution of surface soils on the Hanford Site based on the soil survey of Hajek (1966). According to information in Hajek (1966), the most common soil types in the area of the PNNL Richland Campus are Rupert sand and Burbank loamy sand, each of which may be associated with small areas of Ephrata sandy loam. Soil classifications change over time and documentation of the correlation between soil units in Hajek (1966) and the current soil map units documented in NRCS (2016a) could not be found. No Rupert series is listed in the NRCS official soil series descriptions (NRCS 2016b); however, it has been correlated with the Quincy series (Hajek 1966; PNNL 2017b). The Ephrata sandy loam soil identified in Hajek (1966) may be correlated with the Finley fine sandy loam soil found in the southern part of the PNNL Richland Campus.

Although the amount of soils that would be classified as prime farmland and farmland of statewide importance in the undeveloped areas north of Horn Rapids Road cannot be quantified, it is likely that some of the soils would be so classified based on the types and distribution of soils south of Horn Rapids Road. However, this area has not been farmed since at least the 1930s, is currently not irrigated, has no agriculture-related investments or infrastructure, is adjacent to available utilities and other infrastructure, and has a significant portion of the surrounding land in non-agricultural land uses. Therefore, the area lacks the necessary characteristics to qualify for consideration under the FPPA (7 CFR 658).

The gravel-dominated sediments of the Hanford Formation underlie the surface soils at the PNNL Richland Campus. The thickness of the Hanford sediments ranges from about 12 to 24 m (39 to 79 ft) north of Horn Rapids Road (DOE 2013d) and is expected to be similar across the southern portion of the campus (DOE 2016a). Hanford Formation sediments are typically very permeable to water. In general, the water table across the PNNL Richland Campus lies within the lower portion of the Hanford Formation sediments. Underlying the Hanford Formation are sediments of the Ringold Formation, which are generally finer-grained, more consolidated, and significantly less permeable to water flow than the sediments of the Hanford Formation.

4.4 Water Resources

This section describes the affected environment for water resources for the PNNL Richland Campus.

4.4.1 Surface Water

There are no naturally occurring surface waterbodies on the PNNL Richland Campus. The nearest waterbodies are the Columbia River, adjacent to the northern portion of the campus and about 0.5 km (0.3 mi) east of the southern portion of the campus and the Yakima River, about 5 km (3 mi) southwest of the PNNL Richland Campus. The flow rate and water surface elevation of the Columbia River near the PNNL Richland Campus are regulated by upstream dams, the nearest of which is Priest Rapids Dam.

Columbia River flows near the campus are also influenced by the nearest downstream dam (McNary Dam), which has an impoundment that extends to the Hanford Site 300 Area. Columbia River discharge at the Hanford Site varies seasonally; average monthly discharge between 1960 and 2015 varied from about 2,200 m^3/s (78,000 ft^3/s) in September to 5,690 m^3/s (201,000 ft^3/s) in June (USGS 2015). The highest daily mean discharge over the same period was 15,100 m^3/s (533,000 ft^3/s) in June 1961 (USGS 2015). Daily discharge fluctuations from upstream dams can result in river stage fluctuations at the Hanford Site of up to 3 m (10 ft) during a 24-hour period (Duncan 2007).

The City of Richland operates groundwater-recharge basins located about 0.6 km (0.4 mi) south of the PNNL Richland Campus. These basins are used to infiltrate water pumped from the Columbia River, which is subsequently pumped from nearby groundwater wells as a city water supply (Duncan 2007).

4.4.2 Flooding

The Federal Emergency Management Agency (FEMA) floodplain map for Richland (FEMA 1984) extends north to Horn Rapids Road and indicates that the southern portion of the PNNL Richland Campus, with a ground-surface elevation of about 122 m (400 ft), would be unaffected by the 100-year flood. There is no direct estimate of the flood hazard at the northern portion of the PNNL Richland Campus, which is adjacent to the Columbia River and has a ground-surface elevation less than 122 m (400 ft) near the river. However, the shoreline is relatively steep, with the ground-surface elevation greater than 116 m (380 ft) at a distance of about 91 m (300 ft) from the river. Development is expected to occur further to the west of the Columbia River where the ground-surface elevation is about 122 m (400 ft) and would be unaffected by the 100-year flood.

Duncan (2007) states that the 100-year regulated flood discharge for the Columbia River along the northern boundary of the Hanford Site is estimated to be 12,500 m^3/s (440,000 ft^3/s); corresponding discharge at the PNNL Richland Campus will be somewhat larger. There are no direct estimates of the flood hazard at the PNNL Richland Campus for floods larger than the 100-year flood. However, based on modeling conducted in 1976, Duncan (2007) suggests that the campus would be unaffected by the probable maximum flood on the Columbia River, a discharge of about 39,600 m^3/s (1 million ft^3/s). A flood of this magnitude would result in a water surface elevation of 119 m (390 ft) at CGS, located about 12 km (8 mi) north of the PNNL Richland Campus (Energy Northwest 2011). The probable maximum flood has an unspecified, but very large return period (generally much greater than 500 years). The largest flood of record for the Columbia River occurred in 1894 with an estimated peak discharge of 21,000 m^3/s (742,000 ft^3/s) at the Hanford Site (Duncan 2007). The likelihood of a flood of this magnitude re-occurring has been reduced by the construction of upstream dams that regulate flow for flood control. The U.S. Army Corps of Engineers regulated standard project flood used at CGS is 16,100 m^3/s (570,000 ft^3/s) (Energy Northwest 2011). The standard project flood has an unspecified return period, usually greater than several hundred years (Linsley et al. 1992).

4.4.3 Groundwater

Groundwater in the region of the PNNL Richland Campus originates as recharge from rainfall and snowmelt, from excess irrigation, and from the Yakima River (DOE 2016a). The City of Richland's recharge basins and the Columbia River also contribute to groundwater in the immediate vicinity of the campus. Natural recharge rates for the soils occurring at the PNNL Richland Campus are low, 2.6 to 55.4 mm/y (0.1 to 2.2 in./y) depending on the type and amount of vegetation (Fayer and Walters 1995), so that the majority of groundwater at the campus likely originates offsite. Groundwater at the PNNL Richland Campus occurs in the unconfined aquifer of the Hanford and upper Ringold sediments and in deeper basalt-confined aquifers. The unconfined aquifer in the area of the site is about 5.6 to 9 m (18 to 30 ft) thick. Groundwater elevations measured during March 2015 varied from about 106 to 109 m (344 to 351 ft) across the campus (DOE 2016a). Over the long term, groundwater elevations across the campus have varied from 105 to 110 m (345 to 361 ft) (DOE 2016a), with elevations generally increasing from north to south. Groundwater elevations have consistently been less than 107 m (351 ft) north of Horn Rapids Road. With a ground-surface elevation of about 122 m (400 ft), depth to groundwater is normally more than 12 m (40 ft) across the campus, except near the Columbia River. Groundwater in the unconfined aquifer at the PNNL Richland Campus generally flows to the east and discharges to the Columbia River, but has a northerly flow component due to the influence of groundwater mounding beneath the City of Richland's recharge basins to the south. Groundwater flow is also influenced by the Columbia River stage. When the river stage is higher than the unconfined groundwater elevation, river water may flow into, and mix with, the groundwater. This mixing is not significant at the PNNL Richland Campus except near the river in the northeastern portion of the campus, where no development is expected.

Groundwater quality at the PNNL Richland Campus has been affected by Hanford Site activities, the Horn Rapids Sanitary Landfill (located about 0.7 km [0.4 mi] west of the campus), and other offsite activities. The latest Hanford Site groundwater monitoring report (DOE 2016a) describes groundwater quality at the PNNL Richland Campus based on contaminant measurements from wells located on and around the campus (DOE 2016a, 1100-EM Chapter). Tritium concentrations above background level (142 pCi/L) were reported in wells on and near the PNNL Richland Campus in 2015 (DOE 2016a). The highest concentrations, all less than the drinking water standard (20,000 pCi/L), were from Hanford Site 300 Area wells north of the PNNL Richland Campus. The maximum tritium concentration reported in 2015 for a well on the campus was 295 pCi/L (DOE 2016a). Nitrate concentrations have likely exceeded the 45 mg/L equivalent drinking water standard across the majority of the campus for a number of years, with the highest measured concentrations in the area near the Horn Rapids Sanitary Landfill (DOE 2016a). A nitrate concentration of 88.8 mg/L was reported for a well on the northern portion of the campus sampled in 2014 (DOE 2016a). Uranium concentrations in excess of the drinking water standard (30 μg/L) were measured in groundwater downgradient of the AREVA facility located about 0.3 km (0.2 mi) southwest of the Horn Rapids Sanitary Landfill (maximum observed concentration of 43.2 μg/L in 2015), and in 300 Area wells (observed concentration of 45.1 μg/L in 2015 at the nearest well, about 300 m [1,000 ft] north of the campus boundary) (DOE 2016a). Uranium concentrations in groundwater measured in wells on and adjacent to the PNNL Richland Campus have not exceeded 15 μg/L since 1987 (DOE 2016a). Trichloroethene concentrations near the Horn Rapids Sanitary Landfill and adjacent to the PNNL Richland Campus were less than 1 μg/L in 2015, near or below the detection limit (DOE 2016a).

4.5 Cultural and Historical Resources

Cultural and historic resources are the remains of past human activities and include prehistoric and historic-era archaeological sites, historic districts, and buildings, as well as any site, structure, or object that is at least 50 years old. Traditional cultural properties (TCPs), which are properties important for maintaining the culture of a living community of people, are also considered here. The National Register of Historic Places (NRHP)[1] is a list that recognizes cultural resources that have been deemed to have historic significance. To qualify as NRHP-eligible, a site must meet at least one of the four criteria detailed at 36 CFR 60.4, Criteria for Evaluation (Criterion A-D) and the site must also possess integrity.[2] Cultural resources that are either NRHP-eligible or NRHP-listed are afforded special attention under both NEPA (42 U.S.C. § 4321 et seq.) and National Historic Preservation Act (NHPA; 54 U.S.C. § 300101)

[1] "The NRHP means the National Register of districts, sites, building, structures, and objects significant in American history, architecture, archaeology, engineering, and culture that the Secretary of the Interior is authorized to expand and maintain pursuant to Section 101(1) of the National Historic Preservation Act of 1966, as amended" (36 CFR 67.2).
[2] The NPS defines integrity as the "… ability of a property to convey its significance" (NPS 2002).

because they require avoidance or mitigation of adverse impacts. NEPA must take into consideration impacts to all cultural resources and resources that have additional cultural value beyond NRHP-eligibility recognition (e.g., sacred sites and unique natural areas of aesthetic value).

This section presents background information on the prehistory and history of the Proposed Action area, along with a description of the archaeological sites, TCPs, and architectural resources located on the PNNL Richland Campus. It also describes the NRHP-eligibility status of each resource. An NHPA Section 106 consultation is being performed in parallel to this NEPA assessment, and will be completed in consultation with the Advisory Council on Historic Preservation (ACHP) and consulting parties.

The cultural resources of the Columbia Plateau are diverse, ranging from early pre-contact times to the Atomic Age. Of relevance to the PNNL Richland Campus are the historic contexts for three distinct cultural landscapes: the Native American Cultural Landscape, the Early Settlers and Farming Cultural Landscape, and the Manhattan Project and Cold War-Era Cultural Landscape.

Archaeological investigations conducted on the Columbia Plateau enabled the creation of a cultural chronology dating back to the end of the Pleistocene. Native Americans have lived in and around the region for thousands of years. More than 8,000 years of pre-contact human activity have left extensive archaeological deposits along the Columbia River and, to a lesser degree, the off-river interior.

Ethnographically, the Sahaptin-speaking Cayuse, Walla Walla, Palouse, Nez Perce, Umatilla, Wanapum, and Yakama used this locale in the Columbia Plateau region. 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 a focus on harvesting salmon and other anadromous fish. Seasonal camps were used in the inland areas during the spring and summer months as small groups would travel into the canyons and river valleys to gather roots in the spring then into the mountains to gather ripening berries in late summer. In late fall, the seasonal cycle ended and families returned to the winter villages (Bard and McClintock 1996; Dickson 1999; Chatters 1980; and Galm et al. 1981).

Important cultural sites associated with both the pre-contact and ethnohistoric eras are located on the PNNL Richland Campus. Native American descendants of the area’s original inhabitants continue to use portions of the PNNL Richland Campus for traditional cultural purposes and to access traditional resources and places located on the PNNL Richland Campus. These descendants include members of four federally recognized Tribes (i.e., the Yakama Nation, Nez Perce Tribe, Confederated Tribes of the Umatilla Indian Reservation [CTUIR], and the Confederated Tribes of the Colville Reservation[Colville]) and the Wanapum (a non-federally recognized tribe that have strong ancestral, cultural, and historical ties to the PNNL Richland Campus).

Three of the federally recognized Tribes have treaties with the U.S. government. In June 1855, at Camp Stevens in the Walla Walla Valley, representatives of the United States negotiated treaties with leaders of the 14 Tribes and bands of what would become the Yakama Nation, one with the three Tribes that would become the CTUIR, and one with the Nez Perce Tribe. The U.S. Senate ratified the treaties in 1859. When signing the treaties, the three Tribes agreed to cede large blocks of land to the United States. The PNNL Richland Campus is located within the CTUIR’s ceded lands. The Tribes retained certain lands for their exclusive use (the three reservations) and also retained certain rights and privileges to continue traditional activities outside the reservations. The Confederated Tribes of the Colville Reservation was established by Presidential Executive Order in 1872 and now includes descendants of 12 aboriginal Tribes including several with historical ties to the Hanford area (Palouse, Moses Columbia, and the Nez Perce of Chief Joseph’s Band).

The Lewis and Clark expedition of 1805 began the Euro-American exploration and settlement of the general region. The explorers sought trade items from Native Americans and trade routes were established. It was not until the late 19th and early 20th centuries, however, that the area was intensively settled. During this period, settlers farmed and raised livestock, mined, and built settlements along the Columbia River. Historic archaeological resources mark the locations where gold mining, stock raising, farming, and drilling for natural gas took place from the 1850s to 1943. Near the PNNL Richland Campus, historical activity began in the early 1900s in the region around Richland to the south and the community of Fruitvale to the north, when farming communities expanded with the construction of large-scale irrigation projects, including canals.

Tribes used portions of the PNNL Richland Campus throughout the historical period up until 1943, when both Euro-American settlers and Native Americans were forced to relocate so that the federal government could develop the land for the Manhattan Project. The Tribes continue to have access to the PNNL Richland Campus for gathering, fishing, and ceremonial purposes.

The PNNL Richland Campus was originally part of the DOE Hanford Site, which the federal government created as part of the Manhattan Project in 1943. The Manhattan Project war effort rapidly transformed the Hanford Site from an isolated agricultural region to an industrial complex dedicated to producing plutonium eventually used in the first atomic bombs. Because of the importance of its national defense mission to world history, Hanford's Manhattan Project and Cold War-Era Cultural Landscape is critical for historical interpretation of this period on a national scale. The B Reactor, where the plutonium for the first atomic bomb was made; the 300 Area, where nuclear research and fuel fabrication was conducted (adjacent to the north boundary of the PNNL Richland Campus); and the 200 East and West Areas, where the plutonium was processed, are but a few of the historic remains from the Manhattan Project and Cold War landscape. DOE identified a National Register-eligible Hanford Site Manhattan Project and Cold War-Era Historic District that serves to organize and delineate the evaluation and mitigation of Hanford's plutonium-production built environment (DOE 1998). PNNL Richland Campus facilities are not part of this district.

In the late 1940s, portions of the PNNL Richland Campus south of Horn Rapids and the surrounding area were used as the North Richland Construction Camp. These areas consisted of construction housing for postwar Hanford Site development. In 1951, the property was transitioned to the U.S. Army, which expanded the camp to house personnel and equipment for the support of the air defense installations (anti-aircraft artillery sites) established on the Hanford Site. From 1951 to 1961 it was known as Camp Hanford (and/or the 3000 Area Camp). The anti-aircraft artillery sites were phased out during the late 1950s for the new NIKE missile installations. As such, Camp Hanford was no longer needed to support military defense of the site, and it was closed and deactivated in 1960 (DOE/PNSO 2015).

After decommissioning Camp Hanford, the U.S. Army demolished most of the buildings and transferred the land to the Atomic Energy Commission (AEC), which declared the land to be surplus property and transferred it to the City of Richland. As part of an economic diversification program in 1964, the AEC issued a call for contractors to operate the "Hanford Laboratories," which would conduct R&D in support of the Hanford Site and other missions. In 1965, Battelle was awarded its first contract to operate Hanford Laboratories. Battelle purchased 93 ha (230 ac) of the surplus land south of Horn Rapids Road from the City of Richland to build research facilities that would form the original PNNL Richland Campus. The first four buildings were completed in October 1967: the Research Operations Building (ROB), Mathematics Building (MATH), Auditorium, and Physical Sciences Laboratory (PSL). As a separate part of the economic development program, Douglas Aircraft Company constructed the Research Technology Laboratory (RTL 520) and its support facilities on the approximately 47 ha (115 ac) of property that it purchased from the City of Richland. Construction of the RTL Complex was completed in 1966. The RTL Complex was eventually sold to Exxon Nuclear, which sold it to Battelle in 1981 for PNNL use.

4.5.1 Archaeological and Cultural Resources

An archaeological site is defined by the Washington State Department of Archaeology and Historic Preservation (DAHP) as the presence of two or more artifacts or a cemetery, while an archaeological isolate is defined as the presence of a single artifact (DAHP 2015). Archaeological sites and isolates could be evaluated for NRHP eligibility, however, isolates are typically considered not eligible unless they are of exceptional value.[3]

The pre-contact era includes the period before European contact in the Americas. In the Columbia Plateau, the pre-contact era ended in the early 1800s, when Lewis and Clark traveled through the area. However, more intense European contact was not initiated until the mid-1800s. The historic era in the Columbia Plateau includes items from initial European contact (1800s) through the 1960s. In Washington State, "only those sites that meet the minimum National Register (36 CFR Part 60) age threshold (50 years of age or older) would be retained as historic archaeological records and assigned Smithsonian Trinomials by DAHP" (DAHP 2015).

Cultural resources investigations completed within the PNNL Richland Campus between the early 1980s and 2017 have resulted in the identification of 27 archaeological sites and 17 archaeological isolates. Information on these resources, including NRHP eligibility information can be found in Table 4.2. The results of these investigations and formal NRHP evaluations were included and summarized in the NHPA Section 106 review that is being performed in parallel with this NEPA assessment (Mendez et al. 2017). Per 36 CFR Part 800, the NHPA Section 106 review was transmitted to the Washington State Historic Preservation Office and Tribes on July 17, 2017 for review and comment.

Archaeological resources of note that are located within the PNNL Richland Campus include three village/campsites (45BN28/104, 45BN105, and 45BN642), laterals of the Richland Irrigation Canal (45BN1125), and 45BN1426. 45BN1426 has been identified as an area of cultural significance to regional Tribes and an area that has also been recorded as an archaeological site. A perimeter fence has been established around the outer boundary and the area has been designated as a PDA in recognition of the sensitive and important cultural and biological resources contained within the area. In addition, several historic trash scatters associated with both the historic farming era and the Manhattan Project/Cold War-Era North Richland Construction Camp/Camp Hanford and two pre-contact lithic scatters have also been identified.

Table 4.2. Previously Recorded Archaeological and Cultural Resources within the PNNL Richland Campus

Smithsonian Trinomial Designation[(a)] or Associated Site Number	Context	Type	Description	NRHP Eligibility
45BN105	Pre-Contact	Site	Pre-contact campsite	Unevaluated; listed on the Washington State Heritage Register as part of the Hanford South Archaeological District
45BN1116	Historic	Site	Historic trash scatter	Unevaluated
45BN1117	Historic	Site	Historic trash scatter	Potentially eligible
45BN1125	Historic	Site	Richland Irrigation Canal	Determined eligible

[3] The NPS states "The quality of national significance is ascribed to districts, sites, buildings, structures, and objects that possess exceptional value or quality in illustrating or interpreting the heritage of the United States in history, architecture, archaeology, engineering, and culture and that possess a high degree of integrity of location, design, setting, materials, workmanship, feeling, and association…" (NPS 2002:50).

Table 4.2. (contd)

Smithsonian Trinomial Designation[(a)] or Associated Site Number	Context	Type	Description	NRHP Eligibility
45BN1126	Historic	Site	Historic trash scatter	Determined not eligible
45BN1127	Historic	Site	Historic trash scatter	Determined not eligible
45BN1128	Historic	Site	Historic trash scatter[(b)]	Determined not eligible
45BN1129	Historic	Site	Historic trash scatter[(b)]	Determined not eligible
45BN1130	Historic	Site	Historic trash scatter[(b)]	Determined not eligible
45BN1134	Historic	Site	Low density can scatter	Unevaluated
45BN1363	Historic	Site	Historic trash scatter[(b)]	Determined not eligible
45BN1403	Historic	Site	Historic Horn Rapids Road	Recommended not eligible
45BN1426	Pre-Contact	Site	Culturally sensitive area	Unevaluated
45BN1735	Pre-Contact	Isolate	Pre-contact chopper	Unevaluated[(c)]
45BN1737	Historic	Isolate	Green glass insulator	Unevaluated[(c)]
45BN1937	Historic	Isolate	Milk bottle	Determined not eligible
45BN1938	Historic	Isolate	Hole-in-cap can	Determined not eligible
45BN1939	Historic	Isolate	Export beer bottle	Determined not eligible
45BN1940	Historic	Isolate	Rubber tire	Determined not eligible
45BN1941	Historic	Isolate	Hole-cap-can	Determined not eligible
45BN1942	Historic	Isolate	Flat top beer can	Determined not eligible
45BN1943	Historic	Site	Insulator concentration	Determined not eligible
45BN1944	Pre-Contact	Site	Pre-contact lithic material	Determined eligible
45BN1945	Historic	Site	Subterranean depression	Determined not eligible
45BN1946	Pre-Contact	Site	Pre-contact lithic shatter	Determined eligible
45BN1947	Historic	Site	Historic trash scatter	Determined not eligible
45BN1948	Historic	Site	Historic trash scatter	Determined not eligible
45BN1949	Historic	Site	Historic trash scatter	Determined not eligible
45BN1950	Historic	Isolate	Birdcage	Determined not eligible
45BN1957	Pre-Contact	Site	Relocated pre-contact archaeological material	Unevaluated
45BN28/104	Pre-Contact	Site	Pre-contact village	Unevaluated; listed on the Washington State Heritage Register as part of the Hanford South Archaeological District
45BN511	Pre-Contact	Isolate	Pre-contact lithic material (flake)[(b)]	Unevaluated[(c)]
45BN641	Pre-Contact	Isolate	Pre-contact cobble tool	Unevaluated[(c)]
45BN642	Pre-Contact	Site	Pre-contact campsite	Unevaluated
45BN643	Pre-Contact	Isolate	Lithic debitage[(d)]	Unevaluated[(c)]
45BN644	Pre-contact	Site	Rock feature discovered in the subsurface during archaeological monitoring of the 1994 EMSL facility construction activities and is no longer extant.	Unevaluated
45BN2000	Historic	Site	Foundation	Potentially eligible
45BN1999	Historic	Site	Historic debris	Determined eligible
H3-438[(e)]	Historic	Site	Pile of cobbles, boulders and pieces of ceramic pipe near the intersection of two old dirt roads[(b)]	Determined not eligible
HI-95-137[(f)]	Historic	Isolate	Gray enamelware bucket	Unevaluated[(c)]
HI-95-141	Historic	Isolate	Round tin canister with lid	Unevaluated[(c)]
HI-95-142	Historic	Isolate	Enamelware bucket or basin	Unevaluated[(c)]
HI-95-143	Historic	Isolate	Historic isolate	Unevaluated[(c)]
HI-95-144	Historic	Isolate	Colorless glass bottle with square base	Unevaluated[(c)]

Table 4.2. (contd)

Smithsonian Trinomial Designation[(a)] or Associated Site Number	Context	Type	Description	NRHP Eligibility

(a) Due to its work in multiple states in the 1960s, the Smithsonian Institution developed a unified inventory numbering system to maintain systematic control over all collected data. The trinomial consists of three parts: 1) the state number, 2) the county alpha designation/abbreviation, and 3) the site number.
(b) Previously impacted from construction of the PSF Complex and no longer exists. This resource is not considered as part of this impact analysis.
(c) Isolates are typically considered not eligible in the NHRP.
(d) This item was collected and remains in the PNSO artifact collection; thus, it is not considered as part of this impact analysis.
(e) H3- numbers were a previous archaeological resource numbering system employed by the DAHP.
(f) HI- numbers were temporary numbers assigned to archaeological isolates by the Hanford Cultural Resources Laboratory. These sites were recorded; however, formal documentation was never received by the DAHP for Smithsonian Trinomial designations.

4.5.2 Traditional Cultural Properties

One NRHP-eligible TCP, known as *Shu Wipa,* is located within and extends beyond the boundary of the PNNL Richland Campus (DOE 2015a). The National Park Service (NPS 2012) provides a definition of a TCP as follows:

> A Traditional Cultural Property (TCP) is a property that is eligible for inclusion in the National Register of Historic Places (NRHP) based on its associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. TCPs are rooted in a traditional community's history and are important in maintaining the continuing cultural identity of the community.

Shu Wipa is of cultural and historic importance to the Wanapum for traditional fishing, gathering, and ceremonial purposes (DOE 2015a). The southern portion of the PNNL Richland Campus (south of Horn Rapids Road) has witnessed a large degree of disturbance both historically and in more recent times. As such, this area retains almost no natural landscape features (i.e., natural resources and vegetation) and does not retain the qualities and values that the Wanapum have highlighted as integral to the overall condition of the TCP. In contrast, the northern portion of the PNNL Richland Campus (north of Horn Rapids Road) has witnessed some construction-related activity associated with the PSF Complex; however, it remains largely undisturbed with natural resources remaining relatively intact. The current state of this area preserves the values that make this TCP important to the Wanapum.

During a meeting between the Yakama Nation, PNSO, and PNNL cultural resources staff, the Yakama Nation indicated that they have identified a TCP that is located within, and extends beyond, the boundary of the PNNL Richland Campus. While limited information on this TCP is available, the Yakama Nation have indicated that they hold cultural significance to this area and the abundant cultural resource material within it.

The CTUIR have identified a TCP in the vicinity of the PNNL Richland Campus, *Šúuwipa*. This area was traditionally used for materials and medicine gathering and as a traditional fishing area (Hunn et al. 2015).

The PDA (which coincides with archaeological site 45BN1426) itself has been formally designated as a Sacred Site under Executive Order 13007 by the CTUIR and Nez Perce Tribe. The PDA is also an archaeological site (45BN1426) as well as an area of cultural significance to regional Tribes.

4.5.3 Architectural Resources

Historically significant standing structures within the PNNL Richland Campus include components of the RTL Complex (RTL 520 and RTL 530), which have been determined to be NRHP-eligible. The RTL Complex includes several other service and support buildings that were determined to not be NRHP-eligible (see). Impacts from remediation and demolition of the RTL Complex have been considered in the *Cultural Resources Review of the Remediation of Radiological Contamination at the Research Technology Laboratory (RTL) Complex, Pacific Northwest National Laboratory (PNNL) Campus, Richland, Washington* (Harvey et al. 2015). A Memorandum of Agreement (MOA) to resolve and mitigate these adverse effects to RTL 520 and RTL 530 was developed in consultation with DAHP and executed on March 23, 2017 (DOE/PNSO 2017a). In spring 2017, an architectural resources inventory was completed of the remaining buildings located within the northern and southern portions of the PNNL Richland Campus. Buildings on the PNNL Richland Campus meeting the 50-year threshold for historic documentation requirements were documented on Historic Property Inventory Forms (HPIFs) and evaluated for listing in the NRHP as part of the NHPA Section 106 review for the Proposed Action (Mendez et al. 2017).
DOE-PNSO determined that there are several NRHP eligible facilities and a historic district within the PNNL Richland Campus.

4.6 Biological Resources

The PNNL Richland Campus comprises approximately 269 ha (664 ac) located in the lowest and most arid portion of the Columbia Plateau Ecoregion (EPA 2016), which supports native shrub-steppe vegetation, an estimated 60 percent of which has been converted to agriculture, and the remainder of which is mostly fragmented (FWS 2013; WWHCWG 2012–2015). An exception is the Hanford Site, which lies adjacent to, and just north and west of, the PNNL Richland Campus (Figure 1.1). The Hanford Site has been protected from agricultural use and development for more than 65 years. The portion of the PNNL Richland Campus to the north of Horn Rapids Road was formerly part of the Hanford Site before being assigned to DOE-SC (DOE/PNSO 2015). Thus, since 1943, this area was protected from agricultural use and development prior to transfer and is still dominated by native shrub-steppe vegetation outside of the PSF Complex. The portion of the PNNL Richland Campus to the south of Horn Rapids Road has been developed to various extents and consists of a mosaic of maintained landscapes, agricultural fields, and previously disturbed, early-successional habitats. Species discussed below that have been observed in these two areas are called by their common names; Latin names for these are provided in Appendix A. Latin names are provided in the below discussion only for species potentially occurring in these two areas that have not been observed.

4.6.1 Area South of Horn Rapids Road

Approximately 107 ha (265 ac) of the PNNL Richland Campus are located south of Horn Rapids Road, consisting of facilities, agricultural fields, and early-successional habitats (Figure 4.1). Most facilities are surrounded by landscaped vegetation consisting of planted lawn grass and ornamental trees and shrubs. The facilities are interspersed with irrigated cropland and early-successional habitats.

The landscaped vegetation and existing facilities provide suitable nesting habitat for approximately 25 avian species (see Appendix A) that are common in similar environments throughout the ecoregion. These include birds of prey that nest in trees (e.g., great-horned owl); upland game birds that nest in trees (e.g., Eurasian collared dove), on buildings (e.g., rock dove), or on the ground (e.g., killdeer; California quail; mourning doves); and perching birds that nest in trees (e.g., black-billed magpie, American robin, American crow, American goldfinch, in shrubbery (e.g., Brewer's blackbird), or on human structures (e.g., Eurasian starling, house sparrow, western kingbird).

Agricultural fields consist largely of alfalfa and pasture grass. The early-successional habitats are degraded remnants of shrub-steppe habitat and consist of those with only herbaceous species and those with both a shrub overstory and an herbaceous understory. The overstory of shrub fields consists only of rubber rabbitbrush. The understory of shrub fields and the herbaceous fields is comprised primarily of non-native cheatgrass. Gravel and remnants of cement foundations occur in places throughout the early-successional habitats and are indicative of some prior development. The early-successional habitats are relatively small and are substantially isolated from the expansive and more natural shrub-steppe habitat that exists west of Stevens Drive. Isolation and artificial substrate slow the habitat succession process typical of open expanses of shrub-steppe habitat that have not undergone development. Thus, while the early-successional habitats support some plant species typical of shrub-steppe communities (Table A.3 and Table A.4), they likely will not become mature shrub-steppe habitat (climax plant community) with the 20-year period of the potential buildout. Ground-nesting avian species (e.g., killdeer and mourning doves) may nest in early-successional habitats, on the margins of agricultural fields, and in adjacent non-vegetated areas.

Mammals that use landscaped areas includes eastern gray squirrel, eastern fox squirrel, and Nuttall's cottontail. The eastern gray squirrel and eastern fox squirrel were introduced to Washington State from the eastern United States and occur in many urban and developed areas (WDFW 2016a). 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 agricultural areas and early-successional habitats include mule deer, coyote, American badger, and northern pocket gopher.

There are no federally or state-listed species that use the area south of Horn Rapids Road, except possibly the bald eagle, a federal species of concern, and the long-billed curlew, a Washington State-monitored species (WDFW 2016b). Long-billed curlews have been observed foraging in agricultural fields and lawn areas; however, the species likely nests in shrub-steppe habitat on the west side of Stevens Drive and uses agricultural areas and early-successional habitats for foraging. Bald eagles have been observed perching in ornamental trees and open areas but do not nest there.

4.6.2 Area North of Horn Rapids Road

The approximately 161 ha (399 ac) of the PNNL Richland Campus located north of Horn Rapids Road are bounded to the north by the Hanford Site 300 Area, to the east by the Columbia River, to the west by the City of Richland/Port of Benton/Energy Northwest Industrial Development Area, and to the south by the developed area of the PNNL Richland Campus (Figure 1.2). Biological surveys have been conducted annually in portions of this area since 2009 (PNNL 2016c). Appendix A provides some of the data obtained from these surveys regarding plant communities and wildlife across the PNNL Richland Campus north of Horn Rapids Road between 2009 and 2016.

<u>Uplands</u>. The undeveloped portion of the PNNL Richland Campus north of Horn Rapids Road retains much of its native biodiversity and community structure. Plant communities are classified based on the dominant overstory (shrubs) and understory (grasses and forbs) species (Figure 4.1). Shrub-steppe plant communities in the undeveloped area include those dominated by climax shrubs such as big sagebrush and antelope bitterbrush, which are indicative of relatively little prior disturbance. Communities dominated by subclimax shrubs, such as rubber rabbitbrush and green rabbitbrush, are generally indicative of some prior disturbance. Plant communities dominated by non-native cheatgrass or snow buckwheat, a native perennial sub-shrub, are indicative of more extensive or more recent disturbance (e.g., mechanical disturbance or fire). The western side of the undeveloped area has been disturbed less than the eastern side, as indicated by the spatial extent of the above plant communities that represent such disturbance (Figure 4.1). The more mature and undisturbed shrub-steppe communities generally support greater plant species diversity. The

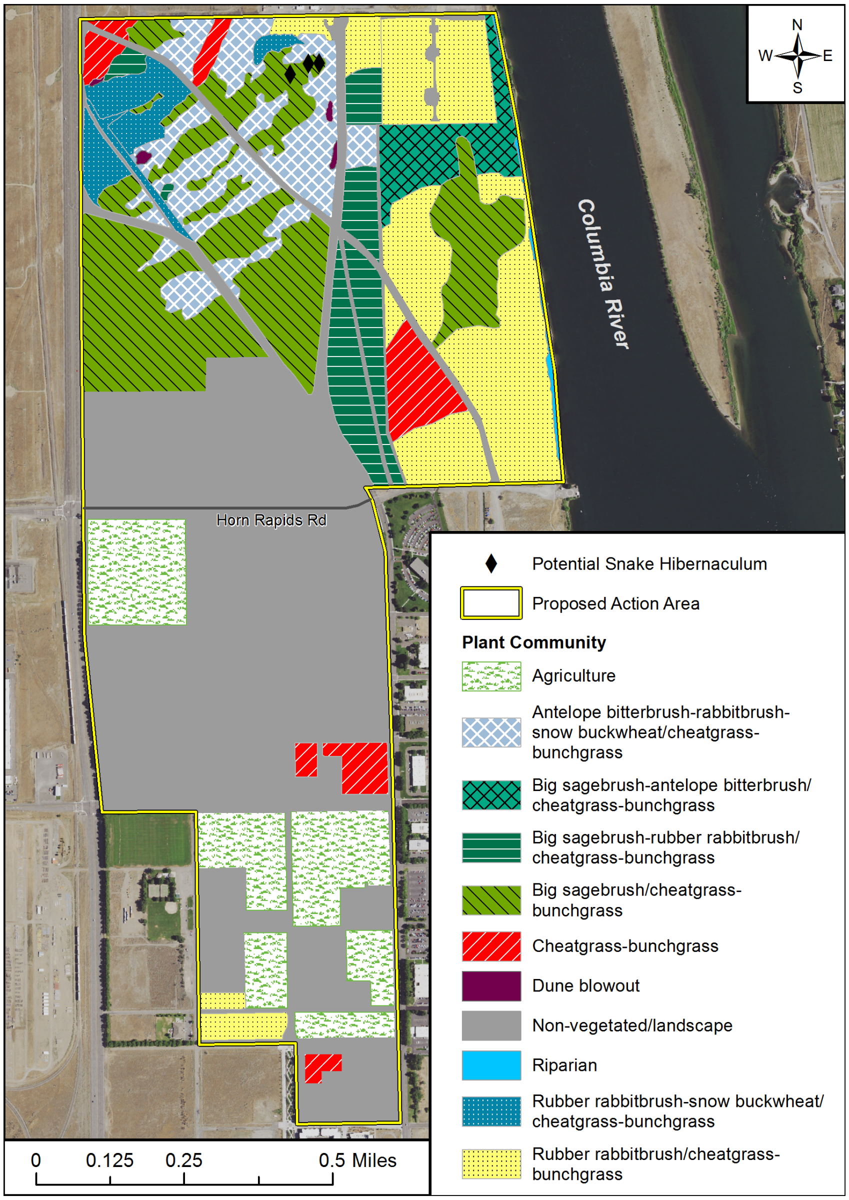

Figure 4.1. Habitat Polygons Located on the PNNL Richland Campus Based on 2016-17 Surveys

southwest-to-northeast trending fingerlike mosaic of bitterbrush and sagebrush communities on the western side of the undeveloped area (Figure 4.1) is indicative of the direction of prevailing wind gusts (Hoitink et al. 2005) that shift loose soils into superficial swales and ridges. The bitterbrush communities tend to occur in the sandier swales while sagebrush communities tend to occur in the loamier soils on the slightly elevated ridges. The above shrub communities include native perennial bunchgrasses; those communities where they are more prevalent are indicated in Figure 4.1. The most common perennial bunchgrass is Sandberg's bluegrass; however, several stands of needle-and-thread grass dominate sandy swales, and Indian ricegrass is represented in several swales containing antelope bitterbrush. Snow buckwheat is prevalent in most big sagebrush, bitterbrush, and rabbitbrush communities (Figure 4.1), and cheatgrass is prevalent in all upland plant communities in the undeveloped area.

Common native forb species in the above plant communities include Carey's balsamroot, long-leaved phlox, yarrow, pale evening primrose, dune scurfpea, turpentine spring parsley, and daisy fleabane. Common non-native forbs include tumble mustard, Russian thistle, and several species listed as Class B and Class C noxious weeds by the State of Washington. Common Class B noxious weeds include diffuse knapweed, rush skeletonweed, Russian knapweed, burningbush, puncturevine, and yellow starthistle (WAC 16-750-011). Common Class C noxious weeds include field bindweed and Russian olive (WAC 16-750-015). Since 2010, PNNL has implemented a program to control populations of some of these weeds (Duncan et al. 2016).

Four relatively stable sand dune blowouts and mature shrub areas with relatively open sand exist in the project area (Figure 4.1). These provide suitable habitat for several species of rare spring ephemeral annual plants, including Great Basin gilia, loeflingia, rosy pussypaws, and Suksdorf monkeyflower (WDNR 2017). The areas were surveyed in 2012 (EAS 2013) and again in 2016 for this EA and these species were not observed, but this does not preclude possible future presence of these species.

Shrub-steppe plant communities north of Horn Rapids Road support a variety of wildlife, including coyote, mule deer, and northern pocket gopher. Migratory bird species that have been observed and likely nest in the shrub-steppe plant communities include, but are not limited to, ground-nesting birds such as mourning doves, horned larks, and western meadowlarks, and shrub-nesting birds such as lark sparrows. The more mature and undisturbed a shrub-steppe community is, the more valuable it generally is to wildlife (e.g., greater abundance of mature sagebrush and native plant species supports a more diverse assemblage of wildlife) (Dobler et al. 1996). Shrub-steppe forb communities support pollinators (79 FR 35901); however, little is known about them or their plant preferences.

Three potential snake hibernacula comprised of partially buried rubble exist in the project area (Figure 4.1). These may be suitable for snake species common in south-central Washington such as the western rattlesnake (*Crotalus viridis*) (Fitzner and Gray 1991), as well as some that are of concern to the State of Washington, such as the striped whipsnake (*Masticophis taeniatus,* Washington State candidate species) (WDFW 2016b). The potential hibernacula were surveyed in spring 2016 but no snake activity was observed. Lack of observation does not preclude possible future occupancy of the hibernacula.

Riparian Area. The riparian community along the Columbia River shoreline north of Horn Rapids Road (Figure 4.1) is limited to a narrow band near the water which consists of multilayered trees, shrubs, and herbaceous species. Common tree species include Siberian elm, white mulberry, poplars, and tree-of-heaven, which is a Class C noxious weed. Shrub willows and wild rose are common shrub species. Common herbaceous species include common St. Johnswort, Himalayan blackberry, and reed canarygrass, all of which are Class C noxious weeds, as well as Columbia tickseed, cocklebur, and chicory.

The riparian community potentially provides suitable habitat for several species of rare plants, including Columbia yellowcress, lowland toothcup, awned halfchaff sedge, grand redstem, Canadian St. John's-wort, and beaked spike-rush (Sackschewsky et al. 2014; WDNR 2017). Columbia yellowcress is known to occur in the riparian zone in the 300 Area, located just north of the project area. The other five species occur in the riparian area elsewhere along the Hanford Reach north of the 300 Area. None of the six species have been observed in the riparian zone in the PNNL Richland Campus (Sackschewsky et al. 2014), but this does not preclude possible future presence of these species.

Riparian habitats support a diverse assemblage of wildlife. The area is used for daytime perching by wintering bald eagles and by foraging osprey. A wintering population of bald eagles occupies the Hanford Reach of the Columbia River annually from approximately mid-November through mid-March. Bald eagles are known to perch in trees near the river within the project area but are not known to nest there (DOE 2013e). A large number of migratory bird species, including eastern kingbird, red-winged blackbird, and Bullock's oriole, use riparian trees and shrubs as nesting habitat. The area is also frequented by wading birds such as the black-crowned night-heron and great egret, and shorebirds such as the spotted sandpiper. Many migratory bird species use the riparian habitats for resting and feeding during spring and fall migration. Riparian forb communities support pollinators; however, little is known about them or their plant preferences.

Federal and State-Listed Species. Federal and state-listed wildlife and plant species known to occur or that potentially occur in the upland and riparian areas of the PNNL Richland Campus north of Horn Rapids Road were identified through the Washington Department of Fish and Wildlife (WDFW 2016b) and Washington Department of Natural Resources (WDNR 2017) and are listed in Table 4.3. The bald

Table 4.3. Wildlife and Plant Species of Conservation Concern Known to Occur or That Potentially Occur on the PNNL Richland Campus

Common Name[(a)]	Genus and Species	Federal Status[(b)]	State Status[(c)]
	Wildlife		
American white pelican	*Pelecanus erythrorhynchos*		Threatened
American badger	*Taxidea taxus*		Monitor
Bald eagle	*Haliaeetus leucocephalus*	Species of Concern	
Black-crowned night heron	*Nycticorax nycticorax*		Monitor
Black-tailed jackrabbit	*Lepus californicus*		Candidate
Burrowing owl	*Athene cunicularia*		Candidate
Loggerhead shrike	*Lanius ludovicianus*		Candidate
Long-billed curlew	*Numenius americanus*		Monitor
Northern sagebrush lizard	*Sceloporus graciosus*		Candidate
Osprey	*Pandion haliaetus*		Monitor
Sage sparrow	*Artemisiospiza nevadensis*		Candidate
Townsend ground squirrel	*Urocitellus townsendii townsendii*		Candidate
	Plants		
Awned halfchaff sedge	*Lipocarpha aristulata*		Threatened
Beaked spike-rush	*Eleocharis rostellata*		Sensitive
Columbian yellowcress	*Rorippa columbiae*	Species of Concern	Threatened
Grand redstem	*Ammania robusta*		Threatened
Great Basin gilia	*Aliciella leptomeria*		Threatened
Canadian St. Johnswort	*Hypericum majus*		Sensitive
Loeflingia	*Loeflingia squarrosa*		Threatened
Lowland toothcup	*Rotala ramosior*		Sensitive
Rosy pussypaws	*Calyptridium roseum*		Threatened
Suksdorf monkeyflower	*Erythranthe suksdorfii*		Sensitive

Sources: WDFW (2016b) and WDNR (2017)

(a) The bald eagle, black-crowned night heron, American white pelican, sagebrush sparrow, black-tailed jackrabbit, badger, and long-billed curlew were observed between 2009 and 2016 on the campus north of Horn Rapids Road (see above text and Appendix A). A single burrowing owl was observed in 2006 (see above text). Other species potentially occur there based on the availability of suitable habitat.

(b) Federal Species of Concern are those that may be in need of conservation actions, ranging from monitoring of populations and habitat to listing as federally threatened or endangered. Federal Species of Concern receive no legal protection and the classification does not imply that the species is being considered for listing as threatened or endangered (FWS 2015).

(c) Candidate animal species are those fish and wildlife species that the WDFW would review for possible listing as endangered, threatened, or sensitive (WDFW 2016b). Threatened plant species are those likely to become endangered in the near future in the State of Washington if factors contributing to population decline or habitat loss continue. Endangered plant species are in danger of becoming extinct or extirpated from the State of Washington. Sensitive species are vulnerable or declining and could become endangered or threatened in the state without active management or removal of threats (WDNR 2017).

eagle, black-crowned night heron, American white pelican, osprey, sagebrush sparrow, black-tailed jackrabbit, American badger, and long-billed curlew were observed between 2009 and 2016 (see Appendix A). Bald eagles and black-crowned night herons have been observed perching in trees and foraging along the Columbia River shoreline but are not known to nest there. American white pelicans have been observed foraging along the Columbia River shoreline but are not known to nest there. Ospreys have been observed perching on utility poles in the uplands north of Horn Rapids Road but are not known to nest there. The species forages in the nearby Columbia River. The sagebrush sparrow is a sagebrush-obligate species (WDFW 2017), and is thus dependent upon and is limited by the extent of mature shrub-steppe habitat (Vander Haegen et al. 2000) and may nest in the uplands. Black-tailed jackrabbits and badgers occupy shrub-steppe habitat and are known to occur in the uplands. Long-billed curlews have been observed in upland habitat north of Horn Rapids Road but are not known to nest there. In addition, a single burrowing owl was observed in 2006 but nesting was not observed (DOE 2007) and the species has not been observed since that time. Townsend’s ground squirrel is known to occur just north of the PNNL Richland Campus in the southern periphery of the Hanford Site 300 Area. No federal or state-listed plant species were observed between 2009 and 2016.

4.7 Wetlands and Floodplains

The only naturally occurring surface waterbody in or adjacent to the PNNL Richland Campus is the Columbia River, which borders the project area on its east side (Figure 4.1). The riparian zone is narrow, generally less than 10 m (33 ft) wide, and ascends abruptly to a steep low-lying bluff or bank roughly 20 ft high along the entire eastern border of the PNNL Richland Campus (Figure 4.2). Floodplains in riverine systems are created by out-of-bank flooding. As discussed in Section 4.4.2, the FEMA floodplain map extends southward from Horn Rapids Road (FEMA 1984); however, there are no FEMA floodplain maps available for the area north of Horn Rapids Road. FEMA floodplain maps south of Horn Rapids Road suggest that the 100-year floodplain does not overtop a bluff that is similar to the bluff present north of Horn Rapids Road (FEMA 1984). As further indicated in Section 4.4.2, the portions of the campus where development would occur are above the level of the probable maximum flood (which has a greater than 500-year recurrence interval). Therefore, none of the campus is assumed to be within a floodplain. This is supported by observations made during the biological field surveys in Section 4.6.2. While daily discharge fluctuations from upstream dams can result in observed river-stage fluctuations at the Hanford Site of up to 3 m (10 ft) during a 24-hour period (Duncan 2007) that inundate the riparian zone, they do not flow out-of-bank. Consequently, the project area does not contain a functional floodplain per the meaning of EO 11988 (42 FR 26951).

The campus property line along the Columbia River is defined by the ordinary high water mark (OHWM), which lies near the bottom of the above-noted bluff. Because all of the PNNL property is above the OHWM, wetland hydrology (i.e., inundation or saturation of the surface for an amount of time sufficient to support the development of hydrophytic vegetation and/or hydric soils) is not likely present in the DOE-owned portion of the riparian zone. In addition, according to the National Wetlands Inventory Database, no known wetlands exist within the riparian zone (FWS 2017). Up-gradient of the river shoreline no plant communities on the PNNL Richland Campus (Figure 4.1) have vegetation suggestive of a wetland community.

Figure 4.2. Columbia River Shoreline adjacent to the PNNL Richland Campus

4.8 Socioeconomics

Activities on the Hanford Site and the PNNL Richland Campus make a substantial contribution to the economic and social characteristics of the Tri-Cities and other parts of Benton and Franklin Counties. Historically, DOE and its contractors have been primary contributors to the local economy (other major contributors being Energy Northwest, Kadlec Regional Medical Center, and the agricultural community). Currently, PNNL employs approximately 4,485 people at several offices throughout the United States, with nearly 94 percent of the PNNL workforce residing in Washington State. Of the total Washington State PNNL workforce, 82 percent reside in Benton County and 11 percent reside in Franklin County (Niemeyer 2017).

Based on 2013 U.S. Census American Community Survey (ACS) population data, population totals for Benton and Franklin Counties were 178,992 and 81,835, respectively (USCB 2015a). From 2010 to 2014, Benton and Franklin Counties grew at a faster rate than Washington State as a whole. The state total percent change in population was 5 percent; Benton and Franklin Counties grew at 6.5 and 12.4 percent, respectively (USCB 2015b). Table 4.4 contains the 2013 ACS population estimates for the area within an 80 km (50 mi) radius of the campus by county as well as population forecasts through 2050.

PNNL has a documented economic impact on the State of Washington (Niemeyer 2017) with a Washington payroll in fiscal year 2015 of $412 million. PNNL generates over $24 million annually in state taxes. The total economic impact of all PNNL activities in Washington is over $1 billion annually, with the majority of that activity occurring in Benton and Franklin Counties. In addition, the study found that PNNL has spun off 71 companies currently doing business in Washington, representing over $567 million in annual revenue in the state.

Table 4.4. 2013 County Population Estimates and Projections for an 80 km (50 mi) Radius from the PNNL Richland Campus

	80 km (50 mi) Radius Portion[(a)]	80 km (50 mi) Radius Population Forecasts Based on County Population Forecasts					PNNL Extended Population Forecasts	
County	2013	2020	2025	2030	2035	2040	2045	2050
Adams	16,168	18,608	19,747	20,886	22,091	23,394	24,804	26,331
Benton	178,992	197,806	210,803	223,689	236,007	247,856	259,101	269,607
Columbia	214	213	211	207	202	197	191	185
Franklin	81,835	100,926	115,142	130,284	146,103	162,900	180,583	199,034
Grant	23,075	26,625	28,786	31,006	33,199	35,389	37,553	39,671
Kittitas	2,020	2,214	2,346	2,474	2,594	2,712	2,826	2,935
Klickitat	1,249	1,274	1,291	1,303	1,307	1,304	1,294	1,277
Walla Walla	49,379	51,546	52,952	54,298	55,467	56,534	57,492	58,334
Yakima	71,308	78,505	82,210	85,820	89,374	92,830	96,167	99,362
Umatilla	47,016	51,362	54,447	57,717	60,888	63,962	66,907	69,692
Morrow	8,603	9,438	9,978	10,526	11,023	11,476	11,879	12,226
80 Km (50 Mi) Radius Total	479,859	538,517	577,912	618,210	658,255	698,553	738,795	778,652

(a) Only the portion of the county within 80 km (50 mi) of the DOE PNNL Richland Campus is included.

Table 4.5 shows 2015 employment by industry for the Tri-Cities area. The Tri-Cities' economy is diverse, as indicated by significant employment across all industry sectors. The area has developed into a retail center that draws business from surrounding communities. It also has become a healthcare hub for those same communities.

Table 4.5. 2015 Tri-Cities Area Employment by Industry

Description	Benton County	Franklin County	Total
Employment by place of work			
Total employment (number of jobs)	104,154	40,954	145,108
By type			
Wage and salary employment	86,145	34,017	120,162
Proprietors employment	18,009	6,937	24,946
Farm proprietors employment	1,360	681	2,041
Nonfarm proprietors employment	16,649	6,256	22,905
By industry			
Farm employment	4,555	4,078	8,633
Nonfarm employment	99,599	36,876	136,475
Private nonfarm employment	86,240	30,449	116,689
Forestry, fishing, and related activities	2,223	(D)	2,223
Mining, quarrying, and oil and gas extraction	143	(D)	143
Utilities	156	(D)	156
Construction	6,059	2,337	8,396
Manufacturing	4,539	3,958	8,497
Wholesale trade	1,712	2,234	3,946
Retail trade	12,031	4,096	16,127
Transportation and warehousing	1,380	(D)	1,380
Information	902	227	1,129
Finance and insurance	3,111	660	3,771
Real estate and rental and leasing	3,942	1,362	5,304
Professional, scientific, and technical services	12,001	974	12,975
Management of companies and enterprises	406	29	435
Administrative and support and waste management and remediation services	10,496	1,676	12,172
Educational services	1,059	793	1,852
Health care and social assistance	11,984	3,188	15,172
Arts, entertainment, and recreation	2,203	520	2,723
Accommodation and food services	7,103	2,121	9,224
Other services (except public administration)	4,790	2,068	6,858
Government and government enterprises	13,359	6,427	19,786
Federal, civilian	765	463	1,228
Military	529	234	763
State and local	12,065	5,730	17,795
State government	1,500	1,636	3,136
Local government	10,565	4,094	14,659

Source: BEA 2016. Note: (D): Not disclosed.

4.9 Environmental Justice

Executive Order 12898, "Federal Action to Address Environmental Justice in Minority and Low-Income Populations," directs federal agencies to identify and address human health or environmental effects of federal actions, which might have disproportionately high and adverse effects on minority populations and low-income populations (59 FR 7629). U.S. Census Bureau data were used to identify minority populations as Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and other Pacific Islander, other races, two or more races, and Hispanic or Latino.

According to the U.S. Census Bureau 2013 5-year ACS (USCB 2015a) population data, the population with an 80 km (50 mi) radius of the campus is estimated to be approximately 480,000 and includes approximately 33 percent minority persons (Nonwhite Hispanic and Latino, Asian, Native American, and African American). 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 (50 mi) radius reside primarily in Yakima County on the Yakama Reservation near the town of Sunnyside. Some smaller concentrations of Native American populations reside 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. Table 4.6 illustrates the county distribution of minority and low-income populations. Figure 4.3 shows the distribution of minority populations within an 80 km (50 mi) radius of the campus. The minority percentages of statewide populations in the states of Washington and Oregon are 28 and 22 percent, respectively (USCB 2015a).

Based on 2013 5-year ACS data, the population within an 80 km (50 mi) radius of the campus includes 17 percent low-income residents (USCB 2015a). Figure 4.4 shows the distribution of low-income populations within an 80 km (50 mi) radius of the campus. The low-income percentages of statewide populations in the states of Washington and Oregon are 13 and 16 percent respectively.

Table 4.6. 2013 Minority and Low-Income Populations within 80 km (50 mi) of the PNNL Richland Campus

State	County	Total Population	Minority Population	Percent Minority	Poverty Population	Percent Poverty
Washington	Adams	16,168	4,658	29	3,889	24
	Benton	178,992	46,740	26	22,560	13
	Columbia	214	178	83	41	19
	Franklin	81,835	46,571	57	16,118	20
	Grant	23,075	7,613	33	5,083	22
	Kittitas	2,020	1,374	68	89	4
	Klickitat	1,249	826	66	390	31
	Walla Walla	49,379	13,928	28	7,951	16
	Yakima	71,308	18,483	26	18,392	26
Oregon	Morrow	8,603	3,899	45	1,544	18
	Umatilla	47,016	15,685	33	6,917	15
80 km (50 mi) Radius Total		479,859	159,955	33	82,974	17

Although there are no Tribal communities in close proximity to the PNNL Richland Campus, the Yakama Nation, CTUIR, the Nez Perce, and the Wanapum consider the area to be historically important for past and ongoing traditional, cultural, and religious purposes. Traditional cultural use includes ceremonial practices and natural resource use (e.g., fishing and plant gathering). The Wanapum and Yakama Nation have identified TCPs that include all or part of the PNNL Richland Campus. These Tribal resources are described fully in Section 4.5.

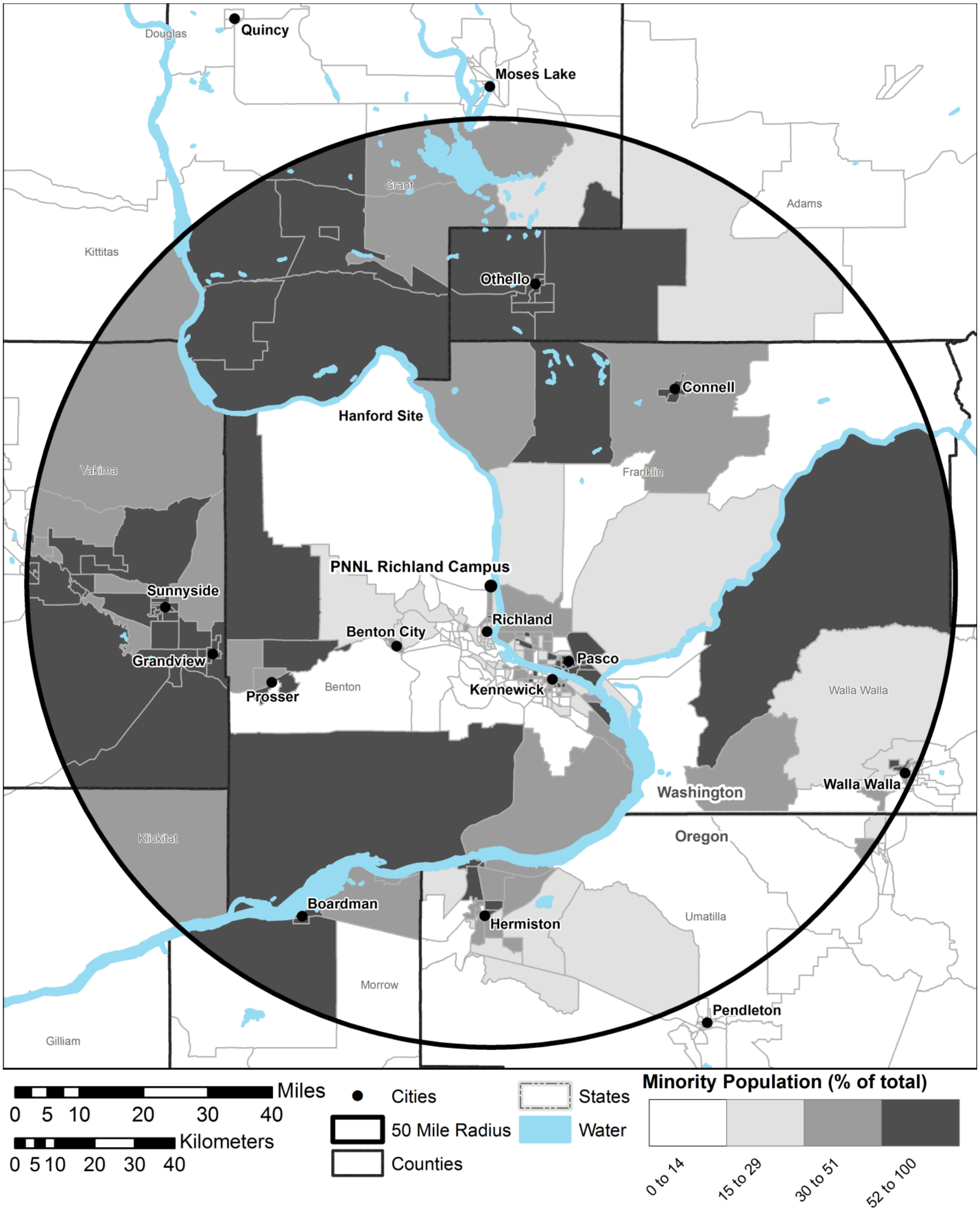

Figure 4.3. 2013 Minority Populations

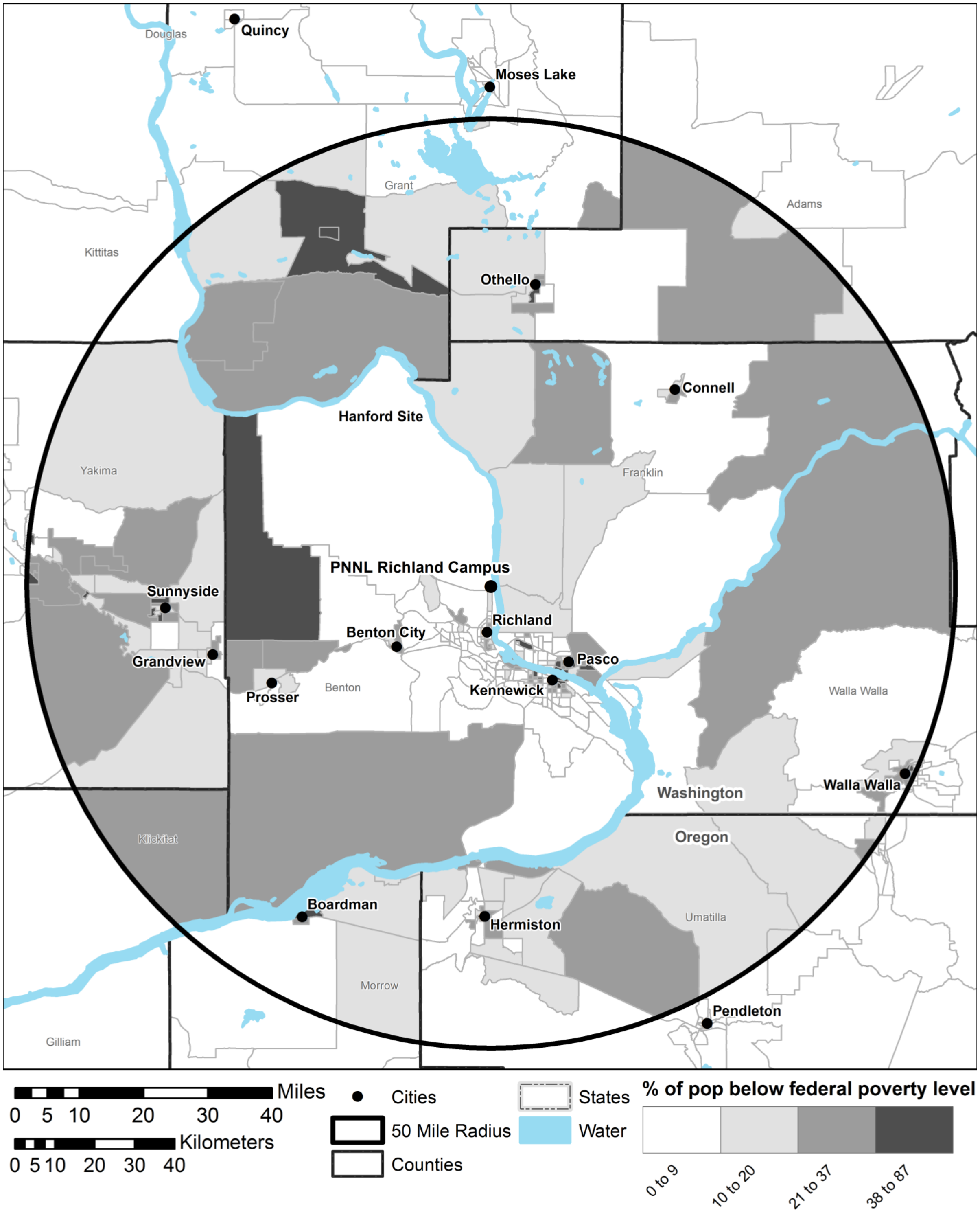

Figure 4.4. 2013 Low-Income Populations

4.10 Transportation and Traffic

The Richland-Kennewick-Pasco Tri-Cities area 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 the PNNL Richland Campus is maintained and operated by the Tri-City & Olympia Railroad Company to the Battelle Boulevard crossing, and from that point north by DOE. 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 to access the north-south arterial of Stevens Drive via Highway 240 (TCRY 2016).

The main road arteries that feed to the PNNL Richland Campus 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 (2017b) provided average daily traffic counts for 2016 and Benton County Washington (2015a) provided average weekday traffic counts for other years. These data are presented in Table 4.7. At peak periods, commuter traffic is often heavy on all primary routes to and from the Hanford Site and the PNNL Richland Campus.

Table 4.7. Traffic Counts for Principal Access Routes to the PNNL Richland Campus

Year of Traffic Count	Data Collection Point	Northbound or Eastbound (number of vehicles[(a)])	Southbound or Westbound (number of vehicles[(a)])
2011	Battelle Boulevard east of Stevens Drive	1,740	1,928
2010	Battelle Boulevard west of George Washington Way	1,312	1,351
2016	Battelle Boulevard west of Stevens Drive	840	817
2016	Horn Rapids Road east of Stevens Drive	748	588
2016	Horn Rapids Road west of George Washington Way	701	560
2007	George Washington Way south of Battelle Boulevard	2,832	3,226
2010	George Washington Way south of University Avenue	4,575	5,071
2016	George Washington Way north of Horn Rapids Road	920	898
2016	George Washington Way north of Spengler Street	6,441	6,748
2016	Stevens Drive north of Horn Rapids Road	3,827	3,872
2016	Stevens Drive north of Spengler Street	8,193	7,206
2016	Stevens Drive south of Battelle Boulevard	6,398	6,621
2016	Stevens Drive south of University Avenue	8,803	8,202
2011	University Avenue east of Stevens Drive	932	840

(a) 2016 values are average daily traffic; other years are average weekday-only traffic.
Source: Benton County Washington (2015a) and City of Richland (2017b).

4.11 Human Health and Safety

Over a 5-year period from 2011 to 2015, the total recordable cases[5] of injuries and illnesses at PNNL averaged 0.70 cases per 200,000 worker-hours (PNNL 2016d). For the 4,400 campus workers, this results

[5] 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.

in an average of 31 total recordable cases annually. The PNNL rate is lower than the average incidence rate for DOE sites (0.94 cases per 200,000 worker-hours for years 2012 to 2016) (DOE 2017b). For comparative purposes, the DOE average incidence rates were well below the Bureau of Labor Statistics rates for U.S. private industry of 3.3 cases per 200,000 worker-hours during the 5-year period from 2011 to 2015 (BLS 2016a).

Based on DOE (2016b), Exhibit 3-13, 2,413 PNNL workers were monitored for occupational radiation exposure in 2015. Of that number, 461 workers had a measurable total effective dose (TED).[6] The PNNL collective dose, which is an indicator of the overall workforce radiation exposure, was about 12.6 person-rem. For perspective, these 2,413 monitored individuals would have each received about 0.311 rem from natural terrestrial and cosmic radiation and inhalation of naturally occurring radon background radiation sources during 2015 (NCRP 2009) or a collective dose of about 750 person-rem from these natural background sources.

Radiation dose to members of the public are evaluated annually against the EPA standard of 10 mrem per year. Based on Duncan et al. (2016), the MEI for the campus was located 0.15 km (0.09 mi) south of the RTL Complex. The total dose to the MEI was 0.00026 mrem TED. The collective dose from campus air emissions for 2015 was 0.00027 person-rem for the 80 km (50 mi) population of 432,000 (Duncan et al. 2016). For perspective, the average dose to each individual in the Richland area from naturally occurring and man-made radiation sources is about 620 mrem/y. A general description of these sources and their contribution to the total average dose is shown in Figure 5.3 in Section 5.2.11.1.3.

4.12 Visual Resources

Visual resources are the natural and man-made physical features that give a particular landscape its character. Visual resources include landforms, vegetation, water, color, adjacent scenery, scarcity, and man-made modifications.

The PNNL Richland Campus is adjacent to the project area evaluated in detail and documented in the *Final Environmental Assessment for the Proposed Conveyance of Land at the Hanford Site* (DOE 2015a). Visually, the campus is not unlike that adjacent project area and the visual resource analysis conducted for that action is bounding on the analysis in this EA.

Evaluating the aesthetic qualities of an area is a subjective process because the value that an observer places on a specific feature varies depending on their perspective and judgment. DOE does not have a standardized approach to management of visual resources; therefore, the referenced assessment (DOE 2015a) used the U.S. Bureau of Land Management's (BLM's) Visual Resource Management (VRM) classification system, as summarized below (BLM 2014). The BLM VRM classification system was chosen as representative of a federal agency methodology and the vistas at the campus are similar to the types of lands the BLM manages. A qualitative visual resource analysis was conducted to determine whether disturbances associated with project activities would alter the visual environment.

[6] The TED is defined as the sum of the dose from radiation sources internal and external to the body, reported in units of rem or mrem. Collective dose is the sum of doses to all individuals in a population and is reported in units of person-rem. For example, a dose of 1 rem TED to each of 10 workers would result in a collective dose of 10 person-rem.

Classifications were derived from an inventory of scenic qualities, sensitivity levels, and distance zones for particular areas:

- Class I: Very limited management activity; natural ecological change.
- Class II: Management activities related to solitary small buildings and dirt roads may be seen, but should not attract the attention of the casual observer.
- Class III: Management activities may attract attention, but should not dominate the view of the casual observer; the natural landscape still dominates buildings, utility lines, and secondary roads.
- Class IV: Management activities related to clusters of two-story buildings, large industrial/office complexes, and primary roads, as well as limited clearing for utility lines or ground disturbances, may dominate the view and be the major focus of viewer attention.

The Visual Resource Inventory Manual (BLM 1986) identifies three mapping distance zones that qualitatively describe how landscapes are observed under good viewing conditions. These are the following:

- Foreground-middleground zone: Areas seen from highways, rivers, or other viewing locations less than 3 to 5 miles away. This is the point where the texture and form of individual plants are no longer apparent in the landscape.
- Background zone: Areas seen from beyond the foreground-middleground zone, but less than 15 miles away. Vegetation in this zone is visible just as patterns of light and dark.
- Seldom-seen zone: Areas that are hidden from view or not distinguishable and more than 15 miles away.

Based on the DOE (2015a) visual analysis, the lands north of Horn Rapids Road are consistent with a VRM Class III rating, and the lands south of Horn Rapids Road are consistent with a VRM Class IV rating. The natural landscape dominates areas north of Horn Rapids Road; however, some roads and minor development are present in the area. The campus is most visible from Horn Rapids Road to the south, and from Stevens Drive and George Washington Way. The primary landscape features in the background zone visible from the analysis area include Badger Mountain to the south and Rattlesnake Mountain to the west. Saddle Mountain and Gable Mountain to the northwest are in the seldom-seen zone.

From Figure 4.5, for the affected environment, the following sites that the Tribes identified as important in their summaries (see Appendix G of DOE 2015a) would or would not be visible (land highlighted or not highlighted in dark brown, respectively):

- Gable Mountain: The campus is in the seldom-seen zone and not discernible (too far away) from Gable Mountain.
- Rattlesnake Mountain: The campus is visible from the mountain, but at the farthest edge of the background zone where specific objects are not readily discernible in the landscape.
- Saddle Mountain: The campus is in the seldom-seen zone and not discernible (too far away) from Saddle Mountain. The Hanford Site 300 Area, the PNNL Richland Campus and the Horn Rapids Industrial Park provide an existing industrial development backdrop to the campus.

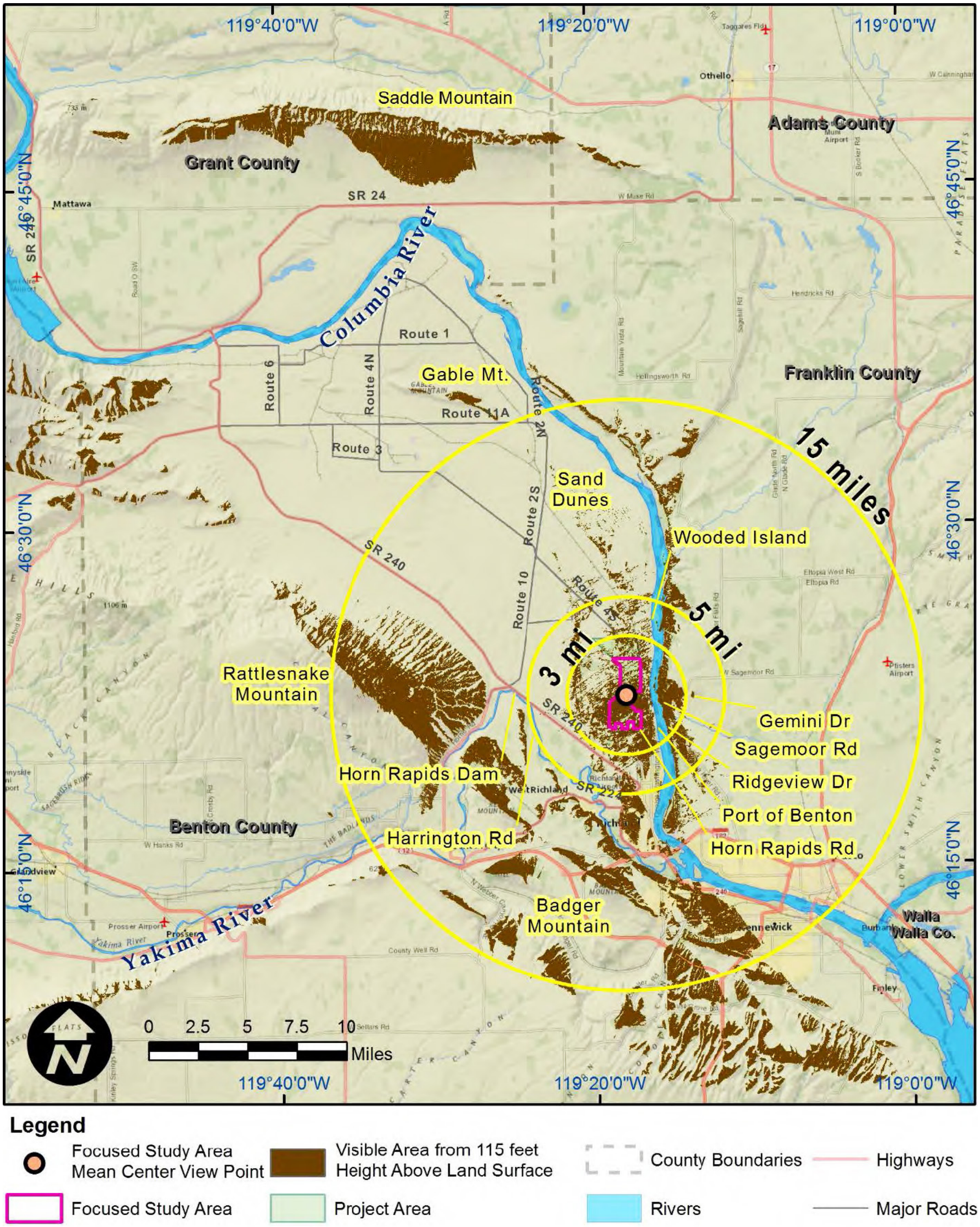

Figure 4.5. Viewshed as Seen from the Land Conveyance Focused Study Area adjacent to the DOE PNNL Richland Campus from a 35 m (115 ft) Elevation (DOE 2015a)

4.13 Noise and Vibration

The region of interest for acoustic noise, vibration, and electromagnetic frequencies includes the PNNL Richland Campus and the surrounding area, including the existing PNNL and Laser Interferometer Gravitational-Wave Observatory (LIGO) facilities. These facilities contain receptors that are sensitive to vibration (e.g., LIGO) and acoustic noise, vibration, and electromagnetic frequencies (e.g., EMSL quiet wing). The receptors have threshold levels much lower than those regulated for the protection of human health. A recent detailed noise impact assessment was completed for the Land Conveyance EA (DOE 2015a). The campus is immediately adjacent to the lands considered in that proposed action. Noise and vibration on the PNNL Richland Campus are regulated under the terms of the deed (DOE 2015b) between DOE and TRIDEC, which identifies the PNNL Noise Generation Standard (Exhibit H, Item 9) and the PNNL Vibration Standard (Exhibit H, Item 10). Acoustic noise and vibration from DOE activities within the region of interest occurs primarily from vehicle traffic, operation of the borrow pits, and heavy equipment operating at remediation and waste sites. Noise and vibration from non-DOE activities at Hanford (e.g., workers commuting to and from the CGS; vibration from regional dams; and operational noise from the AREVA facility, the Perma-Fix facility, and the U.S. Ecology commercial low-level [radioactive] waste disposal site) are also part of the existing background (ambient) sound and vibration environment near the campus.

Future development in the area (e.g., new industry, agriculture, offices, schools, residential areas, roads and other infrastructure) could result in variations in the levels of traffic noise from local roads and increased noise levels near these developments. The appendices to DOE (2015a) provide detailed discussion of nearby activities and facilities that are or would be sources of noise and vibration affecting the campus.

4.13.1 Acoustic Noise

Acoustic noise is generally understood as unwanted sound. Sound propagates through air and solid media (e.g., geologic materials, wood, and even liquids such as water). Through air, sound propagates as a compression wave and travels as fluctuations of air pressure above and below atmospheric pressure. Sound can also be described in terms of a "wave" of vibrating air particles where, at certain points along the wave, air particles are compressed and, at other points, the air particles are spread out. The human ear perceives sound as tones or frequencies. Shorter wavelengths are higher tones/frequencies and longer wavelengths are lower tones/frequencies. The sound pressure level is related to the amplitude of the wave, which is perceived as loudness. Noise may consist of a single or range of frequencies. A frequency-dependent sound pressure rating scale was developed with values given in decibels (dB) to reflect the variations in human sensitivity known as the A-weighting scale and values given in dBA. The threshold of audibility is generally within the range of 10 to 25 dBA for normal hearing.

The State of Washington defines noise as the "… intensity, duration and character of sounds from any and all sources" (RCW 70.107.020). RCW 70.107 and its implementing regulations (WAC 173-60 and WAC 173-62) define the management of environmental noise levels. Maximum noise levels are defined for the zoning of the area in accord with the environmental designation for noise abatement (EDNA). The Hanford Site is classified as a Class C EDNA on the basis of industrial activities. Unoccupied areas are also classified as Class C areas by default because they are neither Class A (residential) nor Class B (commercial). Maximum noise levels are established based on the EDNA classification of the receiving area and the source area. The Class C industrial receptor EDNA is 70 dBA for daytime hours (between 7:00 a.m. and 10:00 p.m.).

The Hanford Site is within Benton County, Washington. Chapter 6A.15 of the Benton County Code of Ordinances (BCC 6A.15) states that the policy of the county is to "minimize the exposure of its citizens to the adverse effects of excessive unwanted public nuisance noise and to protect, promote, and preserve the public health, safety, and welfare." However, a number of exemptions, such as sounds created by the temporary use of construction equipment, are allowed.

4.13.2 Ambient Noise Levels on the Campus

Wind is a primary contributor to background noise levels at Hanford. The entire Hanford Site experiences average wind speeds exceeding 12 mph. In addition to noise from wind, routine DOE field activities contribute to the existing noise environment. Background noise levels in undeveloped areas on the Hanford Site were measured to range between 24 and 36 dBA (Duncan 2007).

The NPS Natural Sounds and Night Skies Division performed sound modeling for the lands immediately adjacent to the campus (DOE 2015a). Using the methodology published in "A Geospatial Model of Ambient Sound Pressure Levels in the Contiguous United States" (Mennitt et al. 2014), the modeled ambient noise levels for the lands adjacent to the campus range between 26.6 and 27.6 dBA.

4.13.3 Vibration

Vibration is an oscillatory motion that can be described in terms of displacement, velocity, or acceleration. Ground-borne vibration could cause building floors to shake, windows to rattle, hanging pictures to fall off walls, and in some cases damage to buildings. Like acoustic noise, vibration from a single source may consist of a range of frequencies. There are no state or local government regulations for vibration. The Occupational Safety and Health Administration enforces vibration standards to protect workers and the only environmental standards are from the Federal Transit Administration for trains and mass transit to protect nearby structures, not for sensitive receptors, such as LIGO and PNNL equipment sensitive to vibration (e.g., EMSL).

4.14 Utilities and Infrastructure

The region of impact for utilities and infrastructure is the PNNL Richland Campus and the surrounding urban environment served by the City of Richland. Infrastructure consists of the systems and physical structures that enable a population in a specified area to function. Infrastructure is wholly human-made, with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as "urban" or developed. The availability of infrastructure and its capacity to support growth are generally regarded as essential to the economic growth of an area. Utilities and infrastructure include electric power supply, gas supply, water supply, and sewer and wastewater systems. The analysis to determine potential effects on infrastructure and infrastructure systems considers primarily whether a proposed action would exceed capacity or place unreasonable demand on a specific utility.

The campus is adjacent to the project area evaluated in detail and documented in DOE (2015a). The campus infrastructure resources are not unlike those of the adjacent project area and the analysis projecting future infrastructure needs in DOE (2015a) is bounding on the analysis in this EA.

The City of Richland would likely be the provider of electricity, water, and sewer system infrastructure to new facilities on the campus. In Richland, the Bonneville Power Administration (BPA) and the City of Richland own and operate eight substations with a summer capacity of 302,000 kV amperes. In 2013, the summer peak demand was approximately 218,000 kW. The City of Richland has recently updated its long range plan for electrical power delivery and plans to update its distribution system to meet future growth (DOE 2015a).

Based on a DOE assessment (DOE 2015a), the Richland Department of Public Works provides water, wastewater, and solid-waste-management services to the City of Richland. The City of Richland obtains about 82 percent of its water directly from the Columbia River, with the remaining water coming from groundwater wells and from a well field north of the city. Prior to consumption, water is stored in 15 reservoirs with a total capacity of about 95,000 m^3 (25 million gal). The city maintains approximately 520 km (1.7 million feet) of pipe. In 2013, the average daily use of water across the entire service area was 55,600 m^3 (14.7 million gal), and the peak daily use was 129,000 m^3 (34 million gal). Water drawn from the Columbia River is treated at the city's water treatment facility. The treatment facility has a capacity of up to 136,000 m^3/day (36 million gal/day). According to the City of Richland Comprehensive Plan, the city has water rights totaling 220,000 m^3/day (58 million gal/day), which is considered adequate to support any future growth of the city, assuming the treatment capacity expands to fully access the rights. A 61 cm (24 in.) main extends north and south along Stevens Drive, connecting to a 76 cm (30 in.) main that serves the Horn Rapids area (DOE 2015a).

Based on the most recent Comprehensive Water System Plan (City of Richland 2010), demand for the city's water is expected to increase 45 percent by 2028. On a maximum day in 2028, the city's system must provide 49 MGD and have the capability to hydraulically distribute and transmit over 52,000 gpm to meet peak-hour demand plus fire flow. Current supplies identified in the plan are expected to cover the anticipated 2028 demand projections (City of Richland 2010).

Richland's sewer collection system consists of gravity sewers, pump stations, and force mains that convey wastewater to the Richland Wastewater Treatment Facility. The treatment facility has a capacity of 43,200 m^3/day (11.4 million gal/day), and an average daily usage of about 20,800 m^3/day (5.5 million gal/day) (DOE 2015a). Treated wastewater is discharged to the Columbia River.

Based on the DOE assessment (DOE 2015a), Richland Fire and Emergency Services provides fire, emergency medical services and transport, and hazard mitigation services for the approximately 46,000 citizens of Richland, and emergency medical transport services for the approximately 18,000 citizens within Benton County Fire District 4. In addition, all services are extended to neighboring agencies through extensive automatic aid agreements in the region. Richland Fire and Emergency Services is made up of 56 uniformed officers and firefighters, of whom 26 are paramedics and 27 are emergency medical technicians. Richland Fire and Emergency Services shares borders with Kennewick, Pasco, Benton County Fire District 4, and the Hanford Fire Department.

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Factors Considered for Analysis

This EA considers the impacts and effects of constructing and operating new and replacement facilities and infrastructure on the PNNL Richland Campus over 20 years, and demolition of outmoded surplus facilities. The actual rate of future growth in facility space and staffing levels over the next 20 years, on a year-by-year basis or cumulatively at the end of 20 years, is uncertain. For a historical context, PNNL (including all non-Richland offices) employed 3,360 staff in 1997, 4,195 in 2008, and more recently, approximately 4,400 staff in 2016. While generally trending slightly upward over time, the long-term historical trend may or may not hold as an indicator of future expectations for growth. Future staffing levels at PNNL will be tied to federal budget priorities, with considerable year-to-year fluctuations. In addition, staffing levels are not always clear indicators of impact levels. For example, new facilities would incorporate energy efficiency measures in their design, and new floor plans would likely include higher staff density. In addition, flexibility in workplace and work schedule arrangements available to staff are likely to continue, allowing staff to telecommute or share workspaces. As a result, energy and space savings may occur even with staff growth. For the purpose of assessing impacts of the potential 20-year buildout, DOE assumes impact levels associated with staff size (e.g., energy consumption and traffic) would continue at their current level and that these levels are generally representative of impacts that would occur even with future staffing increases.

This EA considers the impacts and effects associated with the Proposed Action and with the No Action Alternative. Other alternatives that were considered but not addressed in detail are also described. The CEQ regulations (40 CFR Parts 1500-1508) define the impacts and effects that must be addressed and considered by federal agencies in satisfying the requirements of the NEPA process. These include direct, indirect, and cumulative impacts.

5.1.1 Direct and Indirect Effects

Direct effects are caused by the action and occur at the same time and place (40 CFR 1508.8).

Indirect effects are caused by the action and are later in time or farther removed in distance, and are reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate and related effects on air and water and other natural systems, including ecosystems (40 CFR 1508.8).

5.1.2 Cumulative Impacts

Cumulative impacts are those impacts on the environment that result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes those other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time (40 CFR 1508.7).

The vicinity of the campus considered in the cumulative impact analysis is shown in Figure 5.1. Reasonably foreseeable actions in the vicinity of the campus that may contribute to cumulative impacts of implementing the Proposed Action are listed in Table 5.1. Detailed analyses of the cumulative incremental impacts of these foreseeable actions will be evaluated in each resource area in Sections 5.2 to 5.2.19.

Climate is defined as temporal and spatial patterns of variations in meteorology over a period of several decades (GCRP 2014). In May 2014, the U.S. Global Change Research Program published the Third National Climate Assessment: *Climate Change Impacts in the United States* (GCRP 2014). This report collected, evaluated, and integrated observations and research on climate change in the United States, including assessments of regional climate change in the Pacific Northwest.

Figure 5.1. Vicinity of the PNNL Richland Campus Considered in the Cumulative Impact Analysis

Table 5.1. Reasonable Foreseeable Future Actions

Action	Hectares (Acres)	Relative Location to PNNL Richland Campus
Commercial. Commercial storage, offices, and fabrication for Total Energy Management are under construction on Stevens Drive.	1 (2.5)[(a)]	S
Commercial/Residential. Tract A of Willow Pointe is zoned waterfront and is designated as commercial, multifamily, or residential development.	1.8 (4.4)	E
Industrial. A portion of Port of Benton land is set aside for a clean energy business (POB 2016).	81 (200)	N
Industrial. A Savage Logistics, LLC radioactive and hazardous waste transportation facility is currently under construction on Battelle Blvd.	2 (5)	W
Industrial. A warehouse owned by Bervin Vantage LLC is under construction in the Horn Rapids Master Plan Area (Henderson Loop).	0.3 (0.8)	SW
Industrial. PNNL RTL Complex facilities will undergo decommissioning and demolition (TPA-CN-0738).	0.52 (1.3)	S
Industrial. Property development and building upgrades are proposed for the Richland Innovation Center (POB 2013).	28.7 (71)	S
Industrial. Property development within the Port of Benton Technology and Business Campus will consider Cultural Sensitivity Zones within the area prior to development (POB 2013).	117 (290)	E
Industrial Cleanup. Contamination cleanup and restoration/remediation of the 300 Area land and groundwater on the Hanford Site (DOE and EPA 2013).	18 (45)	N
Industrial/Commercial. The Port of Benton Manufacturing Mall lands are available for commercial/industrial sale/lease; cultural evaluations, artifact collections, and other protective measures will be completed prior to development (POB 2013).	121 (300)	W
Industrial/Commercial/Infrastructure. The Horn Rapids Master Plan provides for land-use Open-Space designation, Industrial designation Commercial/Business Center designation. Proposed infrastructure for the entire master plan area to include water systems, sanitary sewer, irrigation water systems, an electrical substation, industrial and curbed roadways, a railroad crossing, and associated wetland mitigation plans (MacKay Sposito 2016).	998 (2,466)	SW
Industrial/Infrastructure. Lands transferred from TRIDEC to the City of Richland, Port of Benton, and Energy Northwest may include future industrial development and its infrastructure and rail (Tangent 2017).	664 (1,641)	W, NW
Infrastructure. A proposed natural-gas pipeline will connect to an existing pipeline north of Pasco, before traversing 16 km (10 mi) to cross under the Columbia River, and continue 32 km (20 mi) to the Hanford Site 200 East Area (77 FR 3255).	N/A	N
Infrastructure. Improvements to the City of Richland existing water mains and additional water distribution lines may be required to provide increased capacity.	N/A	S, Central
Public. Planned expansion of the WSU Tri-Cities campus includes student housing, academic buildings and laboratories, parking, an amphitheater, office facilities, a boat launch, recreational fields, and a central plant (TVA 2008). The student union building is currently under construction.	81 (200)	S
Recreational. The Horn Rapids Master Plan provides for parks, playgrounds, trails.	N/A	SW
Residential. 150 new Innovation Lofts Apartment units will opening 2017 (part of the Port of Benton Innovation Center).	1.7 (4.24)	S
Shoreline Management. Lands are owned by the U.S. Army Corps of Engineers along the Columbia River are leased to the City of Richland. The City of Richland coordinates with the U.S. Army Corps of Engineers for shoreline management.	N/A	E
Transportation. The current Navy haul road used to transport decommissioned, defueled Naval reactor compartment packages from barge passage to the disposal site may be relocated.	N/A	Central

(a) Hectares/acreages estimated.
N/A = not applicable.

The GCRP (2014) report predicts that climate change may occur in the Pacific Northwest over the 20-year potential buildout of the campus and beyond, and that eventually these changes may noticeably alter the baseline affected environment described in Chapter 4 of this EA. Climate change is a global phenomenon that the buildout of the PNNL Richland Campus would not appreciably alter. However, climate change may alter the baseline environment in which the potential future development would occur.

GCRP (2014) identified potential changes in the regional environment that are relevant to the assessment of impacts from the Proposed Action, including:

- Changes in vegetation, aridity, and potential wildfires
- Changes in surface and groundwater availability and water temperature
- Changes in potential flooding hazards.

Changes to the affected environment and any associated considerations for the assessment of impacts of the Proposed Action are discussed in the resource areas below.

5.2 Environmental Impacts of Proposed Action

The following sections describe direct and indirect impacts of the Proposed Action as described in Section 3. The cumulative impacts of the Proposed Action along with the other foreseeable actions described in Section 5.1.2 are also evaluated.

5.2.1 Land Use

The potential construction and operation impacts of the Proposed Action on land use are evaluated in the following sections.

5.2.1.1 Construction Impacts

As discussed in Section 3.1, implementing the Proposed Action would involve construction and operation of the new facilities for conducting R&D activities. Some of the R&D activities planned for the new facilities would be relocated from PNNL-occupied facilities elsewhere on the 269 ha (664 ac) PNNL Richland Campus and from either leased facilities such as 2400 Stevens or 300 Area facilities.

The affected area of the PNNL Richland Campus is owned partly by DOE and partly by Battelle, and the site is classified as a Business Research Park by the City of Richland (2017a). New PNNL Richland Campus facilities would be constructed and used in accordance with the Business Research Park designation. As shown in Table 3.1, the Proposed Action could increase the acreage used for buildings on the PNNL Richland Campus from the current 15 ha (37 ac) to 25 to 27 ha (62 to 67 ac). The non-irrigated open areas on the PNNL Richland Campus currently include about 148 ha (366 ac); this could decrease by 14 ha (35 ac) to 18 ha (45 ac) in the 20-year potential buildout.

The campus is also identified as a City of Richland Urban Growth Area by Benton County (Benton County Washington 2015b). Although the federal government is not subject to local planning authority, the activities within the PNNL Richland Campus would be consistent with adjacent land uses planned by the City of Richland and Benton County; therefore, no incompatibility issues would be anticipated.

5.2.1.2 Operation Impacts

Impacts from operations would not vary from those expected for the current PNNL Richland Campus. These impacts include traffic and scheduled building and property maintenance activities. These activities would not further alter land uses. Under the Proposed Action, the relocation of staff to new facilities could create vacancies in facilities that are currently privately owned and/or leased. Whether or not such vacated facilities would be re-used, or abandoned and demolished over the course of the 20-year potential buildout would depend upon a variety of factors (e.g., the age and capabilities of a given facility and the economic conditions of the Tri-Cities [Richland, Kennewick, and Pasco, Washington] at the time a building would be vacated).

5.2.1.3 Cumulative Impacts

The potential land-use impacts of the Proposed Action were evaluated in the context of the reasonably foreseeable future actions identified in Table 5.1. Taken together, those actions and the Proposed Action result in cumulative land-use impacts to the local area, including the conversion of existing land uses to new uses and the clearing of vacant land. If the land disturbance expected from the potential development of the campus would occur south of Horn Rapids Road, on lands previously disturbed or currently developed, the cumulative land-use impact would not be significant.

Land disturbance north of Horn Rapids Road would cause incremental conversion of previously undeveloped land from a natural state to a developed state. Though minor, this incremental impact has been accounted for in local land-use plans and development would proceed consistent with applicable zoning and regulations.

5.2.2 Air Quality

Potential impacts on air quality from the release of criteria air pollutants during construction and operation are described in this section. Impacts from the release of other chemicals and radionuclides are described in Section 5.2.11, Human Health and Safety.

5.2.2.1 Construction Impacts

For purposes of impact assessment in this EA it is assumed that 1 to 3 buildings totaling approximately 6,970 m^2 (75,000 ft^2) could be under construction every year over the next 20 years, with an average construction time of 14 to 16 months per building, whereas the larger buildings would take 2 to 3 years to complete. Continuous construction of smaller (<1,860 m^2 [20,000 ft^2]) buildings, with the construction of an occasional larger (5,570 to 18,600 m^2 [60,000 to 200,000 ft^2]) building, could occur for a total buildout of 92,900 m^2 (1.0 million ft^2). Therefore, it is assumed that one to three buildings could be under construction at any given time over the 20-year period.

The largest potential for air pollution during construction would be during site clearing. Site clearing would take a few months for each building, and would involve larger-horsepower diesel equipment, including scrapers, bulldozers, and backhoes. Dust would be generated during earthmoving activities and vehicle movement over unpaved areas. Local air pollution regulations require reasonable precautions be taken to prevent fugitive dust and include preventative measures such as frequent watering, the application of dust adhesion products, or other means. Building construction would take longer and involve concrete pumpers and cranes, as well as smaller-horsepower diesel equipment, such as portable lights and generators. The operation of this construction equipment would generate SO_2, NO_2, particulates, and other air pollutants, in a quantity that is comparable to other similar-sized construction projects. Emissions from mobile, non-road engines are regulated by federal fuel and design performance standards instead of through permitting. Releases would be intermittent and occur over several months. Since construction emissions are intermittent and temporary, and the area is in attainment with criteria air pollutants, no substantial air-quality impacts associated with implementing the construction phase of the Proposed Action are expected.

5.2.2.2 Operation Impacts

5.2.2.2.1 Criteria Air Pollutants

If new facilities were constructed on the PNNL Richland Campus as contemplated, then DOE anticipates that natural-gas-fired boilers would be used for space heating, humidification, or process steam needs. All boilers would employ state-of-the-art, clean-burning technology and therefore would not be expected to require supplemental emission controls. At full potential buildout, up to eight diesel-fueled generators could be needed to provide electricity to some sites in the event of the loss of utility power. These generators would be required to employ Best Available Control Technology (EPA 1979) for emissions, including the use of ultra-low sulfur fuel.

Emissions of criteria pollutants from the PNNL Richland Campus were estimated based on a comparison with 2015 operational emissions from the existing PSF Complex, which includes the 3410, 3420, 3425, 3430, 3820 Buildings. The PSF Complex includes 23,200 m^2 (250,000 ft^2) of mixed office and laboratory space that is functionally similar to the facilities that likely would be constructed on the PNNL Richland Campus. At final buildout, 92,900 m^2 (1.0 million ft^2) of mixed office and laboratory space could be constructed. Therefore, the PSF Complex 2015 boiler emissions were scaled up by a factor of four to estimate the total operational emissions from the PNNL Richland Campus. The PSF Complex has one emergency generator at the 3425 Building; the 2015 emissions from this generator were multiplied by eight to estimate the total emissions expected from the emergency generators on the PNNL Richland Campus. Table 5.2 presents current PNNL Richland Campus emissions from current operations and the expected annual operational emissions from the new boilers and generators at final buildout.

Short-term increases in ambient air pollutant concentrations would be expected to result from fluctuations in the demand for boiler use for space heating, the use or testing of diesel-powered backup electrical power generators, and changing meteorological conditions. Impacts from the PSF Complex emissions were analyzed in the PSF EA (DOE 2007). Short-term and annual average air concentrations were modeled and compared to the NAAQS. The resulting concentrations were found to be well within (≤9 percent) of the NAAQS. Because the PNNL Richland Campus emissions would be approximately four times greater than emissions from the PSF Complex, the resulting criteria pollutant air concentrations would increase. However, they would still be below the NAAQS. Consequently, releases of criteria pollutants from the PNNL Richland Campus would not cause air-quality standards to be approached, and the area would continue to be in attainment with NAAQS.

The PNNL Richland Campus facilities could include some new chemistry and biology laboratories; some of which would be replacing existing leased or decommissioned facilities. Therefore, there would not be an appreciable change in criteria pollutants from R&D work. Table 5.2 provides an estimate of criteria emissions from existing R&D work at PNNL; these emissions are small, especially when compared to emissions from generators and boilers.

The future buildout of the PNNL Richland Campus does not involve a significant change in staffing levels at PNNL, as most staff would be relocating from existing leased or decommissioned facilities. Consequently, there would not be a significant change in vehicle emissions from the Proposed Action.

5.2.2.2.2 Greenhouse Gas Emissions

Stationary fuel combustion units would also be a source of greenhouse gas (GHG) emissions, primarily in the form of carbon dioxide, but also methane and nitrous oxide. Federal (40 CFR Part 98) and state (WAC 173-441) regulations require the reporting of annual GHG emissions from certain sources above threshold amounts (i.e., 25,000 tonnes [27,558 tons] per year [federal] and 10,000 tonnes [11,023 tons] per year [state]). The collection of GHG emissions data is intended to provide a better understanding of the sources of GHGs and to guide development of policies and programs to reduce emissions in the future.

Table 5.2. Estimated Annual Emissions of Criteria Pollutants from the PNNL Richland Campus

Criteria Pollutant[(a)]	New Boilers Emissions (tons/y)[(b)]	New Generators Emissions (tons/y)[(b)]	New R&D Emissions (tons/y)[(b)]	Existing Emissions (tons/y)[(b)]	Total Emissions (tons/y)[(b)(c)]
NO_x	3.98	4.56	0.000024	7.66	16.2
CO	4.20	0.40	0.014	4.29	8.90
SO_2	0.043	0.0082	0.0011	0.031	0.083
THC (total hydrocarbons/VOC)	0.68	0.13	0.14	0.48	1.44
Particulates (total)	0.54	0.20	N/A	0.49	1.22
PM_{10}	0.54	0.20	N/A	0.49	1.22
Pb	0.000036	No vendor data	0.0000000031	0.000021	0.000057

(a) 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.
(b) To convert to tonnes multiply by 0.91.
(c) Total emissions are the sum of the new and existing emissions; this is a conservative estimate since new emissions include a subset of existing emissions that would be moved from decommissioned facilities to new facilities.

Similar to the estimation of criteria pollutants, GHG emission estimates from the combustion units at the PSF Complex were scaled up (by a factor of four for boilers and a factor of eight for generators) to estimate GHG emissions from the new facilities on the PNNL Richland Campus. In 2016, GHG emissions from PSF Complex natural-gas boilers and diesel generators were 1,930 tonnes (2,127 tons) and 99 tonnes (109 tons), respectively. Therefore, annual GHG emissions from the new facility natural-gas boilers and diesel generators would be approximately 7,720 tonnes (8,509 tons) and 792 tonnes (873 tons), respectively. Total GHG emissions from the new facilities would be around 8,512 tonnes (9,383 tons). In 2016, annual GHG emissions from non-leased, campus facilities were approximately 5,406 tonnes (5,959 tons), which is below federal and state reporting levels. At final buildout, the new, DOE-owned facilities could add an additional 8,512 tonnes (9,382 tons) of GHG emissions per year, for a total of 13,900 tonnes (15,322 tons) per year. Therefore, the entire campus would likely exceed the state reporting level at some point during the facility buildout and would be subject to the GHG reporting requirements at that time.

5.2.2.3 Cumulative Impacts

The potential air-quality impacts of the Proposed Action were evaluated in the context of the reasonably foreseeable future actions identified in Table 5.1. Many of the projects identified in Table 5.1 are associated with the development of commercial business and multifamily residences. Air-quality impacts would be primarily from emissions of criteria pollutants from construction activities. These emissions would be intermittent and temporary, and not likely degrade the local air quality. Some of the industrial projects identified in Table 5.1 may be considered “major sources” and therefore be subject to New Source Review Prevention of Significant Deterioration (PSD) air permitting requirements. New Source Review requires stationary sources of air pollution to get air permits before construction starts. PSD permitting applies to new major sources for pollutants where the area the source is located is in attainment or unclassifiable with the NAAQS. PSD does not prevent sources from increasing air emissions. Instead, PSD is designed to preserve the air quality, while protecting public health and ensuring economic growth. Because any major sources would need to be PSD permitted, and these emissions would need to meet the NAAQS, cumulative air-quality impacts from the PNNL Richland Campus in combination with the reasonably foreseeable future actions identified in Table 5.1 would be very low.

5.2.3 Soils and Geological Resources

This section describes the environmental impacts to soils and geological resources for the PNNL Richland Campus.

5.2.3.1 Construction Impacts

Environmental impacts to soils and geological resources result from construction activities that would include clearing, grading, and contouring to establish the final site topography. Construction would also require excavations for building footings and foundations, utilities, and infrastructure. Existing topsoil at the campus would be stripped and stockpiled for use in landscaping, consistent with current practices for other developed areas of the PNNL Richland Campus. Existing soils and sediments would be used in grading and contouring, so that no off-campus materials would be required for construction or landscaping. As stated in Section 3.1.2, the entire campus area, outside of the PDA, could be affected by construction. The maximum depth of disturbance for building excavations would be approximately 15.2 m (50 ft), allowing for basements and underground utility connections. Excavations to this depth would primarily be in the Hanford Formation sediments, but could extend to Ringold sediments depending on the location of the excavation. There may be periodic additions of road base materials onto the existing Navy haul road in the PDA, but no expansion or modifications of the existing route through the PDA.

Impacts to geological resources consist of the excavation of Hanford Formation (and possibly some Ringold Formation) sands and gravels, some or all of which may be used on site for grading. Approximately 720 m^3 (940 yd^3) offsite sand and gravel resources would be required for fill.

5.2.3.2 Operation Impacts

During operation of the new facilities, there would be no additional impacts to soils and geological resources beyond the construction impacts described above.

5.2.3.3 Cumulative Impacts

Impacts to soils resources mainly consist of reworking and redistributing existing surface soils on the campus. From the description in Section 4.3, about 9 ha (22 ac) of soils on the southern portion of the PNNL Richland Campus are classified as “prime farmland if irrigated,” and about 5 ha (12 ac) in the southern part of the campus classified as “farmland of statewide importance,” could be affected by construction. Some additional land in the northern part of the campus would likely be similarly classified and could be affected by construction. With development, these soils would be permanently altered. No surface soils would be mined for offsite uses and no offsite materials would be required.

The future actions identified in Table 5.1 would affect soil resources in the vicinity of the PNNL Richland Campus. However, because the Proposed Action would permanently alter only a small area of soils classified as “prime farmland if irrigated” or “farmland of statewide importance,” and these areas are not subject to the FPPA, the incremental contribution to cumulative impacts to soils and geological resources in the region would be minimal.

5.2.4 Water Resources

This section describes the environmental impacts to water resources for the PNNL Richland Campus.

5.2.4.1 Construction Impacts

As described in Section 4.4, the eastern boundary of the northern portion of the PNNL Richland Campus is located adjacent to the Columbia River, but no surface water resources exist on the campus itself.

Water would be required during construction for activities such as dust suppression, but the amount used would be small and its use intermittent. Water for construction would be supplied from the existing City of Richland source or from the existing, permitted Columbia River withdrawal system

All development on the PNNL Richland Campus would take place above the Columbia River bank and thus outside the Columbia River floodplain. Development on the campus would thus not affect or be affected by flooding along the river. Therefore, DOE has determined that a formal floodplain assessment as described in 10 CFR Part 1022 is not required for the Proposed Action.

Future construction at the site would require a Construction Stormwater General Permit, issued by WA Ecology. During construction, stormwater would be managed onsite with no discharge to either surface waters of the state or UIC wells. Construction activities on the campus would implement best management practices in accordance with the *Stormwater Management Manual for Eastern Washington* (WA Ecology 2004).

As described in Section 4.4, groundwater elevations increase toward the south across the PNNL Richland Campus and are consistently below 107 m (351 ft) north of Horn Rapids Road. With the ground surface at an elevation of about 122 m (400 ft) across the campus, depth to groundwater generally exceeds 15.2 m (50 ft) north of Horn Rapids Road. Because it is expected that any facilities requiring excavations as deep as 15.2 m (50 ft) would be located north of Horn Rapids Road, excavations are not expected to extend into the groundwater. If site-specific conditions indicate that a deep excavation may extend to groundwater, mitigation (e.g., raising the ground surface at the facility location) would be carried out to eliminate potential groundwater interaction and the need for excavation dewatering.

5.2.4.2 Operation Impacts

The City of Richland would supply potable water to the PNNL Richland Campus for most non-irrigation uses. A portion of the water supply for the Water Power Technologies activities in the high-bay building (see Section 3.1.2) may be from the existing, permitted Columbia River withdrawal system in the Hanford Site 300 Area. Future development is anticipated to replace existing structures, and any future increase in PNNL staffing levels would result in minimal change to the PNNL water use for non-irrigation purposes due to improved efficiencies (see Section 5.1). For example, per capita PNNL water use was reduced an average of four percent per year between 2011 and 2016. Average water use for all PNNL buildings (both leased buildings and those on campus) during 2016 was 383 m^3/day (101,000 gal/day). Future water use with full buildout would be similar. Therefore, the Proposed Action would have a small impact on water resources.

Water for irrigation would be supplied from the Columbia River withdrawal system under existing water rights or from the City of Richland. As indicated in Table 3.1, future development of PNNL Richland Campus would decrease the currently irrigated area of the campus by approximately 20 to 25 percent. This reduction would occur due to development on currently irrigated agricultural fields and by using xeriscaping and rock landscaping, which require little or no irrigation, on a greater proportion of the new development. Compared to the amount of water used to irrigate all current PNNL buildings (both leased buildings and those on campus), the amount of irrigation water required for the full buildout is expected to be somewhat reduced due to increased use of xeriscaping and rock landscaping.

The only groundwater currently used to support operation of the PNNL Richland Campus is for the Biological Sciences Facility/Computational Sciences Facility Ground Source Heat Pump. Use of a ground source cooling system to support future PNNL facilities has been ruled out based on failed groundwater testing at the PSF Complex, proximity to Hanford groundwater contaminant plumes, potential thermal effects on the Columbia River, and associated monitoring costs. No additional groundwater would be used to support operation of the PNNL Richland Campus except potentially for landscape irrigation.

Water for sanitary use would be discharged to the City of Richland sewer system, would not require permitting, and would be similar to the existing facilities. Laboratory process water would also be discharged to the City of Richland sewer system, and would require an industrial wastewater permit issued by the City. This permit likely would be similar to the existing PSF Complex, EMSL, and North Richland discharge permits, which include limitations on discharge flow rates, pH, and contaminant concentrations, monitoring and reporting requirements, and an accidental spill prevention plan. Adherence to the permit conditions is expected to minimize impacts from laboratory discharges.

As described in Section 4.4.3 groundwater beneath the PNNL Richland Campus contains concentrations of tritium, nitrate, and uranium above background levels. These contaminant plumes originated from activities to the north and west of the campus. Current PNNL facilities and operations do not contribute to the existing groundwater contaminant plumes, and future PNNL facilities and operations would not contribute to these plumes. During operation, stormwater would be managed onsite either by directing runoff to grass or gravel swales for infiltration, or by the use of UIC wells such as drywells and infiltration trenches (with perforated pipes). The use of UIC wells for stormwater management is regulated by WA Ecology, which includes the use of best management practices to protect groundwater and prevent the spread of any underlying groundwater contamination. Because stormwater management would occur onsite, adhere to best management practices, and be regulated under WA Ecology programs, impacts to surface water and groundwater would be minimal.

5.2.4.3 Cumulative Impacts

The future actions identified in Table 5.1 will increase water use in the vicinity of the PNNL Richland Campus. It is assumed that this water would be provided by the City of Richland and would primarily come from the Columbia River. Based on the estimated water use described by DOE (2015a), water use for the future actions identified in Table 5.1 are estimated to total about 4 MGD. As described in Section 4.14, the City of Richland's current Comprehensive Water System Plan (City of Richland 2010) expects demand for the city's water to increase 45 percent by 2028, to a peak demand of 49 MGD. Even if water use for all the actions identified in Table 5.1 are added to this expected increase, the city's existing water rights (58 MGD) would satisfy this additional demand, assuming the treatment capacity is expanded. Any small increase in water use required by the Proposed Action would come from the existing City of Richland supply and would be a minor fraction of Richland's current available capacity. No significant cumulative impacts to water resources are expected.

Changes in the timing of snowmelt and streamflow due to climate change are expected to reduce the overall supply of water in the northwest (GCRP 2014). Water availability in the late summer is expected to be most affected. Water supply is managed by WA Ecology to support a variety of competing uses, and adaptation to a reduced supply may be required in the future. However, water use of the Proposed Action is expected to remain a small fraction of the City of Richland water supply, and the water resources impact of the Proposed Action is expected to remain small.

Average temperatures in the northwest have increased approximately 1.3°F over the last several decades (GCRP 2014). Should the average temperature continue to increase, irrigation water needs would be expected to rise commensurately. The increased use of xeriscaping/rock landscaping throughout the campus would offset this increased irrigation demand.

5.2.5 Cultural and Historical Resources

The following sections describe the environmental consequences for cultural and historic resources for the PNNL Richland Campus Future Development.

5.2.5.1 Archaeological Resources

The following sections evaluate the potential construction and operation impacts of the Proposed Action to archaeological resources on the PNNL Richland Campus.

5.2.5.1.1 Construction Impacts

As described in Section 4.5, there are 21 extant archaeological sites and 15 extant archaeological isolates located on the PNNL Richland Campus.[7]

Construction and full future buildout of the PNNL Richland Campus would result in impacts to 10 archaeological sites and 11 archaeological isolates. Two archaeological sites located north of Horn Rapids Road (45BN1944 and 45BN1946) are located in an area that would be impacted by construction activities. These archaeological sites were determined eligible for the NRHP as contributing components to the *Shu Wipa* TCP. All archaeological materials associated with these sites were collected and relocated to an area in the PDA in consultation with area Tribes and DAHP. As such, these sites would therefore not be impacted by construction activities because their physical attributes are no longer present. The location where the archaeological material was relocated would be avoided and no impacts to these relocated materials/resources would result from construction activities. Two archaeological sites that are located south of Battelle Boulevard (i.e., 45BN1999 and 45BN2000) have not been evaluated for NRHP eligibility. The current PNNL Campus Master Plan (PNNL 2017a) does not envision any new construction occurring south of Battelle Boulevard; therefore, for the purpose of assessment of impacts in this EA it is assumed that these sites would be avoided in the future. If future plans change and these sites could be affected by campus development, the sites would be evaluated for NRHP eligibility and the impacts to these sites would be assessed in a future NHPA Section 106 review.

Seven archaeological sites would not be impacted by construction activities because no construction activities are planned in these areas and therefore would be avoided. These include three archaeological sites located near the shoreline (45BN28/104, 45BN105, and 45BN642), four archaeological sites (45BN1116, 45BN1134, 45BN1426, and 45BN1957) located in the PDA. Four isolates would not be impacted by construction activities (HI-95-143, 45BN641, and 45BN1735) because they are located in the PDA and one (45BN1737) is located north of the PDA; these isolates would be avoided.

Mitigation actions for potential impacts to historic or cultural resources are being developed through a parallel NHPA Section 106 process. When possible, avoidance of cultural resources would be implemented as a mitigation option. As a protective measures for unknown cultural resources, archaeologists may monitor excavations as appropriate, and site maintenance and operations personnel may be trained and/or instructed to watch for artifacts. Inadvertent discovery plans (IDPs) for both human remains and archaeological materials would be developed and implemented in the event that these materials were discovered inadvertently during construction and associated activities. All work would be completed in accordance with the PNSO Cultural and Biological Resources Management Plan (DOE/PNSO 2015).

5.2.5.1.2 Operation Impacts

Operational impacts to archaeological sites are expected to be minimal. There are nine archaeological sites (i.e., 45BN28/104, 45BN105, 45BN642, 45BN1116, 45BN1134, 45BN1424, 45BN1957, 45BN1999, and 45BN2000) and four isolates (i.e., HI-95-143, 45BN641, 45BN1735, and 45BN1737) that would not be impacted from construction activities; however, because they would remain intact, they have the potential to be impacted by ongoing operations.

[7] These include archaeological sites that still exist and have not either been impacted by construction or collected. Therefore they do not include the five archaeological sites impacted by the PSF Complex (i.e., 45BN1128, 45BN1129, 45BN1130, 45BN1363, and H3-438) the one archaeological site impacted by the EMSL facility (i.e., 45BN644), the one isolate impacted by the PSF Complex (i.e., 45BN511), and the one isolate collected at the PSF Complex (i.e., 45BN643).

Operational activities occurring north of the PDA would avoid impacts to the one archaeological isolate located within the area (i.e., 45BN1737). Operational activities are limited to storage of small amounts of explosives and other materials inside established structures. These activities would be located away from this archaeological isolate. In addition, no operational activities would occur near the three village sites (i.e., 45BN28/104, 45BN105, and 45BN642) located along the river shore as no operational activities are proposed for this area.

Operational activities proposed for the PDA (45BN1426) include fence maintenance and projects intended to protect, preserve, and perpetuate biological and cultural resources. These actions would be conducted in cooperation with the Tribes and have the potential to impact both the PDA and the archaeological sites (45BN28/104, 45BN105, 45BN642, 45BN1116, 45BN1134, 45BN1424, and 45BN1957) and archaeological isolates (HI-95-143, 45BN641, and 45BN1735). Specific impacts associated with these activities are unknown, but appropriate mitigations and avoidance measures would be carried out within the context of future NHPA Section 106 reviews for these activities as they are identified. No operational activities are proposed along or near the Columbia River shoreline above the OHWM, therefore no operational-related impacts would occur on these sites. As stated above, mitigation actions for potential impacts to historic or cultural resources are being developed through a parallel NHPA Section 106 process. When possible, avoidance of cultural resources would be implemented as a mitigation option. As a protective measure for unknown cultural resources, archaeologists may monitor excavations as appropriate, and site maintenance and operations personnel may be trained and/or instructed to watch for artifacts. IDPs for both human remains and archaeological materials would be developed and implemented in the event that these materials were discovered inadvertently during construction and associated activities. All work would be completed in accordance with the PNSO Cultural and Biological Resources Management Plan (DOE/PNSO 2015).

5.2.5.2 Traditional Cultural Properties

The following sections describe the potential construction and operations impacts to TCPs on or near the PNNL Richland Campus.

5.2.5.2.1 Construction Impacts

As described in Section 4.5, *Shu Wipa* overlaps and extends beyond the PNNL Richland Campus. *Shu Wipa* has been, and continues to be, of cultural and historical importance to the Wanapum for traditional activities and ceremonial purposes (DOE 2015a). Construction and associated activities would have both direct and indirect (e.g., visual, auditory, and emissions) effects on the portions of the TCP that overlap the PNNL Richland Campus, including impacts to the overall condition of the TCP, traditional subsistence, and archaeological resources (especially in the areas north of Horn Rapids Road). Construction activities would include the removal of surface vegetation (especially in the northern portion of the PNNL Richland Campus), which would result in the removal and destruction of natural resources, some of which may include culturally important plant species. This would result in the direct loss of culturally important resources affecting the overall integrity and condition of the TCP. Construction and related activities would result in alterations to the natural setting of *Shu Wipa*. For example, changes to the landscape, including removal of surface vegetation; disturbances from construction equipment (e.g., use of heavy machinery); and changes to the natural setting, including the introduction of visual intrusions (e.g., flood lights and the presence of buildings, parking lots, and associated infrastructure) would alter the overall feeling, condition, and experience of the TCP by introducing visual-, auditory-, and emissions-related impacts. Mitigation for impacts to the TCP and associated archaeological resources (both direct and indirect) would be addressed through a separate NHPA Section 106 process for this undertaking, which would be drafted in consultation with ACHP and consulting parties.

While limited information is available regarding the currently undocumented Yakama Nation TCP, construction-related impacts are considered similar to those above. Communication with the Yakama Nation cultural resources staff have indicated that any ground-disturbing activities within the TCP and/or related cultural resources would be considered an adverse effect. Mitigation for impacts to the TCP and associated archaeological resources would be addressed through a separate NHPA Section 106 process for this undertaking, which would be drafted in consultation with ACHP and consulting parties.

The CTUIR TCP, *Šúuwipa*, is located within the vicinity of the project area (Hunn et al. 2015); however, discussions with the CTUIR cultural resources staff have indicated that construction activities would likely not impact this resource.

The PDA is an area that has been designated for preservation in recognition of the area's extreme cultural sensitivity to area Tribes. The CTUIR and Nez Perce Tribe have also formally designated this area as a Sacred Site under EO 13007. In addition, a portion of the PDA has been designated an archaeological site (45BN1426). The PDA would not be directly impacted by construction activities because no construction activities are proposed for this area. The PDA could be indirectly affected by construction activities due to alterations of the surrounding setting which could result in impacts to the overall condition and integrity of the PDA. The introduction of auditory (e.g., heavy equipment use and increased traffic), visual (e.g., excavation and removal of intact habitat in adjacent areas from construction-related activities and the use of flood lights) and emissions (e.g., increased traffic) related impacts all have the potential to effect the PDA and the Tribes' ability to practice traditional activities. The opportunities for Tribal access to that area would remain unchanged and in accordance with regulations and guidance listed above; however, construction would result in an impact to the overall condition of the property as well as the ability for Tribes to practice traditional and religious activities. Mitigation for indirect impacts to the PDA are being developed through a parallel NHPA Section 106 process..

While no access constraints would result from construction, the Proposed Action may limit the Tribes' ability to practice traditional and religious activities on the PNNL Richland Campus. Construction-related activities would reduce the overall footprint of potential areas of interest to the Tribes for traditional use (due to the disturbance, construction, and buildout of large portions of previously undisturbed land on the campus). However, PNSO would continue to facilitate access to members of the Wanapum, Yakama Nation, CTUIR, Colville, and Nez Perce Tribes to gather traditional resources and for practicing traditional cultural and religious ceremonies in accordance with AIRFA, Tribal treaty rights, DOE Order 144.1 (DOE 2009), DOE Policy 141.1 (DOE 2001a), and EO 11593, EO 13175, and EO 13007 (36 FR 8921, 65 FR 67249, and 61 FR 26771, respectively) and the PNSO Cultural and Biological Resources Management Plan (DOE/PNSO 2015). Mitigation for impacts to the TCP are being developed and addressed through a parallel NHPA Section 106 process.

Mitigation actions for potential impacts to historic or cultural resources are being developed through a parallel NHPA Section 106 process. As a protective measure for unknown cultural resources, archaeologists may monitor excavations as appropriate, and site maintenance and operations personnel may be trained and/or instructed to watch for artifacts. IDPs for both human remains and archaeological materials would be developed and implemented in the event that these materials were discovered inadvertently during construction and associated activities. . In addition, PNSO has a Cultural and Biological Resources Management Plan that provides for the protection of cultural resources in accordance with all cultural-resource-related federal laws including NAGPRA, AIRFA, ARPA, and NHPA (DOE/PNSO 2015).

5.2.5.2.2 Operation Impacts

Operations-related activities have the potential for both direct and indirect impacts on the *Shu Wipa* TCP (DOE 2015a). Upon completion of construction-related activities routine operations could potentially include small excavations (i.e., utility repair/maintenance), surface/vegetation removal (i.e., landscaping revisions), and routine maintenance that could have a direct impact to the TCP. These would likely be small in size and scope and incremental in nature and are unlikely to be significant. Indirect effects to the TCP associated with operations would likely include the introduction of visual-, auditory-, and emissions-related impacts on and adjacent to areas of the TCP that would compromise the qualities that make *Shu Wipa* significant to the Wanapum for traditional and ceremonial uses. These indirect impacts could prohibit area Tribes from using these areas to practice traditional and ceremonial activities.

While limited information is available regarding the currently undocumented Yakama Nation TCP, operations-related impacts are considered similar to those above. In addition, as described above, Yakama Nation cultural resources staff have indicated that any ground disturbance within the TCP and/or related cultural resources would be considered an adverse effect. Therefore, operational activities that are ground-disturbing in nature would likely result in an impact to the Yakama Nation TCP. Mitigation for impacts to the TCP is being addressed through a parallel NHPA Section 106 process for this undertaking.

The CTUIR TCP, *Šúuwipa*, is located within the vicinity of the project area (Hunn et al. 2015), however, discussions with the CTUIR cultural resources staff have indicated that operations-related activities would likely not impact this resource.

Operational activities proposed for the PDA include fence maintenance and habitat-enhancement projects, which would be conducted in cooperation with the Tribes and have the potential to impact the PDA. Specific impacts associated with these activities are unknown, but appropriate mitigations and avoidance measures would be carried out within the context of future NHPA Section 106 reviews for each of these activities as they are identified. The PDA may be indirectly affected from operations-related activities taking place in areas adjacent to the PDA and could include the introduction of visual- (e.g., excavations, diminishment of viewshed, and infrastructure), auditory (e.g., heavy machinery, increased personnel, and increased traffic) and emissions (e.g., increased traffic and personnel) related impacts. Mitigation for these impacts would be addressed through a parallel NHPA Section 106 process. No operational activities are proposed along the Columbia River shoreline, therefore no operational-related impacts would occur on these sites. Impacts from operations-related activities would be addressed through a parallel NHPA Section 106 process. Mitigation would be proposed for any NRHP-eligible properties that could be impacted by operations-related activities.

While no access constraints would result from operations, operations-related activities may have an impact on the Tribes' ability to practice traditional and religious activities on the PNNL Richland Campus. Activities associated with ongoing operations have the potential to introduce visual-, auditory-, and emissions-related impacts to areas of significance to the Tribes (including the PDA and the *Shu Wipa* TCP). These activities are likely to be minimal, small in size and temporary in nature and would likely not have an impact. PNSO would continue to facilitate access to members of the Wanapum, Yakama Nation, CTUIR, Colville, and Nez Perce Tribes to gather traditional resources and for practicing traditional cultural and religious ceremonies in accordance with all applicable laws, regulations, and guidance. Mitigation for impacts to the TCP will be addressed through a separate NHPA Section 106 process for this undertaking.

Mitigation actions for potential impacts to historic or cultural resources are being developed through a parallel NHPA Section 106 process. . In addition, PNSO has a Cultural and Biological Resources Management Plan which provides for the protection of cultural resources in accordance with all cultural-resource-related federal laws including NAGPRA, AIRFA, ARPA, and NHPA (DOE/PNSO 2015).

5.2.5.3 Architectural Resources

The following sections describe the potential construction and operation impacts to historic buildings on the PNNL Richland Campus.

5.2.5.3.1 Construction Impacts

As described in Section 4.5, 20 historic buildings are located on the PNNL Richland Campus. Of these, eight have been formally evaluated for NRHP eligibility (i.e., RTL 510, RTL 520, RTL 530, RTL 550, RTL 560, RTL 570, RTL 580, and RTL 590); two have been formally determined to be NRHP-eligible (i.e., RTL 520 and RTL 530) and six have been formally determined not NRHP-eligible (i.e., RTL 510, RTL 550, RTL 560, RTL 570, RTL 580, and RTL 590). Impacts from remediation and demolition of the RTL Complex have been considered in the *Cultural Resources Review of the Remediation of Radiological Contamination at the Research Technology Laboratory (RTL) Complex, Pacific Northwest National Laboratory (PNNL) Campus, Richland, Washington* (Harvey et al. 2015). A MOA to resolve and mitigate these adverse effects to the NRHP-eligible RTL 520 and RTL 530 was executed on March 23, 2017 in consultation with the Washington State DAHP (DOE/PNSO 2017a). The demolition and remediation of the RTL Complex is not being considered as part of the scope for the current EA.

The remaining historic buildings were evaluated for NRHP eligibility as part of the NHPA Section 106 process for the current undertaking (Mendez et al. 2017). There will be no construction impacts to historic buildings located north of Horn Rapids Road because there are none located in this portion of the PNNL Richland Campus. Potential construction-related activities on lands located between Horn Rapids Road and Battelle Boulevard include construction of new facilities and minor modifications to existing facilities. Therefore, impacts to historic buildings are possible, but no building demolition is anticipated to occur north of Battelle Boulevard. Currently, the future use of specific facilities located south of Battelle Boulevard is unknown and ranges from re-use/alteration to abandonment/demolition. A Programmatic Agreement and associated treatment plan will be developed in consultation with the Washington DAHP and consulting parties, to avoid or mitigate potential adverse effects to NRHP-eligible historic buildings on the PNNL Richland Campus.

5.2.5.3.2 Operation Impacts

Direct impacts to NRHP-eligible buildings from operations-related activities may include building modifications and/or alterations. These activities are not likely to have a significant impact on NRHP-eligible buildings; however, a programmatic agreement and associated treatment plan will be developed in consultation with the ACHP and consulting parties to avoid or mitigate any adverse effects to these NRHP-eligible properties on the PNNL Richland Campus.

5.2.5.4 Cumulative Impacts

The potential cultural resource impacts of the Proposed Action were evaluated in the context of the reasonably foreseeable future actions identified in Table 5.1. Taken together, those actions and the Proposed Action would result in cumulative cultural resource impacts to the PNNL Richland Campus vicinity. Impacts from development, construction, and operations would result in the loss of archaeological resources, which are non-renewable regardless of NRHP significance. In addition, impacts to the integrity of the surrounding landscape and traditional and cultural resources would result in cumulative impacts to the *Shu Wipa* TCP and the Yakama Nation TCP. Mitigation actions for potential impacts to historic or cultural resources are being developed through a parallel NHPA Section 106 process.

5.2.6 Biological Resources

The buildout could occur over 20 years and may convert some or most areas within the PNNL Richland Campus currently occupied by natural vegetation (Figure 4.1) to landscaped facilities. The buildout may also replace existing landscaped facilities, agricultural areas, early-successional habitats, and non-vegetated areas with newer landscaped facilities or infrastructure. The potential effects of habitat conversion north of Horn Rapids Road would differ from those of the habitat conversion south of Horn

Rapids Road based on the habitats and associated wildlife that would be affected (see Section 4.6). Effects would depend on the type and relative value of the habitat. Four categories of habitats are present across the PNNL Richland Campus. They are presented below in order of decreasing ecological value:

1. potential habitat for Washington threatened and endangered plants or animals that includes the riparian zone of the Columbia River, dune blowouts, mature shrub-steppe (habitat polygons with big sagebrush [Figure 4.1] and/or antelope bitterbrush [Figure 4.1] as the dominant shrubs) (climax plant community), and potential snake hibernacula (Figure 4.1)
2. intermediate shrub-steppe (habitat polygons with rubber rabbitbrush [Figure 4.1] as the dominant shrub) (subclimax plant community)
3. areas of primarily non-native plants (habitat polygons with cheatgrass [Figure 4.1] as dominant)
4. non-vegetated areas, agricultural fields, and landscaped facilities (Figure 4.1).

These four resource categories are depicted in Figure 5.2.

5.2.6.1 Construction Impacts

5.2.6.1.1 Area North of Horn Rapids Road

Development could take place west of the George Washington Way Extension and possibly in the uplands north of the PDA. Thus, there would be no development in the PDA or along the Columbia River shoreline. Table 5.3 shows the affected acreages and/or the number of affected locations by biological resource and biological resource category.

Potential Rare Plant Habitat. Four relatively stable dune blowout areas could be removed by development (Table 5.3). These areas support mature shrub-steppe and native forbs. They are suitable habitat for rare plant species but are currently unoccupied (see Section 4.6). Combined, the four dune blowout areas comprise 0.35 ha (0.87 ac). Similar dune blowout areas occur nearby on the Hanford Site. Thus, removal of the four dune blowouts in the project area would represent a relatively small loss of suitable habitat for rare plants. The mature shrub-steppe that would remain east of George Washington Way would provide 24.7 ha (60.5 ac) of suitable habitat for rare plants; however, it is currently unoccupied (see Section 4.6). Large expanses of mature shrub-steppe occur nearby on the Hanford Site. Thus, removal of this habitat in the project area would represent a relatively small loss of suitable habitat for rare plants.

The Columbia River riparian area would not be affected by development (Table 5.3) and would thus continue to provide suitable habitat for the rare plant species discussed in Section 4.6.

Mature Shrub-Steppe. Mature shrub-steppe includes areas dominated by big sagebrush and/or antelope bitterbrush (Section 4.6). In general, these areas have greater native plant species and wildlife diversity than less mature and more recently disturbed shrub-steppe habitat (i.e., intermediate shrub-steppe and areas of primarily non-native annual plants) (Section 4.6). About 54.2 ha (134.4 ac) of mature shrub-steppe (Table 5.3) could be removed by development. About 24.7 ha (60.5 ac) of mature shrub-steppe would remain east of the George Washington Way extension. The remaining mature shrub-steppe would be even more isolated (already isolated to the north by the Hanford Site 300 Area, to the east by the Columbia River, and to the south by the City of Richland) from other similar habitat in the vicinity by the development that would occur immediately to the west of the George Washington Way extension. The reduction in size and distribution and the increase in isolation would tend to degrade the remaining mature shrub-steppe by making it more susceptible to invasion by weedy species (Section 4.6), which would reduce its suitability for native forbs (including the rare species noted in Section 4.6 and any associated pollinators [79 FR 35901]) and bunchgrasses and would make the habitat less valuable to wildlife (Dobler et al. 1996). In particular, sagebrush-obligate species (e.g., the sagebrush sparrow; WDFW 2017), which are dependent on mature shrub-steppe habitat, would be affected (Vander Haegen et al. 2000). A mitigation action plan describing the approach for mitigating the loss of mature shrub-steppe (which includes the dune blowouts noted above) is provided in Appendix B. Mitigation for disturbance of mature shrub-steppe is expected to offset the loss of this habitat for dependent species such as the sagebrush sparrow (Section 4.6).

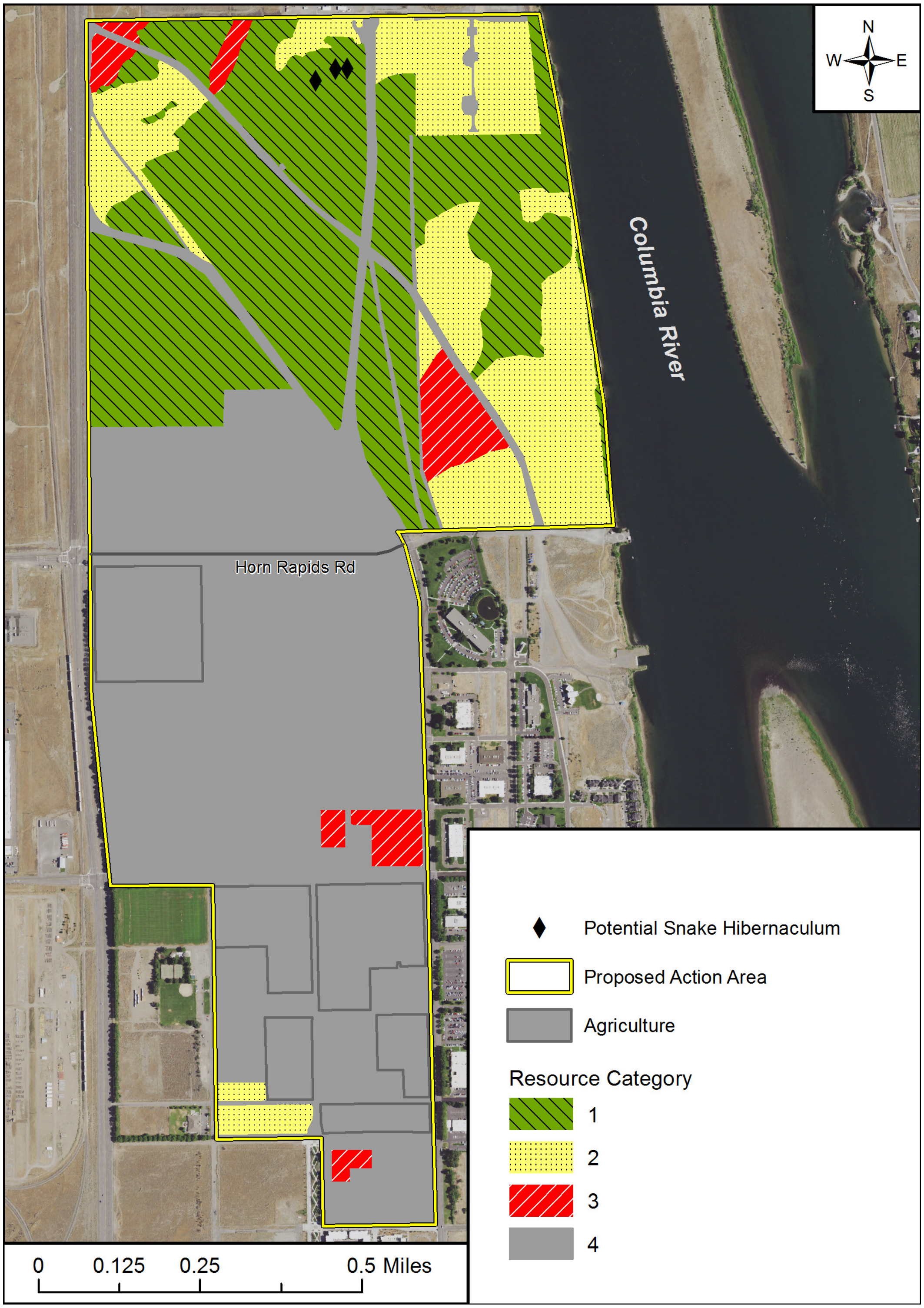

Figure 5.2. Categories of Habitat Resources Located on the PNNL Richland Campus

Table 5.3. Resource Categories That Could Be Disturbed by Development North of Horn Rapids Road

Resource Category	Resource	Affected Ha (Ac)/ Number of Locations	Habitat Use or Potential Use[(a)]
1 – Potential rare plant habitat	Dune blowouts	0.35 (0.87), 4 locations	Suitable habitat for rare plants listed as threatened or endangered by the State of Washington
1 – Potential rare plant habitat	Riparian area	none	Suitable habitat for rare plants listed as threatened or endangered by the State of Washington
1 – Mature shrub-steppe	Habitat dominated by big sagebrush or bitterbrush	54.2 (134.4)	Suitable habitat for rare plants and shrub-steppe wildlife (e.g., ground- and shrub-nesting birds) including mature shrub-steppe obligate bird species
1– Potential snake hibernacula	Partially buried rubble with interstices potentially suitable as hibernation sites	3 locations	Potentially suitable habitat for local snake species, including those of concern to the State of Washington
2 – Intermediate shrub-steppe	Habitat dominated by rubber rabbitbrush	17.3 (42.8)	Shrub-steppe wildlife, including ground- and shrub-nesting birds
3 – Areas of primarily non-native annual plants	Habitat dominated by cheatgrass	2.4 (5.8)	Steppe wildlife, including ground-nesting birds
4– Non-vegetated areas, agricultural fields, and landscaped facilities	Gravel parking lots, laydown areas, ornamental vegetation, alfalfa and pasture fields, facilities	32.6 (80.6)	Ground-nesting birds and birds that nest in ornamental vegetation and on man-made structures

(a) See Section 4.6 for a more detailed description.

Potential Snake Hibernacula. Three potential snake hibernacula (Figure 4.1) could be removed by development. These sites are currently unoccupied (Section 4.6). Occupied snake hibernacula occur nearby on the Hanford Site and are critical for maintaining local snake populations, including those of species of concern to the State of Washington (Section 4.6) (Lindsey et al. 2013). Removal of the three potential hibernacula in the project area would represent a relatively small loss of potentially suitable habitat, and would not affect snake populations unless occupied. Although snakes have not been observed using these hibernacula, this does not preclude possible future occupancy by snakes.

Intermediate Shrub-Steppe. Intermediate shrub-steppe includes areas dominated by rubber rabbitbrush (Section 4.6). About 17.3 ha (42.8 ac) of intermediate shrub-steppe could be removed by development. About 22.4 ha (55.4 ac) of intermediate shrub-steppe would remain east of the George Washington Way extension. The remaining intermediate shrub-steppe would be even more isolated from other similar habitat on the Hanford Site by the development that would occur immediately to the west of the George Washington Way extension. The reduction in size and distribution and the increase in isolation would tend to degrade the remaining intermediate shrub-steppe by making it more susceptible to invasion by weedy species (Section 4.6), which would reduce native forbs (and any associated pollinators [79 FR 35901]) and bunchgrasses and make the habitat less valuable to wildlife (Dobler et al. 1996).

Areas of Primarily Non-Native Annual Plants. Areas of primarily non-native annual plants are dominated by cheatgrass (Section 4.6). About 2.4 ha (5.8 ac) of this habitat type could be removed by development. About 4.1 ha (10.1 ac) of this habitat type would remain east of the George Washington Way extension.

Non-Vegetated Areas, Agricultural Fields, and Landscaped Facilities. About 32.6 ha (80.6 ac) of non-vegetated areas and landscaped facilities currently exist in the southwest corner of the project area. These may be replaced by new facilities with xeriscaping. No agricultural fields exist north of Horn Rapids Road.

Wildlife. Wildlife present west of the George Washington Way extension (Section 4.6) could suffer direct mortality, disturbance, and displacement. In general, less-mobile animals (e.g., small burrowing mammals and unfledged birds) would incur greater direct mortality than those that are more mobile (e.g., adult birds and mid-sized to large mammals). Disturbances below lethal levels may adversely affect wildlife behaviors (e.g., movement, feeding, sheltering, and reproduction). Some mobile wildlife may also disperse into similar habitats in nearby areas, such as that remaining east of the George Washington Way extension or on the Hanford Site. Similar habitats, if suitable, may already be occupied, and resources would then need to be partitioned among a greater number of individuals, which may lead to competition resulting in increased predation, decreased fecundity, and population declines. Thus, wildlife that disperses into areas of similar habitat may also effectively be considered lost. Losses of wildlife, whether by direct mortality, disturbance, or displacement, would likely be greater due to removal of mature shrub-steppe than intermediate shrub-steppe and especially areas occupied primarily by non-native annual plants. Installation of facilities and xeriscaping would increase habitat for avian species that nest on man-made structures and decrease habitat for shrub- and ground-nesting species (Section 4.6). A mitigation action plan describing the approach for mitigating potential impacts to wildlife, including migratory birds, is provided in Appendix B. The plan would involve biological surveys to ascertain occupancy by wildlife prior to land clearing. If needed, measures would be implemented to avoid or minimize potential impacts to wildlife, including migratory birds.

Construction and traffic noise could potentially affect wildlife use of habitat (Dufour 1980; MSU 1971) during and after the development phases of the buildout. Construction noise was assumed to be similar to that specified for the nearby land conveyance from the Hanford Site to the Tri-City Development Council (TRIDEC) for the purpose of economic development (DOE 2015a). Noise levels upwards of 90 dBA would be produced from construction heavy equipment, compressors, and generators but would not likely exceed 100 dBA at the source, and most construction equipment would not exceed 90 dBA measured at a distance of 50 ft from the source. Equipment (e.g., pile drivers and rock hammers) generate higher sound pressure levels but would not likely be necessary since soils and rocks in the project area are relatively soft (DOE 2015a). Noise at these levels are substantially above ambient (26.6 and 27.6 dBA [Section 4.13.2]) and could thus affect wildlife use of habitat in the PDA (which lies just east of George Washington Way); however, the extent of that impact cannot be predicted with certainty (Caltrans 2016; Ortega 2012; USDOT 2004). Wildlife (especially bird) responses to noise are variable and may range from habituation to varying degrees of avoidance (leaving habitat unoccupied). Sound pressure levels at or above 93 dBA may cause temporary threshold shift (temporary hearing loss which recovers over a period of minutes to days from the end of noise exposure) in birds (Caltrans 2016). Sound pressure levels from stationary sources are expected to attenuate at about 6 dBA for every doubling of distance (DOE 2015a), and so would likely be below temporary threshold shift levels at 50 to 100 ft. While construction noise could affect some wildlife in the PDA intermittently during periods of construction, any effects would likely extend only a short distance from the construction site and be temporary, as they would be punctuated by periods of relative quiet between bouts of noise, during nighttime hours, and between construction phases.

Unlike construction noise, traffic noise would be permanent. George Washington Way traffic levels north of Horn Rapids Road currently amount to about 2,000 vehicles per day (including traffic in both north and south directions) (Table 4.11) at 35 mph. Traffic noise depends upon the volume and speed of traffic. Observations made during the biological field surveys noted in Section 4.6.2 indicate that traffic noise on George Washington Way north of Horn Rapids Road is intermittent at these traffic volumes. Vehicles travel at 35 mph and generate noise at about 65 dBA (DOE 2015a). Intermittent traffic noise alone (without the other variables associated with roadways such as edge effects and visual disturbance) of about 55 to 61 dBA in mountain shrubland in southwest Idaho has been associated with a decrease in habitat use (leaving the area) within about 50 m by fall migrating songbirds and a decrease in body mass index in individual birds that remained in the affected area (Ware et al. 2015). Thus, existing traffic noise along George Washington Way north of Horn Rapids Road may already similarly affect avian use of nearby habitat. Future traffic volume and speed in the built-out area is not expected to differ significantly from existing conditions on the developed portion of the campus, where PNNL staff access office buildings and associated parking areas at speeds of about 25 mph. Existing traffic conditions on the developed portion of the campus represent an (unspecified) increase in the number of automobiles and lesser speeds than the current traffic conditions on George Washington Way north of Horn Rapids Road described above. Auto traffic at 25 mph would generate about 60 dBA (DOE 2015a). Thus, any effects on avian habitat use would likely be less intensive over a lesser distance but likely would be more continuous (due to more vehicles) than under existing traffic conditions along George Washington Way north of Horn Rapids Road, and would not represent a substantial change from the possible baseline effects described above.

Noxious Weeds. Construction activities, especially ground clearing, could lead to a proliferation of noxious and invasive weed species (Section 4.6). PNNL maintains an active noxious weed control program (Duncan et al. 2016) and it is expected that this program would continue in the future. Additional controls (described in the mitigation action plan in Appendix B) would be implemented as needed to minimize the introduction and spread of noxious weeds by construction equipment.

5.2.6.1.2 Area South of Horn Rapids Road

The four highest habitat types present north of Horn Rapids Road (grouped collectively under category #1 described in the introduction to Section 5.2.6) are absent south of Horn Rapids Road (Table 5.4). Agricultural areas are present only south of Horn Rapids Road (Table 5.4). Acreages of the categories of habitats that would be affected by development are listed in Table 5.4.

Table 5.4. Resource Categories That Could Be Disturbed by Development South of Horn Rapids Road

Resource Category	Resource	Affected Ha (Ac)	Habitat Use or Potential Use
2 – Intermediate shrub-steppe	Habitat dominated by rubber rabbitbrush	2.3 (5.7)	Shrub-steppe wildlife, including ground- and shrub-nesting birds
3 – Areas of primarily non-native annual plants	Habitat dominated by cheatgrass	3.1 (7.8)	Steppe wildlife, including ground-nesting birds
4 – Non-vegetated areas, agricultural fields, and landscaped facilities	Gravel parking lots, laydown areas, ornamental vegetation, alfalfa and grass hay fields, facilities	101.6 (251.2)	Ground-nesting birds and birds that nest in ornamental vegetation and on human-made structures

Intermediate Shrub-Steppe. Intermediate shrub-steppe includes areas dominated by rubber rabbitbrush (Section 4.6). About 2.3 ha (5.7 ac) of intermediate shrub-steppe could be removed by development. No intermediate shrub-steppe vegetation would remain on the PNNL Richland Campus south of Horn Rapids Road.

Areas of Primarily Non-Native Annual Plants. Areas of primarily non-native annual plants are dominated by cheatgrass (Section 4.6). About 3.1 ha (7.8 ac) of this habitat type could be removed by development. No areas of primarily non-native annual plants would remain on the PNNL Richland Campus south of Horn Rapids Road.

Non-Vegetated Areas, Agricultural Fields, and Landscaped Facilities. All 101.6 ha (251.2 ac) currently comprising non-vegetated areas, agricultural fields, and landscaped facilities may be removed and replaced with new facilities and xeriscaping. Facility demolition would temporarily reduce nesting habitat for avian species that nest on man-made structures (Section 4.6). However, an increase in new facilities may create more nesting habitat for such species. Replacement of the current landscaping with xeriscaping would permanently reduce nesting habitat for avian species that nest in ornamental trees and shrubs (Section 4.6), but may increase habitat for ground-nesting species. Removal of agricultural fields would remove some habitat for ground-nesting birds, particularly along field margins. This may also remove foraging habitat for the long-billed curlew, a Washington State-monitored species (WDFW 2016b) (Section 4.6). However, ample foraging habitat for this species exists nearby on the Hanford Site.

Noxious Weeds. The PNNL program to control the spread of noxious and invasive weeds (that could result from construction activities) described in Section 5.2.6.1.1 would also be implemented in the project area south of Horn Rapids Road.

Stockpiled Soils. Stockpiled soils could be a source of fugitive dust. Fugitive dust generation would be minimized to the extent practicable by employing construction best management practices. Stockpiled soils may be utilized by local wildlife such as migratory birds, which could be adversely affected when soil is moved or re-used. Stockpiled soils would undergo a biological survey to ascertain occupancy by wildlife prior to re-use onsite or transport offsite for disposal in local commercial landfills. If needed, measures would be implemented to avoid potential impacts to wildlife, including migratory birds.

The majority of mature and intermediate shrub-steppe and wildlife that could be disturbed occur north of Horn Rapids Road. Some effects of habitat disturbance on wildlife could be severe (e.g., mortality), while some effects would likely be less severe (e.g., disturbance and displacement). Notwithstanding the local loss of shrub-steppe and individual wildlife, effects to overall shrub-steppe habitat and wildlife populations are considered relatively small in the context of the widespread occurrence of such resources in the broader area (i.e., Hanford Site) and because DOE will perform compensatory mitigation. Mitigation of mature shrub-steppe habitat at a minimum of a 3:1 replacement ratio, as described in the *Cultural and Biological Resources Management Plan* (DOE/PNSO 2015), is assumed to offset losses of habitat value and wildlife due to the buildout. Consequently, potential impacts to shrub-steppe habitat and wildlife from the buildout are considered noticeable but not significant.

5.2.6.1.3 Operation Impacts

During operation of the new facilities, there would be no additional impacts to biological resources beyond the construction impacts described in the Section 5.2.6.1.

5.2.6.2 Cumulative Impacts

The development areas depicted in the project vicinity in Figure 5.1 and the projects described in Table 5.1, especially the City of Richland/Port of Benton/Energy Northwest Industrial Development Area and projects associated with the Horn Rapids Master Plan would tend to further isolate the shrub-steppe and associated wildlife that may remain in the project area after the buildout. Existing shrub-steppe and wildlife in the project area are currently isolated to the north by the Hanford Site 300 Area, to the east by the Columbia River, and to the south by the City of Richland. The increase in isolation from west of Stevens Drive would increase travel distances to intact shrub-steppe habitat for mobile wildlife displaced by the buildout and dispersing from the project area. Increased isolation would also tend to further degrade any shrub-steppe that may remain in the project area by making it more susceptible to invasion by weedy species (Section 5.2.6.1.1) (and less likely to be colonized by native plant species from shrub-steppe located greater distances to the west), which would reduce native forbs and bunchgrasses and make the habitat less valuable to wildlife.

Development in the project area would remove a small fraction of shrub-steppe compared to that which would be removed by the actions in the vicinity listed in Table 5.1 and to the substantive past actions that isolated it from the north (development of the 300 Area) and from the south (development of the City of Richland). Thus, the buildout would provide a small incremental impact to shrub-steppe habitat and associated wildlife when added to other past, present, and reasonably foreseeable future actions.

The climate of the Columbia Basin is characterized by warm summers with little precipitation, followed by cold winters during which most of the annual precipitation falls. Average temperatures in the northwest have increased approximately 1.3 °F over the last several decades (Mote et al. 2014). Should the average temperature continue to increase, some adverse effects could be seen in the native vegetation communities of the Columbia Basin, especially in periods of drought. Hotter, drier summers would increase evapotranspiration that could weaken perennial or woody plants, and increase the risk of fire, both of which would reduce native shrubs and perennials and favor invasive annual species such as cheatgrass. These changes would likely be discernible only over a much larger scale (regional) than the project area, and any changes on the PNNL campus would be insignificant compared to the habitat conversion that would result from the facility buildout.

5.2.7 Wetlands and Floodplains

There are no wetlands or floodplains in the project area (Section 4.7). Therefore, there would be no direct, indirect, or cumulative impacts to wetlands or floodplains due to the Proposed Action. Because there would be no impacts, DOE determined that a formal floodplain and wetland assessment as described in 10 CFR Part 1022 is not required.

5.2.8 Socioeconomics

The following sections describe the environmental consequences for socioeconomics for the PNNL Richland Campus. Potential impacts on socioeconomics as a result of construction and operation of new facilities and infrastructure are described in the following sections.

5.2.8.1 Construction Impacts

As described in Section 3.1, the precise design of the new facilities is not known, other than the construction of up to 92,900 m^2 (1 million ft^2) of floor space. Because the precise design of the facilities is not known, reasonable approximations were made based on other, similar types of recent local construction. An estimated average of approximately 175 construction workers could be employed over a 20-year period with a peak workforce of approximately 350 workers. Peak conditions would occur with the construction of buildings having 18,600 to 23,200 m^2 (200,000 to 250,000 ft^2) of floor space and would last 24 to 36 months.

Based on construction workforce estimates, construction activities would likely have little effect on the existing community. Total employment in Benton and Franklin Counties in November 2016 was approximately 125,000, with an unemployment rate averaging approximately 6.6 percent (BLS 2016b). Thus, even if construction creates additional service sector jobs, the total increase in employment likely would be under 1 percent of the current employment level. Therefore, adverse impacts to related community services and infrastructure, including housing and schools, would not be expected.

5.2.8.2 Operation Impacts

The new facilities would house existing research staff and a minimal number of new research staff. Existing staff initially would be relocated from other leased facilities near the campus. As campus facilities are replaced, relocated staff would move into the newly constructed facilities. Consequently, no impacts on socioeconomics or community infrastructure would be expected from operations associated with implementing the Proposed Action.

5.2.8.3 Cumulative Impacts

The potential socioeconomic impacts of the Proposed Action were evaluated in the context of the reasonably foreseeable future actions identified in Table 5.1. Taken together, those actions and the Proposed Action result in cumulative socioeconomic impacts to the local area (e.g., increased economic activity, employment, traffic, and increased demand on community infrastructure and services). However, as discussed for the Proposed Action, the likely incremental impacts of construction worker employment would be minor in the context of the activities listed in Table 5.1. There would be no net change in operations employment from the Proposed Action.

5.2.9 Environmental Justice

The following sections describe the environmental consequences for environmental justice for the PNNL Richland Campus. Potential impacts on socioeconomics as a result of construction and operation of the new facilities and infrastructure are described below.

5.2.9.1 Construction Impacts

Section 4.9 presents the baseline assessment of environmental justice conditions within 80 km (50 mi) of the PNNL Richland Campus. The Proposed Action would not result in disproportionately high and adverse effects on minority or low-income populations. Given the “adverse” criterion is not met, the “disproportionately high” criterion is not a consideration. Hence, thresholds for environmental justice related impacts are not reached. Some Tribal resources may be affected by the Proposed Action; these impacts are discussed in Section 5.2.5. DOE is working with the consulting parties on a separate NHPA Section 106 process for this undertaking to develop stipulations that, once implemented, would mitigate potential adverse impacts to these Tribal resources.

5.2.9.2 Operations Impacts

Operational impacts of new facilities and/or additions and new infrastructure are expected to be similar to those from ongoing PNNL operations. Currently, there are no know impact pathways associated with PNNL operations that have been determined to affect low-income or minority populations disproportionately; therefore, operation of the new facilities and/or additions and new infrastructure is not expected to have the potential for disproportionately high and adverse impacts on minority or low-income groups as defined in Section 4.9.

5.2.9.3 Cumulative Impacts

Taken together, the activities in Table 5.1 would be expected to have cumulative physical and socioeconomic impacts to residents and commuters using the access routes for those activities. These impacts are discussed in Section 5.2.10. Beneficial socioeconomic impacts would be derived from the economic activity associated with these activities including employment, income generation, and tax revenue impacts. These impacts are discussed in Section 5.2.8. Because these impact pathways are not specific to low-income or minority populations, disproportionately high and adverse impacts to these groups would not be expected. Cumulative impacts to Tribal resources are considered in Section 5.2.5.4.

5.2.10 Traffic and Transportation

The following sections describe the environmental consequences for traffic and transportation for the PNNL Richland Campus.

5.2.10.1 Construction Impacts

As described in Section 3.1, the precise design of the new facilities is not known other than up to approximately 92,900 m^2 (1 million ft^2) of new laboratory and office space.

While an actual construction schedule is dependent on mission need and funding authorities, for purposes of this EA it is assumed that 1.5 buildings would be constructed per year, with an average construction time of 14 to 16 months per building. It is estimated that an average of approximately 175 construction workers would be employed over a 20-year period with a peak workforce of about 350 workers.

Based on Section 3.1.2 and Figure 1.2, construction activities may occur anywhere within the PNNL Richland Campus footprint, except within the PDA. Thus, construction traffic impacts would be proportional to where development occurs. The impact analysis uses Horn Rapids Road access points as representative entry points to where construction activities would be likely to occur. Depending on the actual site of new construction activities, other east-west entry points from George Washington Way or from Stevens Drive might be used (e.g., 5th Street). Battelle Boulevard and University Drive are other potential entry points. Construction traffic would be assumed to minimize use of Battelle Boulevard for campus entry, given the substantial current volume of PNNL staff using that entry point. University Drive could be used to enter the campus from the south, depending on the actual location of facilities to be constructed. The traffic counts for University Drive are not significantly different from those for Horn Rapids Road.

At the height of construction, as many as 350 additional vehicles may be going to and from the construction site. Assuming construction traffic would be distributed proportionally between the two ends of Horn Rapids Road, inbound traffic counts could increase to approximately 735 and 923 vehicles, respectively. This potential increase represents an approximately 23 to 31 percent increase over current average daily traffic on Horn Rapids Road at the peak of construction activities. During non-peak construction periods, the increase over current average daily traffic on Horn Rapids Road would be about 12 to 15 percent. These changes in traffic are relative to the most recent traffic estimates from the City of Richland, which are discussed in Section 4.10. Baseline traffic growth is expected to occur over the construction period and, therefore, traffic increases from construction activities would be less than the percentage increases discussed above.

Construction deliveries at the peak of construction likely would result in multiple concrete truck deliveries for pouring building slabs, with up to 10 to 15 concrete trucks during a working day. Larger loads would also make deliveries (e.g., steel), but would not be expected to result in as many trips per day. Because these periods of peak delivery to the construction site would be of short duration and widely spaced over the years of buildout, increases to traffic from construction deliveries would be minor.

The impacts of traffic accidents involving construction workers traveling to and from the construction site were calculated using traffic accident statistics for Benton County compiled by the Washington State Department of Transportation (Washington State 2016). This report gives the collision, serious injury, and fatality rates for each county in the state. Benton County collision, serious injury, and fatality rates were 176.3, 3.35, and 0.65 per 100 million vehicle-miles traveled, respectively. On average, it was assumed that 175 workers per day would travel an average distance of 20 km (12 mi) one-way to the construction site. This distance encompasses most of the Tri-Cities region and accounts for the fact that most of the workers would travel a shorter distance and that some are likely to car-pool. Assuming workers make the trip 250 days per year over 20 years, the total distance traveled would be about 35 million km (~22 million mi). The impacts in terms of accidents, injuries, and fatalities are shown in Table 5.5.

Table 5.5. 20-Year Construction Traffic Accident Impacts

Number of Workers	Trips per Day	Avg. Distance (km)	Days per Year	No of Years	Total distance (km)	Accidents	Injuries	Fatalities
175	2	20	250	20	35,000,000	39	1 (0.73)	0 (0.14)

As shown in the table, when risk-weighted, perhaps one injury involving workers commuting to the construction site would occur during the construction period, resulting in no fatalities.

5.2.10.2 Operation Impacts

The new facilities would employ mostly existing research staff and a minimal number of new research staff under baseline conditions. Existing staff would be relocated from other operating facilities on the campus and from leased facilities, and the number of new staff is not expected to be significant. To address building access and avoid local congestion, it is likely that additional parking would be included in the development. Once operating, local traffic impacts would be limited to a potential change in traffic patterns by PNNL staff and result in only minimal impact overall.

Section 3.1.7 indicates that if facilities are constructed north of Horn Rapids Road during the progressive buildout of the campus, through traffic on George Washington Way would be permanently re-routed to alternative local routes to facilitate travel beyond the campus. Thus, use of George Washington Way as operations begin would change from a thoroughfare to local access driveways. Table 4.11 indicates as a daily average, roughly 900 northbound and 900 southbound vehicles utilize George Washington Way in its current configuration north of Horn Rapids Road. This through traffic would be distributed to alternative routes to and from points north of the campus. DOE expects that traffic noise volume would be reduced from current levels, as vehicles accessing points on the PNNL Richland Campus would be traveling at much slower speeds and vehicle noise would be masked by the ambient noise of the operating facilities.

5.2.10.3 Cumulative Impacts

The potential traffic impacts of the Proposed Action were evaluated in the context of the reasonably foreseeable future actions identified in Table 5.1. Taken together, those actions and the Proposed Action result in cumulative traffic impacts to the local area and natural degradation to roadways over time caused by vehicle use. However, as discussed for the Proposed Action, the likely incremental impacts of construction worker traffic would be minor in the context of total traffic volume on Stevens Drive and George Washington Way. There would be no net change in operation traffic from the Proposed Action.

5.2.11 Human Health and Safety

Impacts on health and safety from construction and operation of the PNNL Richland Campus are presented in this section. Radiological, chemical, and physical impacts are described in Sections 5.2.11.1, 5.2.11.2, and 5.2.11.3, respectively.

5.2.11.1 Radiological Impacts

Radiological impacts are described in the following sections. Impacts are reported as dose to the MEI and as collective dose to the population within 80 km (50 mi) of the campus.

5.2.11.1.1 Construction Impacts

No radiological impacts resulting from construction are anticipated. The radiological impact to construction workers would be negligible and would be similar to those described below for members of the public in a 80 km (50 mi) radius of the PNNL Richland Campus.

5.2.11.1.2 Operation Impacts

Routine Operations

Radiological operations for new facilities would be similar to current operations. The expected impacts to the members of the public and biota from routine operations would be similar to current impacts. Current radiological emissions are presented in the PNNL Annual Site Environmental Report for calendar year 2015 (Duncan et al. 2016) and earlier years, as well as historical experience with the 300 Area laboratories at the Hanford Site where PNNL conducts R&D activities. DOE's experience indicates that operation (or modification) and subsequent decommissioning of such facilities normally pose no potential for significant environmental impacts (61 FR 6414). Facilities constructed north of Horn Rapids Road would remain within the area where meteorology is characterized by 300 Area meteorological data. The ambient air monitoring program for radionuclides would be modified as necessary to adequately account for new facilities. The dose to the MEI resulting from radiological emissions is expected to remain well below the 10 mrem annual regulatory standard.

Estimates of human health consequences following exposure to ionizing radiation are expressed in terms of probability of latent cancer fatality (LCF) for individuals or number of LCFs for populations, and are based on a dose-to-LCF factor of 0.0006 LCF per person-rem for both workers and the public (ISCORS 2002). Consequences for populations are also expressed as risk of LCF in the population, accounting for the estimated frequency of an event that results in exposure of the population to radiation. In estimating the risk from accidents, the frequency of an event is usually designated by a range and is characterized as either "Anticipated" (frequency ranging from 1 in 100 to 1.0 per year), "Unlikely" (frequency ranging from 1 in 10,000 to 1 in 100 per year), or "Extremely Unlikely" (frequency ranging from 1 in 1,000,000 to 1 in 10,000 per year). Events expected to occur with a frequency lower than 1 in 1,000,000 per year are not considered for purposes of safety analysis. For routine activities or exposure of populations to background radiation, the estimated frequency of the exposure is assumed to be 1.0.

Workers − Radiological impacts on worker health and safety from future operations were estimated to be bounded based on 5 years of recent experience from PNNL R&D activities, which are expected to be representative of activities that would be conducted in the PNNL Richland Campus following future development. Worker doses over the 5-year period from 2011 to 2015 are presented in Table 5.6 (Buckner et al. 2015; REMS 2017).

Table 5.6. Worker Doses from PNNL R&D Activities (Buckner et al. 2015; REMS 2017)

	Number of Workers with Measured Doses by Category (mrem)							Total Worker
Year	Not Measurable	Less than 100	100 to 250	250 to 500	500 to 750	750 to 1,000	1,000 to 2,000	Collective Dose (person-rem)
2011	1,416	192	33	18	7	1	0	22
2012	1,380	198	21	16	5	0	0	18
2013	1,935	367	36	8	0	0	0	15
2014	1,937	441	21	9	3	0	0	16
2015	1,978	430	28	3	0	0	0	13

At the dose levels presented in Table 5.6, the inferred probability of an LCF for the maximally exposed worker over a 30-year career (at 1 rem/y) would be 0.02, with no (0.3) inferred LCFs for the worker population as a whole over a 30-year period, assuming a 5-year average collective dose of 16.8 person-rem per year. For perspective, 10 LCFs would be inferred to occur among this work force from naturally occurring sources of radiation during this same period, assuming a 5-year average annual workforce of 1,729 individuals and a TED of 0.311 rem to each individual resulting from natural background sources.

Public − Based on results calculated for releases of radioactive materials to air from PNNL facilities, as presented in the PNNL 2015 Annual Site Environmental Report (Duncan et al. 2016), the annual dose (exclusive of background) to the MEI in the public would be similar to current doses and far below the 10 mrem regulatory dose standard. If an individual were to be exposed for 30 years at current dose levels, the total dose (0.0078 mrem) would result in a negligible expectation of a LCF (0.0000000047 or about 1 fatality per 200 million persons). For perspective, that individual would have received over 9,000 mrem from natural background radiation sources over a 30-year period, from which the probability of a LCF would be less than 0.006.

5.2.11.1.3 Cumulative Impacts

Based on the results of analyses presented in this section, cumulative radiological impacts are expected to be minimal. The area of most probable influence associated with operation of the PNNL Richland Campus would consist principally of the northern portion of the City of Richland and the rural area of Franklin County in an easterly direction across the Columbia River from the PNNL Richland Campus.

The past Hanford Site activities that had the largest impact on the area of interest were the operation of the fuel fabrication facilities, production reactors, separations and product finishing plants, and R&D facilities employed on the site in support of national defense programs. Environmental impacts manifested themselves principally as a result of the release of radioactive material to air, water, and ground that occurred during production of nuclear materials for national defense during World War II and the subsequent Cold War era.

Ongoing or planned actions that might also have a radiological impact on the same area of interest would include those associated with the following operations:

- Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. § 9601 et seq.) remediation projects and remediation of the river corridor in the southeastern portion of the Hanford Site
- ongoing waste management and cleanup of the Hanford Site in general
- CGS, a nuclear power plant located north of the 300 Area and operated by Energy Northwest
- Perma-Fix Northwest, a radioactive and mixed waste treatment facility
- AREVA, a nuclear fuel fabrication plant
- Unitech Services Group (material processing and waste-management services)
- Test America (environmental testing services)
- Bioproducts, Sciences, and Engineering Laboratory (BSEL), a joint WSU and PNNL project located on the WSU-Tri-Cities campus

As indicated earlier, the maximum annual dose to the MEI resulting from the PNNL Richland Campus emissions would be about 0.00026 mrem. In 2015, the combined annual contribution to radiation dose from all of the above-named nearby sites of potential releases would have yielded a total dose of <0.5 mrem to an individual located on the PNNL Richland Campus. Based on the most recent 5-year average, routine PNNL Richland Campus operations would result in a total collective annual dose of about 0.0063 person-rem to the population within an 80 km (50 mi) radius. For perspective, the average dose to each individual in the Richland area from naturally occurring and man-made sources is about 300 mrem/y. A general description of these sources and their contribution to the total average dose is shown in Figure 5.3.

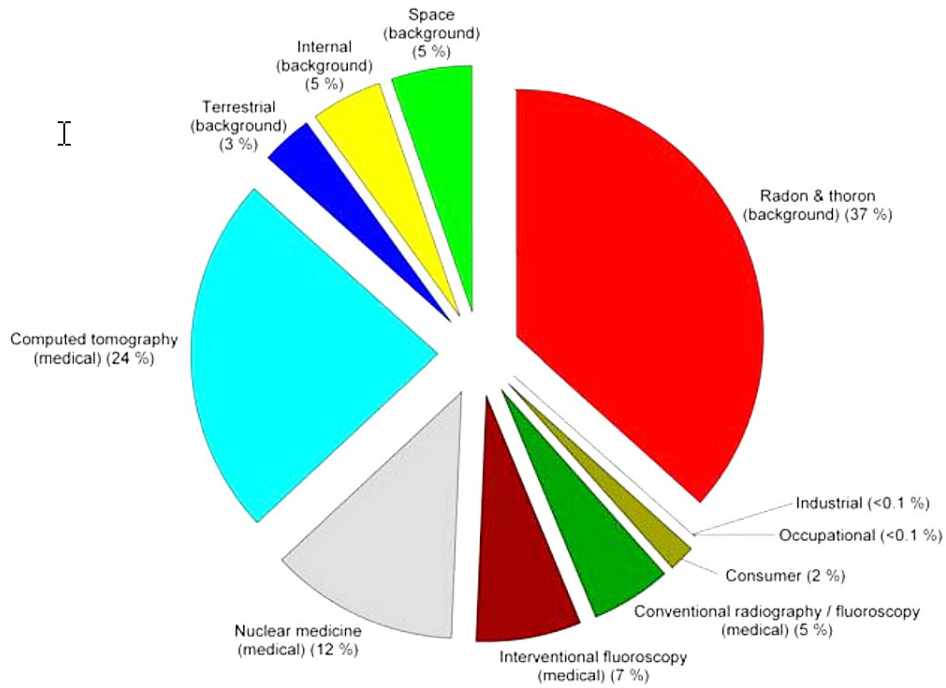

Figure 5.3. Sources of Radiation Exposure (Reprinted with permission of the National Council on Radiation Protection and Measurements, http://ncrponline.org/ [NCRP 2009])

Table 5.7 shows a broader view of collective radiological impacts on human health and safety within the affected population, including the projected contribution from PNNL Richland Campus.

Based on the dose estimates in Table 5.7, whether PNNL R&D activities are carried out at the PNNL Richland Campus or not at all, there would be no appreciable difference in cumulative impacts on human radiological health and safety. Therefore, operation of the PNNL Richland Campus would result in minimal net change to cumulative impacts on the surrounding environment.

5.2.11.2 Chemical Impacts

Chemical impacts resulting from construction, operation, and cumulative impacts are described in Sections 5.2.11.2.1, 5.2.11.2.2, and 5.2.11.2.3, respectively.

5.2.11.2.1 Construction Impacts

Minimal chemical impacts resulting from construction are likely and would primarily be related to emissions from construction equipment and related construction activities. The chemical impact to construction workers would be negligible and similar in nature to normal construction and finishing activities (e.g., painting).

5.2.11.2.2 Operation Impacts

Potential impacts on health and safety of both workers and the public from exposure to non-radioactive hazardous chemicals for routine operations and accident conditions at the PNNL Richland Campus are considered in this section.

Table 5.7. Estimated Past, Present, and Reasonably Foreseeable Collective Population Dose and Health Effects in the Hanford Environs from Release of Radioactive Material to the Atmosphere[(a)]

Source of Impacts	Dose (person-rem)	Inferred Latent Cancer Fatalities[(a)]
Past Operations		
Hanford production operations 1944−1988 (DOE 1995)[(b)]	100,000	60
Hanford post-production operations 1989–2005 (DOE 1990–2006)[(b,c)]	9	0.0054
Hanford operations (2006–2015)[(d)]	5.4	0.0032
PNNL Richland Campus operations (2010–2015)[(e)]	2.8	0.0017
Ongoing (2016) and Proposed Operations		
PNNL Richland Campus R&D (20-year projection, 2016–2035)[(e)]	0.13	0.000078
Hanford R&D operations (20-year projection, 2016−2035)[(d)]	11.8	0.0071
CGS, U.S. Ecology Commercial Low-Level Waste Disposal, and other Non-DOE commercial sources (20-year projection: 2016–2035)[(f)]	10.7	0.0064
2016–2017 Plutonium Finishing Plant stabilization[(g)]	7.6	0.0046
Reasonably Foreseeable Operations		
Vitrification plant operations[(h)]	400	0.24
Cumulative Totals		
Hanford production operations (1944–1988)	100,000	60
Post-production to date Hanford and PNNL operations (1988–2015)	17.2	0.0103
Hanford Vitrification plant operations	400	0.24
20-year projected Hanford and PNNL operations (2016–2035)	19.6	0.012
20-year projected, non-DOE sources (2016–2035)	10.7	0.0064
Perspective		
20-year cumulative background dose (e.g., 2016–2035)[(i)]	2,688,000	1,600

(a) Based on 0.0006 inferred LCFs per person-rem. Values rounded to two significant figures.
(b) Assumes constant population of about 380,000. All doses given to one significant figure.
(c) Based on Hanford Site Environmental Reports for calendar years 1989 through 2005 (available at http://msa.hanford.gov/page.cfm/EnviroReports).
(d) Based on Hanford Site Environmental Reports for calendar years 2011 through 2015 (assumed 5 years at Hanford, then moving operations to the PNNL Richland Campus for the next 15 years; available at http://msa.hanford.gov/page.cfm/EnviroReports).
(e) Based on PNNL Richland Campus radioactive air emissions reports for calendar years 2011 through 2015 (available at http://www.pnnl.gov/about/RAE_compliance_reports/).
(f) Based on Energy Northwest CGS for calendar year 2015 (Energy Northwest 2016).
(g) MEI dose (0.000013 rem) times the 2010 80-km (50-mi) population centered at the central 200 Area (586,500) (Hamilton and Snyder 2011).
(h) Based on earlier NEPA documents (1996).
(i) Based on the 2010 80 km (50 mi) population centered at the 300 Area (432,117).

As discussed in Section 3.1.4, chemical quantities and types anticipated for use in facilities within the PNNL Richland Campus would be similar to existing uses at PNNL. Table 3.3 provides an estimated inventory of hazardous chemicals at the PNNL Richland Campus. Work would be performed in laboratories designed for safe use of chemicals, including equipment such as ventilation-controlled fume hoods and worker protective clothing. WA Ecology regulates the emissions of 395 chemicals under WAC 173-460, "Controls for New Sources of Toxic Air Pollutants." The potential emissions of those chemicals from the proposed R&D activities would be similar to PSF Complex emissions evaluated for the PSF Complex EA (DOE 2007). Concentrations were calculated for the points of nearest potential public exposure using the EPA Industrial Source Complex dispersion model (DOE 2007).

The results are presented in Table 5.8, which shows the annual average and 24-hour average ambient air concentration for the 20 toxic air pollutants that were the highest percent of their respective health-risk based Acceptable Source Impact Levels (ASILs) as listed in that regulation. Based on the small percentages of ASILs estimated, and the fact that the sum of fractions for all the air toxic pollutants to be used in future facilities is less than one, it is concluded that impacts on public health from the release of chemicals from routine operations would be minimal.

Table 5.8 Estimated Concentrations of PNNL Richland Campus Laboratory Toxic Air Pollutant Emissions

	Ambient Air Concentrations		
Chemical	Annual Average, μg/m^3	24-Hour Average, μg/m^3	Percent of ASIL
Hydrogen Chloride	0.00024	0.10	1.42
Chlorodifluoromethane	0.021	8.7	0.73
Lead Compounds	0.0000068	0.0029	0.58
Diborane	0.0000044	0.0019	0.50
Polyaromatic Hydrocarbons	0.0000000027	0.0000011	0.24
Chloroform	0.000078	0.033	0.18
Phosphine	0.0000054	0.0023	0.18
Nitrogen Trifluoride	0.00040	0.17	0.17
Ammonia	0.00037	0.15	0.15
Acrylic Acid	0.00000072	0.00030	0.10
Methylene Chloride	0.00053	0.22	0.10
Boron Trifluoride	0.000017	0.0071	0.08
1,2-Epoxybutane	0.000025	0.011	0.05
Toluene	0.00044	0.19	0.05
Vinyl Chloride	0.0000043	0.0018	0.04
Trichloroethylene	0.00019	0.081	0.03
Chromium	0.000000022	0.0000093	0.03
Nitric Acid	0.000010	0.0043	0.03
Carbon Tetrachloride	0.000017	0.0071	0.03
Hexafluoroacetone	0.0000013	0.00053	0.02

Note: to convert m^3 to ft^3, multiply by 35.3147.

As a research laboratory, PNNL recognizes that it has many buildings where chemicals are used and/or stored for research operations and maintenance activities and therefore has introduced controls to avoid potential hazards include training, inventory control procedures, approvals prior to chemical requisitioning, and work procedures for chemicals use, including adequate safety requirements. Because management practices and activities at the PNNL Richland Campus would be similar in nature to current practices and activities, the potential impacts from use of hazardous chemicals are expected to remain low.

5.2.11.2.3 Cumulative Impacts

The potential chemical impacts of the Proposed Action were evaluated in the context of the reasonably foreseeable future actions identified in Table 5.1. Taken together, those actions and the Proposed Action result in cumulative chemical impacts to the local area. Chemical impacts resulting from construction and operation of the PNNL Richland Campus were found to be small and would generally be similar to those from current PNNL activities. Therefore, operation of the PNNL Richland Campus would result in minimal net change to cumulative chemical impacts on the surrounding environment.

5.2.11.3 Physical Impacts

Physical impacts resulting from construction, operation, and cumulative impacts are described in Sections 5.2.11.3.1, 5.2.11.3.2, and 5.2.11.3.3, respectively.

5.2.11.3.1 Construction Impacts

Construction of the PNNL Richland Campus could require approximately 175 workers per year over a 20-year period. During the 2 or 3 peak years of construction, 350 workers per year could be required. Based on the 2015 Washington State Department of Labor & Industries total recordable case (TRC) rate for non-residential construction (i.e., 3.5 cases of injury/illness per 200,000 labor-hours; WLNI 2016), about 6.1 cases of injury/illness might occur per year during construction of the PNNL Richland Campus. The TRCs of occupational injury and illness anticipated from the construction activities during average and peak years are indicated in Table 5.9. The national TRC rate for all construction workers is also 3.5 per 200,000 labor-hours (BLS 2016a). No fatalities are expected during an average (less than 0.02) or peak (less than 0.04) construction year based on the 2015 national fatality rate for construction workers of 10.1 per 200 million labor-hours (BLS 2016c)

Table 5.9. Number of Total Recordable Cases Resulting from Construction and Operations Activities

	Assumption	Workers	TRC rate per 200,000 Worker-Hours	Total Recordable Cases Per Year	Basis for Rate Assumed
Annual Construction	Average all years	175	3.5[(a)]	6.1	Washington State, non-residential construction 2015
	Peak year	350	3.5[(a)]	12.3	
Annual Operations	Workers at new facilities	1,500 – 2,000	0.70	10.5 – 14.0	PNNL (2011 – 2015)
	Total campus workers	4,400	0.70	30.8	
Cumulative Physical Impacts					
			TRC per Year	Years	Cumulative TRC
	Construction workers		6.1	20	123
	Operations-campus workers				
	New facilities only		10.5 – 14.0	20	210 – 280
	All campus facilities		30.8	20	616
	Total Cumulative Total Recordable Cases			**20**	**739**

(a) Reported as rate per 100 fulltime-equivalent workers. Each worker is assumed to work 8 hours per day for 250 days per year, equivalent to a TRC rate per 200,000 worker-hours.

The rate of increase, if any, in the number of total campus workers over the next 20 years is uncertain; however, additional construction workers would be employed during building projects. Table 5.9 indicates the annual number of TRC cases for the campus workers (31 cases) and construction workers (7 to 13 cases), rounding up. The campus worker cases are based on the average TRC rate for PNNL employees from 2011 to 2015, 0.7 TRC per 200,000 labor-hours (DOE 2017b). The construction worker TRC rate, described in the preceding paragraph, is greater than the typical campus worker due to the more physical nature of the work. If the 2015 recordable cases rate for private industry is assumed for both campus and construction workers (3.0 cases per 200,000 worker-hours) (BLS 2016a), 100 additional cases would occur each year.

5.2.11.3.2 Operation Impacts

If the buildout is completed, the buildings could house 1,500 to 2,000 staff. Assuming that the PNNL average incidence of 0.70 cases of injury/illness per 200,000 labor-hours (Section 4.11) is still representative in 20 years and that the workers work 250 days per year, approximately 11 to 14 injuries per year might be expected (Table 5.9).

5.2.11.3.3 Cumulative Impacts

Physical impacts resulting from construction and operation of the PNNL Richland Campus were found to be small and would generally be similar to those from current PNNL activities. Table 5.9 indicates the cumulative impact to construction workers and campus workers over the 20-year potential buildout period. Total campus employment is not expected to change, but construction workers would add to campus-related employment numbers. Therefore, operation of the PNNL Richland Campus could result in approximately 20 percent more TRCs of injury and illness due to cumulative physical impacts on workers. Based on employment levels and the time frame considered, no fatalities are expected.

5.2.12 Visual Resources

The visual resource analysis focuses on the degree of contrast between the Proposed Action and the surrounding landscape, the sensitivity levels of key observation points, and the visibility of the Proposed Action from those key observation points (see Figure 4.4) in reference to the PNNL Richland Campus. The distances from key observation points to the affected area were also considered, as distance could diminish the degree of contrast and visibility. To determine the range of the potential visual effects, the viewshed analysis considered the potential effects in light of the aesthetic quality of surrounding areas, as well as the visibility of possible activities and facilities from key observation points. The detailed assessment performed by DOE (2015a) bounds the impacts expected for the campus (see Section 4.11).

5.2.12.1 Construction Impacts

During construction, equipment and activities would be visible within the campus; however, as expected, visibility would diminish as a function of the viewer's distance. Construction activities would be similar to activities occurring in the 300 Area to the north and in the City of Richland to the south. The campus would be partially visible from Stevens Drive on the west, George Washington Way on the east, and from roadways on the interior of the campus. These vantage points do not offer unique or distinctive views or serve as viewpoints for sensitive viewers.

As noted in Section 4.11, the campus has a mix of Class III and Class IV viewshed characteristics. Depending on the location of potential new facilities, development could result in a change in the VRM classification of the campus from Class III to Class IV, as the buildings and infrastructure on the built-out site would become the primary focus for viewers. This development would be consistent with development in the 300 Area to the north and in the City of Richland to the south. In both areas, the existing buildings and structures are similar in height to the potential representative facilities. If construction occurred south of Horn Rapids Road, it is likely that the Class IV viewshed characteristics would be maintained. The area to the west of the campus is primarily undeveloped and the Proposed Action would change the visual environment.

Development would be consistent with the visual resources goals of the City of Richland Comprehensive Land Use Plan (City of Richland 2008). The plan states as a goal that development should recognize and preserve established major vistas, as well as protect natural features such as rivers, ridgelines, steep slopes, major drainage corridors, and archaeological and historic resources.

5.2.12.2 Operation Impacts

Once the campus is developed, key observation points that the Tribes identified as important in their summaries (see Appendix G of DOE 2015a) would or would not be visible (land highlighted or not highlighted in dark brown, respectively, in Figure 4.5). The views from these key observation points would not change to any extent in reference to baseline conditions.

5.2.12.3 Cumulative Impacts

The potential visual resource impacts of the Proposed Action were evaluated in the context of the reasonably foreseeable future actions identified in Table 5.1. Taken together, those actions and the Proposed Action result in cumulative visual impacts to the local area. However, as discussed for the Proposed Action, the likely impacts of the Proposed Action would be minor in the context of the existing viewshed.

5.2.13 Noise and Vibration

Impacts of the Proposed Action from construction and operations would be managed to maintain applicable standards. Specific impacts are discussed in the following sections.

5.2.13.1 Construction Impacts

A detailed noise impact assessment was completed for DOE (2015a). The PNNL Richland Campus is immediately adjacent to the lands considered in DOE (2015a). 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 area would be the Willow Pointe housing development, located approximately 0.4 km (0.25 mi) east of the campus at its closest point, along the Columbia River, and the Lofts and Commons Apartments near the southern campus boundary. 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 campus (WAC 173-60). Existing campus buildings could be affected by noise from potential construction activities, depending on where on campus those activities take place. In addition, an onsite guest house that accommodates up to 81 overnight visitors is located on campus. 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 LIGO, located approximately 14 km (~9 mi) northwest of the campus and EMSL and other sensitive activities on the PNNL Richland Campus. Prior to construction, LIGO and other facility operators would be notified so that operators could take the extraneous ground vibrations from construction into account.

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 ongoing operations.

5.2.13.2 Operation Impacts

Operations of new facilities (i.e., new office buildings and laboratory facilities including their heating systems, ventilation systems, and air conditioning systems including chillers and compressors) are not likely to produce appreciably greater amounts of acoustic noise or vibration than current facilities on the PNNL Richland Campus. The transport and loading and unloading of semi tractor-trailers onsite would generate acoustic noise and vibration. Vibration could result from trucks backing into loading docks and passing over speed bumps or other traffic calming devices (Appendix C in DOE 2015a). The duration of such vibrations would be intermittent.

Operation of new facilities would result in a minor increase in traffic volumes on the local roadway network, and consequently, an intermittent increase in noise levels from traffic sources along affected roadway segments. It is likley that noise levels from traffic would remain within industrial noise ordnance levels.

5.2.13.3 Cumulative Impacts

The potential noise impacts of the Proposed Action were evaluated in the context of the reasonably foreseeable future actions identified in Table 5.1. Taken together, those actions and the Proposed Action result in cumulative noise impacts to the local area. However, as discussed for the Proposed Action, the likely impacts of construction noise would be minor and kept within prescribed limits. There would be no net change in operations noise from the Proposed Action.

5.2.14 Utilities and Infrastructure

The assessment of potential effects to infrastructure relies on identifying the current levels of service for existing infrastructure and comparing that to the expected infrastructure requirements from the construction and operation of the new facilities on the PNNL Richland Campus. Spatially, the analysis extends to the broader infrastructure systems that would be required for the new facilities. Temporally, the analysis considers those effects that could occur in the short term (construction of facilities) and those that could occur in the long term (operation of facilities). See the individual resource topics in this EA for discussions of potential impacts from construction, including utilities and infrastructure.

5.2.14.1 Construction Impacts

Under the Proposed Action, the campus could eventually hold new and existing PNNL facilities. Key infrastructure has been extended to new PNNL facilities north of Horn Rapids Road, and much of the existing campus is currently developed and has existing infrastructure; therefore, depending on actual facility locations, some additional infrastructure may have to be constructed. Electricity and natural gas are provided by the City of Richland and the Cascade Natural Gas Corporation, respectively. Construction assumptions are discussed at the beginning of this chapter. Land disturbances for all construction activities are described in Sections 3.1 and 5.2.1.

Water service for new facilities north of Horn Rapids Road, would be connected to existing supply lines installed to serve the first phase of the multi-phased industrial development. Future PNNL water use will require the construction of additional water supply infrastructure, overseen by the City of Richland, that is already planned to connect other future development in the PNNL Richland Campus vicinity.

Additional sewer line service would connect to recent infrastructure upgrades for any new PNNL facilities north of Horn Rapids Road. It is unlikely that the entire campus could be served by gravity flow; therefore, as the campus is developed, new sewer lift stations and associated forced mains would be required.

A fiber optic data communication network serves the City of Richland. It is anticipated that the network would be extended to the new facilities on the campus along existing and newly constructed access roads.

The City of Richland's Sandhill Crane Distribution Substation receives power from BPA's 115 kV transmission line that runs between the BPA White Bluffs Transmission Substation and the City of Richland First Street Distribution Substation. The Sandhill Crane Distribution Substation is currently at capacity and the City of Richland plans to construct a new substation in the future on Kingsgate Way west of the Battelle Boulevard intersection (DOE 2015a). Depending on the rate of development within the campus and the adjacent lands, a second substation may be required at a future date. BPA would provide electrical transmission lines that would be needed for any new substation. The City of Richland likely would construct new distribution lines from the substations to serve the campus.

The City of Richland would work with natural gas providers to bring natural-gas service to the new facilities, as needed. Alternatively, supply to the PNNL Richland Campus may be obtained from the current DOE connection to Cascade Natural Gas in the 300 Area. When the City of Richland or another local jurisdiction considers a future need for additional infrastructure (e.g., gas lines to serve the area), it would conduct State Environmental Policy Act reviews for those actions.

5.2.14.2 Operation Impacts

Table 3.4 lists the expected utility service demands at full buildout of the campus. The projected water use at full buildout would be approximately 383 m^3/day (101,000 gal/day), which is about 0.7 percent of the City of Richland current average daily water use and 0.3 percent of the city's water treatment capacity (City of Richland 2010). The quantity of wastewater generated would be approximately 345 m^3/day (91,000 gal/day), or about 0.8 percent of the design capacity of the City of Richland Wastewater Treatment Facility. Similarly, electrical demand for all new facilities would be approximately 3,151 kW, or about 1.4 percent of the peak power demands in 2013. Construction of the new substations to the north and south of Horn Rapids Road, when needed, would assure that adequate load capacity exists for future demands on the power system in that area of the city.

The Proposed Action could result in new, long-term demand for utility services. New infrastructure and services would be provided and maintained by the City of Richland, Port of Benton, BPA, and Cascade Natural Gas Corporation, as applicable.

The City of Richland would provide solid waste disposal and recycling services to any new facilities on the campus. Although the Horn Rapids Sanitary Landfill is anticipated to reach capacity by 2018, the City of Richland is exploring alternative options for waste disposal and no effects on its ability to provide these services are anticipated (DOE 2015a).

5.2.14.3 Cumulative Impacts

The potential infrastructure impacts of the Proposed Action were evaluated in the context of the reasonably foreseeable future actions identified in Table 5.1. Taken together, those actions and the Proposed Action result in cumulative infrastructure impacts to the local area. However, the same utilities and jurisdictions cover the actions found in Table 5.1, and resources are planned to meet the demands of all the expected projects in the local area. Thus, the contribution of the Proposed Action to cumulative infrastructure impacts is anticipated in the planning processes of the affected jurisdictions, and would not be significant in the context of all planned infrastructure improvements.

Average temperatures in the northwest have increased approximately 1.3 °F over the last several decades (GCRP 2014). Should the average temperature continue to increase, long-term effects on the need for utility services may be observed. These effects are manifest over time as gradual but constant changes in the demand for water (irrigation), electricity (heating and cooling), and natural gas (heating). These resource needs are accounted for through the ongoing resource planning processes, which make incremental assessments of trends in demand and seek to acquire resources as needed in response to changing demand.

5.2.15 Waste Generation and Disposition

DOE utilizes a comprehensive approach to implementing the requirements of EO 13693 *Planning for Federal Sustainability in the Next Decade* (80 FR 15871) 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. Waste-management activities associated with construction and facility operations would be conducted in accordance with the environmental stewardship portion of this program.

5.2.15.1 Construction Impacts

A majority of the construction waste and debris (e.g., cardboard, metal, wood, and concrete) would be recycled; however, approximately 1,530 m^3 (2,000 yd^3) might be disposed of at the Horn Rapids Sanitary Landfill. In addition, demolition of existing structures (primarily south of Battelle Boulevard) would result in approximately 1,990 m^3 (2,600 yd^3) of excess concrete and approximately 180,000 kg (397,000 lb) of excess metal, wood and sheetrock. 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 utilizing long-haul services to a regional landfill (City of Richland 2011).

5.2.15.2 Operations Impacts

PNNL primarily generates general sanitary trash, hazardous wastes, and low-level wastes from R&D operations on the PNNL Richland Campus. PNNL maintains the capability on the campus to manage waste in accordance with federal and state regulatory requirements. Final disposition of all hazardous waste is performed offsite, and is contracted to commercial companies with permitted treatment, storage, and disposal facilities. Radioactive and mixed waste streams are also sent through Hanford Site for disposal. The types of waste generated in support of R&D operations in the new facilities under this action are likley to be similar to the PSF Complex. During 2016, 30,965 kg (68,266 lb) of hazardous waste and 26,484 kg (58,387 lb) of low-level radioactive wastes were generated at the PNNL Richland Campus. The addition of new facilities under the Proposed Action is estimated to not significantly alter PNNL's hazardous waste volumes (approximately ±5 percent), as the new facilities would house research relocated from other facilities in North Richland. The design of new facilities would incorporate areas to manage waste materials generated from R&D and operations.

Liquid wastes from new facilities would consist of process waste water and sanitary sewage. Both of these wastewater streams would be sent to the City of Richland's Publicly Owned Treatment Works for processing. Process wastewater generated as a part of facility operations would be permitted in accordance with the City of Richland Pretreatment Program (Richland Municipal Code 17.30); monitoring and reporting would be performed in accordance with applicable permit conditions. Process wastewater from the new facilities would be similar in composition to the existing facilities. Past monitoring results (Duncan et al. 2016) demonstrate the ability for R&D and facility operations to maintain compliance with applicable wastewater permits.

Based on currently operating facilities actual annual waste-generation rates, the estimated annual waste volumes that would be generated from the new facilities when fully operational are show in Table 5.10.

Table 5.10. Current and Potential New Annual Waste Volumes

	Operational Footprints		
Component (per year)	Current PNNL Facilities[(a)]	Potential 20-Year Additions[(b)]	Total Anticipated Volume
Nonhazardous solid waste	10,496 m^3 (13,728 yd^3)	524 m^3 (686 yd^3)	11,021 m^3 (14,414 yd^3)
Hazardous waste	30,965 kg (68,266 lb)	1,548 kg (3,413 lb)	32,513 kg (71,679 lb)
Low-level radioactive waste	26,484 kg (58,387 lb)	1,324 kg (2,919 lb)	27,808 kg (61,306 lb)

(a) Volumes include wastes generated on the PNNL Richland Campus and leased facilities in North Richland.
(b) Future buildout replaces leased facilities in North Richland, the incremental change in overall waste volumes may fluctuate approximately 5 percent.

5.2.15.3 Cumulative Impacts

Sanitary trash and hazardous wastes generated by PNNL would not increase significantly, as the new facilities are similar to existing operations. Future actions (Table 5.1) in the vicinity of the campus indicate the potential for an industrial park, manufacturing facilities, and housing developments. The future industrial park tenants and manufacturing operations could have the potential to generate hazardous waste, however hazardous wastes are typically sent to offsite treatment, storage, and disposal facilities. In addition, these future industrial/manufacturing operations and housing developments would generate sanitary wastes that would be sent to the City of Richland, but current capacities and planned growth of city infrastructure are anticipated to be able to accommodate projected waste volumes.

5.2.16 Accidents

Potential impacts from postulated accidents are described in this section. Impacts from the routine release of chemicals and radionuclides are described in Section 5.2.11, Human Health and Safety.

Section 3.0 discusses the Proposed Action, including a description of the PNNL Richland Campus and the potential buildings and infrastructure requirements. Several new facilities would include radiological and chemical laboratories. In addition, DOE is considering a new project-specific high-bay facility that would house a hydrotreater to convert bio-oil to liquid hydrocarbon fuels that could serve as gasoline, jet and diesel blendstocks. Impacts from postulated accidents at facilities housing chemical laboratories, radiological laboratories, and the hydrotreater are discussed below.

5.2.16.1.1 Chemical Facilities

The PNNL Richland Campus would include new buildings that would have chemistry laboratories that may be capable of working with toxic chemicals. Some of these facilities would be replacing existing PNNL capability. In general, the quantity and type of chemicals would remain within the envelope of what is currently in use at PNNL.

Chemical work would be performed in laboratories designed for safe use of chemicals, including equipment such as ventilation-controlled fume hoods and worker protective clothing. WA Ecology regulates the emissions of toxic chemicals under WAC 173-460, "Controls for New Sources of Toxic Air Pollutants." At PNNL, toxic chemicals are generally used in bench-scale projects, thus quantities at any one location tend to be small. Although laboratory-scale research activities are exempt from

WAC 173-460 requirements, Section 5.2.11 analyzed the potential impacts from routine use of toxic chemicals using dispersion modeling of the site boundary. Air concentrations were well below the ASILs (WAC 173-460) for all toxic chemicals of any significance. Because toxic chemical quantities are expected to be small, no accident scenario is envisioned that would lead to an offsite consequence due to chemicals.

5.2.16.1.2 Radiological Facilities

The PNNL Richland Campus may include several new buildings that may be capable of working with radiological material. Some of these facilities may be replacing existing capability at the Laboratory. In general, the quantity and type of radioactive materials would remain within the envelope of what is currently authorized under PNNL's existing radioactive air permits. The current published list of radioactive materials handled or potentially handled at the campus can be found in the PNNL 2015 Annual Site Environmental Report (Duncan et al. 2016). The new facilities would be designated as less than Hazard Category 3 nuclear facilities. Nuclear Hazard Category 3 facilities include those where the hazard analysis indicates the potential for only significant localized consequences. Thus, no radiological accident scenario is envisioned that would lead to a significant offsite consequence.

5.2.16.1.3 High-Bay Facility

PNNL currently operates a hydrotreater inside of the PDLW high-bay work area. PNNL Richland Campus buildout may include a new high-bay facility that would house the existing PDLW hydrotreater as well as new or replacement hydrotreater equipment or other biofuel processes.

The hydrogen needed for the high-bay facility is based on the requirements for a nominal hydrotreater run of approximately 60,000 standard cubic feet (scf). To provide adequate planning and operational flexibility, three potential scenarios for hydrogen gas were analyzed to estimate the amount of material at risk (MAR):

1. Cylinders: For this scenario, eight permanently placed refillable 12 packs (cradles) of high-pressure cylinders connected via a manifold are used to supply the building. The cylinders are assumed to contain 232 scf of hydrogen, for a total calculated MAR of 22,272 scf. This scenario most closely matches the configuration currently being used in the hydrotreater operations at PDLW.
2. Multi-tube storage racks: For this scenario, two multi-tube storage racks of 12 seamless swaged-ended vessels are assumed to supply the facility needs. The individual tubes are assumed to contain 1,650 scf of hydrogen, thus the total MAR based on both storage racks is 39,600 scf.
3. Tube trailer: For this scenario, a commercially available tube trailer closely matching the needs for a complete hydrotreater run is assumed to supply the building needs, with 61,800 scf of hydrogen. In addition, the 12-pack of high-pressure bottles evaluated in scenario 1 is included. The MAR for these bottles is 2,784 scf. As the actual sizing may be slightly larger depending on the trailer supplier and availability, a MAR value of 65,000 scf was used.

Table 5.11 summarizes the maximum amount of hydrogen gas that could be stored and handled in the high-bay facility hydrotreater. Various accident scenarios were evaluated with the quantities to assess potential offsite consequences. Two accident types—vapor cloud explosion and vapor cloud fire—resulted in the largest impact distances. However, these distances did not lead to any offsite consequences. The results of the accident scenarios are presented in the following sections.

Table 5.11. Material at Risk – Entire Inventory Release

Scenario	Total Hydrogen Volume (scf)	Total Hydrogen Mass[(a)] (kg)
Cylinders	22,272	53
Multi-tube storage racks	39,600	94
Tube trailer	65,000	154

(a) Mass calculated assuming a density of 0.00238 kg/scf at standard temperature (0°C) and pressure (101.325 kPa).

Vapor Cloud Explosion

The bounding scenarios presented in this section follow the guidance and methodologies presented in the EPA Risk Management Program Guidance for Offsite Consequence Analysis (OCA) (EPA 2009). For a vapor cloud explosion, the potential offsite hazard is from a threshold level of pressure (i.e., an overpressure) from a blast wave. Overpressure refers to the sudden onset of a pressure wave after an explosion. A pressure wave is caused by the energy released in the initial explosion; the pressure wave is nearly instantaneous and travels at the speed of sound. Pressure waves radiate outward and could generate hazardous fragments (e.g., building debris and shattered glass). At high overpressures, structural damage to buildings could occur. Sudden changes in pressure could also affect pressure-sensitive organs (e.g., ears and lungs). Per the OCA, the distance to 1 pound per square inch (psi) overpressure is the primary level of concern. An overpressure of 1 psi may cause partial demolition of houses (which could result in serious injuries to people) and shattering of glass windows (which may cause skin laceration from flying glass).

For a worst-case analysis, the total quantity of the flammable substance is assumed to form a vapor cloud. The entire contents of the cloud are assumed to be within the flammability limits, and the cloud is assumed to explode. For the worst-case, analysis, 10 percent of the flammable vapor in the cloud is assumed to participate in the explosion (i.e., the yield factor is 0.10). Consequence distances to an overpressure level of 1 psi were determined using Equation C-1 from the OCA; this equation is provided in Appendix C of the EA.

Table 5.12 provides the distance to 1 psi overpressure for the vapor cloud explosion based on the MAR listed in Table 5.11. The maximum distance to 1 psi is 125 m (410 ft) for the tube trailer scenario; this distance results in no offsite consequence.

Table 5.12. Vapor Cloud Explosion Distance to 1 psi Overpressure

Scenario	Hydrogen Mass (kg)	Distance to 1 psi (m)
Cylinders	53	87
Multi-tube storage racks	94	106
Tube trailer	154	125

Vapor Cloud Fire

The bounding scenarios presented in this section follow the guidance and methodologies presented in the EPA OCA (EPA 2009). For a vapor cloud fire, the potential offsite hazard is from thermal radiation (i.e., heat) from dispersion of a cloud of flammable vapor and the subsequent ignition of the cloud following dispersion. Such a fire could flash back and represent a heat radiation hazard to anyone in the area of the cloud. The distance to the lower flammability level (LFL) represents the maximum distance based on the total quantity of flammable material could be released from a vessel or pipeline at which the radiant heat effects of a vapor cloud fire might have serious consequences.

The analysis of vapor cloud fires follows the guidance in the OCA, which provides reference lookup tables for estimating the distance to the LFL based on an assumed stability class and wind speed. The methodology determines the distance to the flammable endpoint based on the release rate (lb/min) divided by the LFL concentration in (mg/L). For hydrogen, the LFL is 3.3 mg/L (EPA 2009). Because the method assumes that the vapor cloud release is in a steady state and that vapor cloud fires are nearly instantaneous events, the release duration is not a critical factor for estimating vapor cloud fire distances. For these calculations, it is assumed the entire inventory is released in 1 minute if the flow rate is not otherwise limited (i.e., choked flow). The choke flow release rate was calculated assuming a severed supply line of 0.5 in. Schedule 40 pipe and a bounding pressure; this equation is provided in Appendix C of the EA.

Table 5.13 provides the distance to the LFL for a vapor cloud fire based on the MAR listed in Table 5.11. The maximum distance to the LFL is 322 m (1,060 ft) for both the multi-tube storage racks and tube trailer scenarios; this distance results in no offsite consequence.

Table 5.13. Vapor Cloud Fire Distance to LFL

Scenario	Mass (kg)	Distance to LFL[a] (m)
Cylinders	53	161
Multi-tube storage racks	94	322
Tube trailer[b]	154	322

(a) Based on Table 26 of EPA-550-B-99-009 (EPA 2009).
(b) Choked flow limited release rate applies.

5.2.17 Intentional Destructive Acts

Prior to 2001, DOE NEPA documents did not typically include an analysis of intentional destructive acts. Following the events of September 11, 2001, DOE implemented measures to minimize the risk and consequences of potential intentional destructive acts on its facilities. Consistent with DOE guidance, DOE currently analyzes the potential impacts of intentional destructive acts in NEPA documents. DOE (2002) provided guidance for this analysis.

It is not possible to predict whether intentional destructive attacks would occur, or the nature or types of such attacks. Nevertheless, DOE has evaluated security scenarios involving intentional destructive acts to assess potential vulnerabilities and identify improvements to security procedures and response measures. Security at its facilities is a critical priority for DOE. Therefore, DOE continues to identify and implement measures to defend and deter attacks at PNNL. DOE maintains a system of regulations, orders, programs, guidance, and training that form the basis for maintaining, updating, and testing site security to preclude and mitigate any potential intentional destructive attacks.

Although an intentional act is unlikely, an intentional destructive act targeting the PNNL Richland Campus is possible. However, conservative assumptions inherent in the accidents analyzed in DOE facility-specific safety analysis reports and documented safety analyses (e.g., PNNL 2015a) assume initiation by natural events, equipment failure, or inadvertent worker actions. The accidents evaluated in these documents include earthquakes, fires, criticalities, and airplane crashes, all of which could cause a release of radiological materials or chemicals to the environment. Intentional destructive acts could also potentially cause a release of these materials to the environment; however, radiological inventories in new buildings would be less than Hazard Category 3 facilities and releases, should one occur, would not result in adverse impacts off the PNNL Richland Campus. If an intentional destructive act were to occur, the resulting consequences to workers and the public would be similar to those occurring from natural or human-caused events. In addition, the Proposed Action would not increase the likelihood of an intentional destructive act or the resulting consequences.

5.2.18 Environmental Sustainability

The DOE-Battelle Prime Contract for the management and operation of PNNL (DOE/PNSO 2017b) incorporates applicable requirements from DOE Order 436.1, "Departmental Sustainability" (DOE 2011), including associated performance goals, objectives, and systems (Duncan et al. 2016).

DOE Order 436.1 (DOE 2011) was approved on May 2, 2011. The purpose of this Order is to

> …1) ensure the Department carries out its missions in a sustainable manner that addresses national energy security and global environmental challenges, and advances sustainable, efficient and reliable energy for the future, 2) institute wholesale cultural change to factor sustainability and greenhouse gas (GHG) reductions into all DOE corporate management decisions, and 3) ensure DOE achieves the sustainability goals established in its Strategic Sustainability Performance Plan (SSPP) pursuant to applicable laws, regulations and Executive Orders (EO), related performance scorecards, and sustainability initiatives….

PNNL has incorporated these requirements through contract modifications, which include the development of an annual PNNL Site Sustainability Plan (e.g., PNNL 2015b), incorporation of sustainable acquisition requirements into applicable processes, and the development of an environmental management system that is certified to International Organization for Standardization (ISO) 14001:2015 standards.

The PNNL Site Sustainability Plan (e.g., PNNL 2015b), which identifies the status and accomplishments of sustainability projects related to DOE's sustainability goals, is prepared and submitted to DOE annually in accordance with DOE guidance. The PNNL Site Sustainability Plan includes Pollution Prevention Program activities, accomplishments, and continuous improvement opportunities (Duncan et al. 2016).

This already established approach to planning, implementing, and monitoring actions directed at meeting DOE sustainability goals and objectives would also be applied to the construction and operations of all new facilities developed in the future development.

5.2.19 Irreversible and Irretrievable Commitment of Resources

5.2.19.1 Construction Impacts

Construction of the facilities on the PNNL Richland Campus would require an irreversible and irretrievable commitment of the resources listed in Table 5.14.

Table 5.14. Construction Resources with Irreversible and Irretrievable Commitments and Their Potential Usage

Resource	Commitment	Comment
Fill dirt	720 m^3 (940 yd^3)	The area being considered is generally flat, with small depressions and rises. As development occurs, the site would be graded and leveled using existing material. Existing topsoil would be piled and retained onsite for landscaping, as needed.
Concrete	36,200 m^3 (47,325 yd^3)	Construction contracts typically define the usage of local materials and materials with recycled content to meet high-performance sustainability standards.
Steel	4,360 tonnes (4,803 tons)	Construction contracts typically define the usage of local materials and materials with recycled content to meet high-performance sustainability standards.
Asphalt	50,700 tonnes (55,902 tons)	Construction contracts typically define the usage of local materials and materials with recycled content to meet high-performance sustainability standards.
Diesel	18,900 L (5,000 gal)	Diesel and gasoline fuel would be consumed by during the operation of construction vehicles and other construction-related equipment.
Gasoline	82,000 L (21,667 gal)	

None of these resources are unique or regionally in short supply and DOE use of these resources would not result in any shortage or impact to other regional users.

The potential development on the campus would require the removal of existing shrub-steppe habitat. Mitigation relative to the removal of shrub-steppe environment is further discussed in Appendix B.

5.2.19.2 Operation Impacts

Operation of new facilities on the PNNL Richland Campus would require an irreversible and irretrievable commitment of the resources listed in Table 5.15.

Table 5.15. Operation Resources with Irreversible and Irretrievable Commitments and Their Potential Usage

Resource	Commitment	Comment
Natural gas	379,688 Therms	Hot water heaters, boilers, and other facility equipment would be natural-gas fired. The value presented above represents annual consumption for the full potential buildout of facilities.

5.2.19.3 Cumulative Impacts

The Potential resource impacts of the Proposed Action were evaluated in the context of the reasonably foreseeable future actions identified in Table 5.1. The future actions and the Proposed Action result in cumulative-resource impacts to the local area. The timing of future actions and the Proposed Action likely would occur relatively evenly over the 20-year span, such that the likelihood of “peak” demand for resources is not likely to be an issue. The impacts from the Proposed Action to resources in the region would be relatively minor in the context of total future development in the area.

5.3 Environmental Impacts of the No Action Alternative

Under the No Action Alternative, DOE would not obtain replacement facilities or provide new facilities for PNNL staff and existing and future research missions. PNNL would continue to occupy and operate the existing facilities on the PNNL Richland Campus. Existing facilities may be refurbished or demolished based on mission needs and life-cycle cost assessment.

5.3.1 Adverse Impacts

PNNL’s capability to support of the nation’s strategic goals in science, national security, energy, and the environment for DOE and other federal clients over the next 20 years would be substantially reduced. Declines in facilities and capabilities could lead to losses in new employment opportunities. The local community economic benefits associated with construction of new facilities and infrastructure would not be realized.

5.3.2 Beneficial Impacts

The shrub-steppe and other native habitat and cultural resources within the PNNL Richland Campus would be undisturbed, and emissions and noise from construction activities would not occur. The resource commitments necessary for the future buildout would not occur.

6.0 ENVIRONMENTAL PERMITS AND REGULATORY REQUIREMENTS

PNNL is required to carry out operations in compliance with all federal, state, and local laws and regulations; Presidential EOs; DOE Orders; and procedures (DOE/PNSO 2017b). Environmental regulatory authority over the DOE Office of Science and its laboratories is vested in federal, state, and local agencies.

Federal, state, and local laws apply to construction and operation of the new future facilities. The environmental regulatory framework includes requirements regarding planning for facilities to protect air and water quality, human health, and the environment. Based on the research capabilities in the new facilities, it is anticipated that the following environmental permits, consultations, or other regulatory compliance would be required for future construction and operations on the PNNL Richland Campus.

- **Industrial Wastewater Pretreatment Permit**. The City of Richland Pretreatment Program sets forth uniform requirements for industrial users of the Publicly Owned Treatment Works for the City of Richland and enables the city to comply with all applicable state and federal laws, including the *Federal Water Pollution Control Act* (commonly referred to as the *Clean Water Act*) (33 U.S.C. § 1251 et seq.) and the General Pretreatment Regulations (40 CFR Part 403). The regulatory driver is the City of Richland's Pretreatment Program, Richland Municipal Code 17.30, the *Richland Pretreatment Act*. Process wastewater streams from R&D activities would be permitted with the City of Richland, monitoring and reporting would be conducted in accordance with permit requirements.
- **Stormwater/Underground Injection Control Program**. WA Ecology regulates underground injection under WAC 173-218, *Underground Injection Control Program*. The purpose of the program is to preserve and protect the waters of the state. Consistent with current PNNL operations, it is anticipated that UIC wells may be used for onsite management of stormwater and condensates. UIC wells would be constructed in accordance with Ecology requirements and registered with WA Ecology.
- **Construction Stormwater General Permit**. WA Ecology is delegated authority by EPA to implement the water quality permit. The regulatory drivers are *Water Quality Standards for Groundwaters of the State of Washington* (WAC 173-200) and the *Clean Water Act* (33 U.S.C. § 1251 et seq.). As a best management practice, construction activities would be performed in accordance with the *Stormwater Management Manual for Eastern Washington* (WA Ecology 2004).
- **Radioactive Air Emissions**. WDOH regulates radioactive air emissions under *Radiation Protection—Air Emissions* (WAC 246-247), *Ambient Air Quality Standards and Emission Limits for Radionuclides* (WAC 173-480), and *National Emission Standards for Hazardous Air Pollutants* (40 CFR Part 61 Subparts A and H and Appendix B, Method 114). PNNL currently maintains a radioactive air emissions license for R&D activities on the PNNL Richland Campus. As new radiological facilities are identified, permit applications identifying anticipated radioactive materials, potential environmental impacts, and proposed control technologies would be submitted under the existing license to WDOH for review and approval.
- **Non-Radiological Air Pollutant Notice of Construction Approval Order**. The Benton Clean Air Agency regulates air pollutants under *Regulation 1 of the Benton Clean Air Agency* (BCAA 2014) which implements *General Regulations for Air Pollution Sources* (WAC 173-400), *Operating Permit Regulations* (WAC 173-401), and *Controls for New Sources of Toxic Air Pollutants* (WAC 173-460). Under these regulations, a Notice of Construction Application shall be submitted to the Benton Clean Air Agency for review, and approval obtained before a new emission source may be constructed.

- **Protection of Plant and Animal Species**. The *Endangered Species Act* (16 U.S.C. § 1531 et seq.), *Bald and Golden Eagle Protection Act* (16 U.S.C. § 668 et seq.), and *Migratory Bird Treaty Act* (16 U.S.C. § 703-712) all identify requirements that must be met to protect native plant and animal species and the ecosystems upon which they depend.
- **Cultural and Historic Resource Protection**. Federal agencies must preserve and protect cultural resources in a spirit of stewardship to the extent feasible given the agency's mission. DOE responsibilities are defined by a number of regulations and policies, including the *National Historic Preservation Act* (54 U.S.C. § 300101 et seq.), the *Archaeological Resources Protection Act of 1979* (16 U.S.C. § 470aa et seq.), the *Native American Graves Protection and Repatriation Act* (25 U.S.C. § 3001 et seq.), and the *DOE Native American Indian and Alaska Native Tribal Government Policy* (DOE 2006).
- **Transportation.** Transportation of hazardous materials on the PNNL Richland Campus and shipments to offsite entities is conducted in accordance with Title 49 of the Code of Federal Regulations, *Transportation* requirements (49 CFR). PNNL uses trained staff to execute shipments under an internal transportation program.
- **Hazardous and Radioactive Waste.** Hazardous generated on the PNNL Richland Campus is temporarily accumulated in accordance with the Washington State *Dangerous Waste Regulations,* WAC Chapter 173-303. Temporary accumulation areas are likely to be constructed in facilities or groups of facilities generating wastes. Temporary accumulation requirements include centralized accumulation that is limited to 90 days or less, controls to prevent releases or other hazards, and closure and cleanup of centralized accumulation areas. Hazardous waste is then shipped to offsite facilities for treatment and ultimate disposal. Radioactive waste is managed according to the requirements of the *Atomic Energy Act of 1954* (42 U.S.C. § 2011 et seq.) and DOE Order 435.1, Change 1, *Radioactive Waste Management* (DOE 2001b). Radioactive waste is shipped to the Hanford Site or commercial facilities for treatment and ultimate disposal. These practices are not expected to change during the buildout of facilities under this EA.

7.0 PUBLIC, AGENCIES, AND TRIBAL GOVERNMENT NOTIFICATIONS

On February 9, 2016, and December 29, 2016, DOE sent NEPA (42 U.S.C. § 4321 et seq.) notifications of its intention to prepare this EA to interested parties on its stakeholder list, and the recipients were invited to send their questions or comments regarding the EA to DOE for consideration. The notification briefly identified an anticipated timeframe for the draft EA and a point of contact for questions and comment submittal.

NEPA distribution list:

- Advisory Council on Historic Preservation
- Applied Process Engineering Laboratory
- Benton and Franklin Counties
- Benton Clean Air Agency
- Benton Conservation District
- Benton Franklin Health District
- Bureau of Land Management
- CH2MHill Hanford Plateau Remediation Company
- Cities of Richland, Pasco, Kennewick, and West Richland
- Columbia Riverkeeper
- Confederated Tribes of' the Colville Reservation
- Confederated Tribes of the Umatilla Indian Reservation
- Energy Northwest
- Federal and Washington State Congressional Representatives
  - Federal District Offices
- Hanford Advisory Board
- Hanford Challenge
- Hanford History Project
- Hanford List Serve
- Heart of America Northwest
- Inheriting Hanford
- Labor Unions
  - Central Washington Building Trades Council
  - Hanford Atomic Metal Trades Council
- League of Women Voters of Benton-Franklin Counties
- Libraries
  - DOE Public Reading Room
  - Public/Local
  - University Libraries
    - Branford Price Millar Library (Portland State University)
    - Foley Center Library, Gonzaga University
    - Suzzallo Library (University of Washington)
- LIGO Hanford Observatory
- Local businesses/industry near the campus
  - Kindercare Learning Center
  - Pacific EcoSolutions, Inc.
  - Penford Food Ingredients
  - Perma-Fix Northwest
- Lower Columbia Basin Audubon Society
- Mission Support Alliance

- Museums
  - East Benton County Historical Society and Museum
  - The Reach Museum
- Nez Perce Tribe
- Oregon Department of Energy
- Port of Benton
- Private citizens
- Puget Sound Naval Shipyard and Intermediate Maintenance Facility
- State of Oregon Department of Environmental Quality
- Tapteal Greenway Association
- Tri-Cities Industrial Development Council
- Tri-City Regional Chamber of Commerce
- U.S. Army Corps of Engineers
- U.S. Department of Energy
  - Headquarters
  - Richland Operations Office
  - Office of River Protection
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Geological Survey Forest and Rangeland Ecosystem Science Center
- Universities/Colleges
  - Washington State University – Tri-Cities
  - Heritage University
  - Columbia Basin College
- Visit Tri-Cities
- Wanapum
  - Wanapum Heritage Center
- Washington Closure Hanford
- Washington Department of Archaeology and Historic Preservation
- Washington Physicians for Social Responsibility
- Washington River Protection Solutions
- Washington State Department of Ecology
- Washington State Historic Preservation Office
- Yakama Nation

7.1 Responses Received

EAs do not require public scoping; however, in response to DOE's notifications, DOE received five responses. Overall, the responses focused on topics that can be grouped into the general categories as follows:

- Range of alternatives
  - Include a range of reasonable alternatives that meet the stated purpose and need, and that are responsive to the issues identified during the scoping process.
  - Quantify impacts of each alternative action and determine corresponding mitigation measures.
  - Select feasible alternatives that minimize environmental degradation.
- Environmental effects
  - Include environmental effects and mitigation measures.

- Water resources and impacts
  - Disclose waters in the analysis area and vicinity that proposed developments may impact, nature of the potential impacts, and pollutants likely to affect those waters.
  - Assess whether proposed facilities would affect drinking water and sources. If they would be impacted, the EA would need to include contaminants of concern and measures to take to protect drinking water and related source areas.
  - Address potential effects of facility discharges on surface and groundwater quality.
  - If facilities would be zero discharge, disclose the amount of process water that would be disposed of onsite and explain methods of onsite containment.
  - If evaporation ponds would be used for disposal of wastewater, indicate how seepage into groundwater will be prevented.
  - Identify the storm design containment capacity of ponds, explain how overflow in larger storm events will be managed, and discuss potential environmental impacts (i.e., drainage channels affected, water quality, and biological resources) in the event of overflow.
  - Disposal of wastewater or other fluids into the subsurface is also subject to the requirements of the UIC program and permits may be required, depending on project specifications and federal and/or state requirements.

    Any project construction that would disturb a land area of one or more acres also requires a National Pollutant Discharge Elimination System permit for discharges to waters of the United States.
  - Document the project's consistency with applicable storm water permitting requirements and discuss specific mitigation measures that may be necessary or beneficial in reducing adverse impacts to water quality.
  - Consider low-impact development techniques[8] during project activities due to their potential to reduce stormwater volumes and mimic natural conditions.

    Discuss conservation measures to implement to reduce water demands. Facility designs should maximize conservation measures such as appropriate use of recycled water for landscaping, xeriscaping, and water conservation education.
  - Discuss water reliability for future development projects, factoring in the effects of climate change.
- Hazardous materials, solid and other waste
  - Address potential direct, indirect, and cumulative impacts of hazardous waste from construction and operation of the proposed project.
  - Identify projected hazardous waste types and volumes, and expected storage, disposal, and management plans.
  - Identify any hazardous materials sites within the project's study area, if any, and evaluate whether those sites would impact the project in any way.

[8] http://v1v..·w.epa.gov/polluted-runotT-nonpoint-source-pollution/urban-runoff-low-in1pact-development

- Address radionuclide and chemical contamination in soil and/or groundwater within the analysis area and vicinity, and whether anticipated projects may result in a disturbance of radioactive contaminants or their release into the environment.
- Address other contaminants to expect as an issue of concern in the area. To the extent that contamination may be an issue of concern, the EA should identify feasible measures to take to avoid, reduce or mitigate these impacts.

  If development projects in the analysis area would involve use of pesticides and herbicides, the EA should address any potential toxic hazards related to the application of the chemicals, and describe actions to take to assure that impacts by toxic substances released to the environment would be minimized.

- Aquatic resource and impacts
  - Describe all waters of the United States, including wetlands that could be affected by proposed development activities and their locations in the project area, preferably using maps.
  - Include data on acreages and channel lengths, habitat types, values, and functions of the waters and related wetlands. If the projects would result in impacts to aquatic resources (e.g., filling of wetland), then DOE would need to work with the U.S. Army Corps of Engineers to determine if projects would need a Clean Water Act (33 U.S.C. § 1251 et seq. [Federal Water Pollution Control Act of 1972]) Section 404 permit.

    Include information explaining why activities would be located in floodplains, alternatives considered, and steps taken to reduce impacts to floodplains.
- Habitat, vegetation, and wildlife
  - Describe the current quality and capacity of habitat, its use by wildlife in the proposed project area, especially avian populations.

    The EA should:

    - Identify species, describe their critical habitat and potential impacts.
    - Discuss blasting and excavation needs, methods, and control of effects, and mitigation of impacts.
    - Indicate Best Management Practices to protect resources and role of the Hanford Site Biological Resources Management Plan (DOE 2013f).
    - Include a vegetation management plan to address control of invasive plants, including prevention, early detection of invasion, and control procedures for the species. The plan should be consistent with Executive Order 13112, *Invasive Species* (64 FR 6183).
    - Cover revegetation activities that could take place on part of the 34 ha (83 ac) (near the river) per the land conveyance MOA (Appendix K in DOE 2015a).
- Air-quality impacts
  - Address air-quality protection. The types of fuels to be used during construction activities, increased traffic during operations, and related VOCs and NOx emissions, should be disclosed and the relative effects on air quality and human health evaluated.
  - Dust particulates from construction activities and ongoing operation of roadways are important concerns. The EA should evaluate air-quality impacts, and detail mitigation steps to take to the impacts. If, during construction of projects, there would be burning of cleared vegetation, then the

EA should include a smoke management program that would be followed to reduce public health impacts and potential ambient air-quality exceedances.

Because of the presence of radionuclides in the area, the EA should include the most current information regarding radionuclide emissions affecting the analysis area, consistent with the Federal Clean Air Act (42 U.S.C. § 7401 et seq.) and the EPA's National Emission Standards for Hazardous Air Pollutants (NESHAP; 40 CFR Part 61) requirements.

– Evaluate mitigation measures to reduce radionuclide emissions to the greatest extent practicable, including for the No Action Alternative, and discuss DOE's current efforts to limit, control and reduce radionuclide emissions.

- Cumulative effects
  – Assess impacts over the entire area of impact and consider the effects of the proposed project when added to other past, present, and reasonably foreseeable future projects in and outside the analysis area, including those by entities not affiliated with DOE. There are five key areas to consider:
    1. Resources, if any, that are being cumulatively impacted.
    2. Appropriate geographic area and the time over which the effects have occurred and will occur.
    3. All past, present, and reasonably foreseeable future actions that have affected, are affecting, or would affect resources of concern.
    4. A benchmark or baseline.
    5. Scientifically defensible threshold levels.
- Endangered Species Act (ESA)
  – Identify the endangered, threatened, and candidate species under the ESA (16 U.S.C. §1531 et seq.), and other sensitive species within the project area.
  – Describe critical habitats and how the proposed project will meet all requirements under ESA, including consultation with the U.S. Fish and Wildlife Service and, if applicable, the National Oceanographic Atmospheric Administration.
- Climate change effects
  – Concern that continued increases in GHG emissions resulting from human activities contribute to climate change.
  – Consider how resources affected by climate change could potentially influence proposed developments and vice versa.
  – Quantify and disclose GHG emissions from the project and discuss mitigation measures to reduce emissions.
  – Discuss sustainability and demonstrate how the Proposed Action will be consistent with federal goals.
- Mitigation and pollution prevention measures
  – Include all reasonable mitigation and pollution prevention measures.
- Coordination with land-use planning activities

- Discuss how the Proposed Action would support or conflict with the objectives of federal, state, Tribal or local land-use plans, policies and controls in the analysis area and vicinity.
- Address existing constraints in the analysis area; for example, power lines and utility Right-Of-Ways, floodplains, and how acceptable land uses will be consistent with Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. § 9601 et seq.) activities at the Hanford Site, and the ability to obtain construction and operating permits and licenses.

- Coordination with Tribal governments
  - Describe the process and outcome of government-to-government consultation between DOE and each of the Tribal governments within the analysis area, issues that were raised (if any), and how those issues were addressed in the selection of the proposed alternatives.
  - Address the NHPA (54 U.S.C. § 300101) and Executive Order 13007, *Indian Sacred Sites* (May 24, 1996; 61 FR 26771).
- Environmental justice and public participation
  - Include an evaluation of environmental justice populations within the geographic scope of the analysis area. If such populations exist, the EA should address the potential for disproportionate adverse impacts to minority and low-income populations, and the approaches used to foster public participation by these populations.
- Consultations/notifications
  - Commenters asked to be included on future distribution reports and to be forwarded any relevant (i.e., cultural) reports.

8.0 REFERENCES

7 CFR Part 658. *Code of Federal Regulations*. Title 7, *Natural Resources Conservation Service*, Part 658, "Farmland Protection Policy Act." Washington, D.C. Available at https://www.ecfr.gov/cgi-bin/text-idx?SID=5f6273e38b239eb7a9097b466ddee54a&mc=true&node=pt7.6.658&rgn=div5.

10 CFR Part 61. *Code of Federal Regulations*, Title 10, *Energy*, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste." Washington, D.C. Available at http://www.ecfr.gov/cgi-bin/text-idx?SID=0b06f2a589eb2c3033844e73fe9b216e&mc=true&node=pt10.2.61&rgn=div5.

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APPENDIX A– BIOLOGICAL RESOURCE DATA

Biological resource survey polygons are shown in Figure A.1. The biological resource survey polygons in Figure A.1 that correspond to the habitat polygons in Figure 4.1 above are listed in Table A.1. The biological resource survey polygons in Figure A.1 that correspond to the habitat resource categories in Figure 5.2 above are listed in Table A.2. Dominant overstory and understory plant species are listed for the survey polygons in Table A.3. All plant species observed in the survey polygons are listed in Table A.4. Bird species, mammal species, and plant species observed north of Horn Rapids Road from 2009 through 2015 are listed in Table A.5, Table A.6, and Table A.7.

Figure A.1. Biological Resource Survey Polygons across the PNNL Richland Campus from Surveys Conducted in 2016-17. Polygon numbers correspond to those presented in Table A.2 and Table A.3.

Table A.1. Survey Polygon Numbers in Figure A.1 Corresponding to Habitat Polygons in Figure 4.3.

Habitat Polygon from Figure 4.1	Survey Polygon Number from Figure A.1
Agriculture	200, 203, 204, 206, 207, 210
Antelope bitterbrush-rabbitbrush-snow buckwheat/cheatgrass-bunchgrass	13, 14, 15, 17, 28, 102, 103, 112a, 119, 120, 122
Big sagebrush-antelope bitterbrush/ cheatgrass-bunchgrass	109
Big sagebrush- rubber rabbitbrush/ cheatgrass-bunchgrass	10, 25, 104, 106, 112, 133
Big sagebrush / cheatgrass-bunchgrass	16, 20, 27, 29, 107, 110, 114, 115, 117, 124, 131, 132
Cheatgrass-bunchgrass	3, 19, 26, 118, 201, 202, 211
Dune blowout	5, 24, 30, 129
Riparian	111
Rubber rabbitbrush-snow buckwheat/ cheatgrass-bunchgrass	2, 4, 116, 130
Rubber rabbitbrush / cheatgrass-bunchgrass	6, 9, 11, 100, 101, 105, 108, 208, 209

Table A.2. Survey Polygon Numbers in Figure A.1 Corresponding to Resource Category Areas in Figure 5.2.

Habitat Resource Category from Figure 5.2	Survey Polygon Number from Figure A.1
1	5, 10, 13, 14, 15, 16, 17, 20, 24, 25, 27, 28, 29, 30, 102, 103, 104, 106, 107, 109, 110, 111, 112, 112a, 114, 115, 117, 119, 120, 122, 124, 129, 131, 132, 133
2	2, 4, 6, 9, 11, 100, 101, 105, 108, 116, 130, 208, 209
3	3, 19, 26, 118, 201, 202, 211
4	200, 203, 204, 206, 207, 210

Table A.3. Dominant Plant Species (≥1 percent canopy cover) for Habitat Polygons Located on the PNNL Richland Campus Based on 2016–17 Surveys (Figure A.1). Polygons 2-133 are located north of Horn Rapids Road. Polygons 201-211 are located south of Horn Rapids Road.

Polygon Number	Survey Date(s)	Surveyors	Dominant Shrub Species Common Name[(a)]	Dominant Shrub Species Latin Name[(a)]	Approximate Percent Cover	Dominant Herbaceous Species Common Name[(a)]	Dominant Herbaceous Species Latin Name[(a)]	Percent Cover
2	2/3; 4/7; 5/2/2016	K. Hand; C. Duberstein	rubber rabbitbrush	*Ericameria nauseosa*	2	snow buckwheat	*Eriogonun niveum*	25
						cheatgrass	*Bromus tectorum*	20
3	2/52016	J. Becker; K. Hand; C. Duberstein	none	none	none	cheatgrass		40
						Jim Hill's tumblemustard	*Sisymbrium altissimum*	25
						Sandberg bluegrass	*Poa secunda*	5
4	2/10/2016	K. Hand	rubber rabbitbrush		1	cheatgrass		60
						prickly Russian thistle	*Salsola tragus*	5
						snow buckwheat		2
5	1/28; 4/11; 5/2/2016	K. Hand	none	none	none	lemon scurfpea	*Psoralidium lanceolatum*	10
						snow buckwheat		5
						shy gilia cheatgrass	*Gilia sinuata*	5 5
6	1/28/2016	J. Becker; K. Hand	rubber rabbitbrush		8	cheatgrass prickly Russian thistle		50 5
						Jim Hill's tumblemustard		2
9	1/28; 4/11/2016	J. Becker; K. Hand; C. Duberstein	rubber rabbitbrush; green rabbitbrush antelope bitterbrush	 *Chrysothamnus viscidiflorus* *Purshia tridentata*	10 2 1	cheatgrass; snow buckwheat		42 5
10	1/28; 4/11/2016	J. Becker; K. Hand; C. Duberstein	big sagebrush rubber rabbitbrush	*Artemisia tridentata*	9 5	cheatgrass;		50
11	2/3/2016	J. Becker; K. Hand	rubber rabbitbrush		20	cheatgrass		25
						Sandberg bluegrass		10

Table A.3. (contd)

Polygon Number	Survey Date(s)	Surveyors	Dominant Shrub Species Common Name[(a)]	Dominant Shrub Species Latin Name[(a)]	Approximate Percent Cover	Dominant Herbaceous Species Common Name[(a)]	Dominant Herbaceous Species Latin Name[(a)]	Percent Cover
13	2/5;2/9/16	J. Becker; K. Hand	rubber rabbitbrush		5	cheatgrass		45
			antelope bitterbrush		5	snow buckwheat		10
			green rabbitbrush		5	Sandberg bluegrass		5
						prickly Russian thistle		2
						Jim Hill's tumblemustard		3
						needle-and-thread grass	*Hesperostipa comata*	1
14	2/5/2016	J. Becker; K. Hand	antelope bitterbrush		3	snow buckwheat		3
						cheatgrass		50
			green rabbitbrush		2	prickly Russian thistle		5
						needle-and-thread grass		5
15	2/3; 2/5/2016	J. Becker; K. Hand	antelope bitterbrush		3	cheatgrass		40
			green rabbitbrush		2	snow buckwheat		3
16	2/5/2016	J. Becker; K. Hand	big sagebrush		15	cheatgrass		60
						Sandberg bluegrass		5
17	4/7/2016	C. Duberstein	antelope bitterbrush		5	cheatgrass		60
			green rabbitbrush		1	Sandberg bluegrass		15
						snow buckwheat		1
19	2/5; 4/7/2016	J. Becker; K. Hand	none			cheatgrass		60
						Sandberg bluegrass		5
						prickly Russian thistle		1
20	2/3; 4/7/2016	J. Becker; K. Hand; C. Duberstein	big sagebrush		14	cheatgrass		50
24	2/10/2016	J. Becker	rubber rabbitbrush		3	cheatgrass		32
						snow buckwheat		4
						lemon scurfpea		5
						Sandberg bluegrass		2
25	2/10/2016	J. Becker; K. Hand	big sagebrush		10	cheatgrass		60
			rubber rabbitbrush		2	Sandberg bluegrass		10
						prickly Russian thistle		5
						Russian knapweed	*Acroptilon repens*	2

Table A.3. (contd)

Polygon Number	Survey Date(s)	Surveyors	Dominant Shrub Species Common Name[(a)]	Dominant Shrub Species Latin Name[(a)]	Approximate Percent Cover	Dominant Herbaceous Species Common Name[(a)]	Dominant Herbaceous Species Latin Name[(a)]	Percent Cover
26	2/10; 4/7/2016	K. Hand; C. Duberstein	none			cheatgrass prickly Russian thistle Russian knapweed		60 5 2
27	4/6/2016	C. Duberstein	big sagebrush		10	cheatgrass		80
28	2/10; 4/6; 5/2/2016	J. Becker; K. Hand; C. Duberstein	antelope bitterbrush rubber rabbitbrush green rabbitbrush		5 2 2	cheatgrass snow buckwheat		40 5
29	4/6/2016	C. Duberstein	big sagebrush		10	cheatgrass Sandberg bluegrass		70 10
30	2/9/2016	K. Hand	rubber rabbitbrush antelope bitterbrush		5 2	cheatgrass snow buckwheat threadleaf phacelia lemon scurfpea	*Phacelia linearis*	5 7 2 10
100	5/3/17	J. Becker; K. Hand	rubber rabbitbrush		3	cheatgrass Sandberg bluegrass bulbous bluegrass	*Poa bulbosa*	75 10 3
101	5/1/2017	J. Becker; K. Hand	rubber rabbitbrush		3	cheatgrass bulbous bluegrass		70 17
102	4/5/2106	C. Duberstein	antelope bitterbrush green rabbitbrush		2 1	cheatgrass Sandberg bluegrass snow buckwheat		55 10 1
103	3/28/2016	K. Hand	rubber rabbitbrush antelope bitterbrush		15 2	cheatgrass Sandberg bluegrass snow buckwheat		25 15 10
104	4/12 and 5/11/2016 5/1/2017	K. Hand C. Duberstein J. Becker	big sagebrush rubber rabbitbrush green rabbitbrush		5 2 1	cheatgrass Sandberg bluegrass bulbous bluegrass snow buckwheat		57 3 5 4
105	5/1/17	J. Becker; K. Hand	rubber rabbitbrush		3	cheatgrass bulbous bluegrass Sandberg bluegrass sand dropseed snow buckwheat	*Sporobolus cryptandrus*	70 10 5 5 1

Table A.3. (contd)

Polygon Number	Survey Date(s)	Surveyors	Dominant Shrub Species Common Name[(a)]	Dominant Shrub Species Latin Name[(a)]	Approximate Percent Cover	Dominant Herbaceous Species Common Name[(a)]	Dominant Herbaceous Species Latin Name[(a)]	Percent Cover
106	2/5/2016	J. Becker	big sagebrush rubber rabbitbrush		5 15	cheatgrass snow buckwheat		50 1
107	3/28; 3/30;; 5/11/2016	K. Hand; N. Freeman-Cadoret	big sagebrush		18	cheatgrass Sandberg bluegrass		45 5
108	5/1/17	J. Becker; K. Hand	rubber rabbitbrush green rabbitbrush		7 1	cheatgrass sand dropseed bulbous bluegrass Sandberg bluegrass		50 17 5 2
109	5/3/17	J. Becker; K. Hand	big sagebrush antelope bitterbrush green rabbitbrush		3 3 2	cheatgrass Sandberg bluegrass snow buckwheat bulbous bluegrass needle-and-thread grass		50 10 2 1 1
110	5/3/17	J. Becker; K. Hand	big sagebrush rubber rabbitbrush		15 1	cheatgrass Sandberg bluegrass bulbous bluegrass		50 7 2
111[(b)]			See footnote			See footnote		
112	4/11/2016	C. Duberstein	big sagebrush rubber rabbitbrush		13 3	cheatgrass Sandberg bluegrass		70 8
112a	5/3/2017	J. Becker; K. Hand	antelope bitterbrush green rabbitbrush rubber rabbitbrush		1 2 2	cheatgrass Sandberg bluegrass snow buckwheat needle-and-thread grass		60 15 2 2
114	2/10; 4/6/2016	J. Becker C. Duberstein	big sagebrush		10	cheatgrass		80
115	3/28; 4/5/2016	K. Hand; C. Duberstein	big sagebrush		25	cheatgrass Sandberg bluegrass		35 10
116	3/31/2016	C. Duberstein	rubber rabbitbrush		4	cheatgrass Sandberg bluegrass snow buckwheat		75 4 2
117	3/28/2016	K. Hand	big sagebrush		20	cheatgrass Sandberg bluegrass needle-and-thread grass		40 8 1
118	5/1/17	J. Becker; K. Hand	none			cheatgrass Sandberg bluegrass		80 3

Table A.3. (contd)

Polygon Number	Survey Date(s)	Surveyors	Dominant Shrub Species Common Name[(a)]	Dominant Shrub Species Latin Name[(a)]	Approximate Percent Cover	Dominant Herbaceous Species Common Name[(a)]	Dominant Herbaceous Species Latin Name[(a)]	Percent Cover
119	3/28; 3/30/2016	K. Hand; N. Freeman-Cadoret	antelope bitterbrush green rabbitbrush		5 1	cheatgrass snow buckwheat Sandberg bluegrass		35 10 10
120	3/28; 3/29/2016	K. Hand	rubber rabbitbrush antelope bitterbrush green rabbitbrush		10 8 2	cheatgrass snow buckwheat Sandberg bluegrass Indian ricegrass fineleaf hymenopappus	 *Achnatherum hymenoides* *Hymenopappus filifolius*	35 10 10 5 2
122	4/26/2017	J. Becker	rubber rabbitbrush green rabbitbrush antelope bitterbrush		2 2 1	cheatgrass Sandberg bluegrass snow buckwheat		50 25 10
123	3/28/2016	K. Hand	rubber rabbitbrush green rabbitbrush		5 2	cheatgrass Sandberg bluegrass snow buckwheat needle-and-thread grass		25 20 5 2
124	4/26/2017	J. Becker	big sagebrush		15	cheatgrass Sandberg bluegrass snow buckwheat		70 5 1
129	5/2/2016	K. Hand	rubber rabbitbrush		10	cheatgrass fineleaf hymenopappus		5 5
130	2/10; 3/28; 4/7; 5/2/2016	K. Hand C. Duberstein	rubber rabbitbrush		13	cheatgrass Sandberg bluegrass snow buckwheat		20 15 10
131	4/26/2017	J. Becker	big sagebrush green rabbitbrush		15 1	cheatgrass needle-and-thread grass		70 1
132	4/26/2017	J. Becker	big sagebrush		10	cheatgrass needle-and-thread grass Sandberg bluegrass		60 15 5
133	4/26/2017	J. Becker	big sagebrush rubber rabbitbrush		20 5	cheatgrass Sandberg bluegrass bulbous bluegrass		50 10 2
201	4/25/2017	J. Becker; K. Hand	none			cheatgrass bulbous bluegrass		65 3

Table A.3. (contd)

Polygon Number	Survey Date(s)	Surveyors	Dominant Shrub Species Common Name[(a)]	Dominant Shrub Species Latin Name[(a)]	Approximate Percent Cover	Dominant Herbaceous Species Common Name[(a)]	Dominant Herbaceous Species Latin Name[(a)]	Percent Cover
202	4/25/2017	J. Becker; K. Hand	none			cheatgrass bulbous bluegrass		90 5
208	4/24/2017	J. Becker; K. Hand	rubber rabbitbrush		15	cheatgrass		40
209	4/24/2017	J. Becker; K. Hand	rubber rabbitbrush		15	cheatgrass bulbous bluegrass sand dropseed		55 2 1
211	4/24/2017	J. Becker; K. Hand	none			bulbous bluegrass cheatgrass sand dropseed		40 25 5

(a) Nomenclature according to U.S. Department of Agriculture (USDA 2017), Natural Resource Conservation Service Plants Database (http://plants.usda.gov/java/)

(b) Dominant species and cover estimates not provided for habitat polygon 111 (riparian zone of the Columbia River), where dominant species vary widely north of Horn Rapids Road. Species observed in 2015 are indicated in Table A.4.

Table A.4. Plant Species for Habitat Polygons Located on the PNNL Richland Campus Based on 2016–17 Surveys (Figure A.1). Polygons 2-133 are located north of Horn Rapids Road. Polygons 201-211 are located south of Horn Rapids Road.

		Polygon Number[b,c]														
Species Name[a]	Common Name[a]	2	3	4	5	6	9	10	11	13	14	15	16	17	19	20
Achillea millefolium	common yarrow					X	X	X		X	X		X	X		
Achnatherum hymenoides	Indian ricegrass	X	X		X	X	X			X			X		X	X
Acroptilon repens[e]	Russian knapweed					X				X						
Allium sp.	onion						X			X						
Ambrosia acanthicarpa	flatspine bur ragweed						X	X		X						
Amsinckia sp.	fiddleneck		X			X	X	X		X	X	X	X	X	X	X
Amsinckia tessellata	bristly fiddleneck						X	X		X				X	X	
Artemisia tridentata	big sagebrush	X						9	+	X		X	15	X	X	14
Asparagus officianalis	garden asparagus									X						
Astragalus caricinus	buckwheat milkvetch									X						
Balsamorhiza careyana	Carey's balsamroot									X			+			X
Bassia scoparia[e]	burningbush		X												X	
Bromus tectorum	cheatgrass	20	40	60	5	50	42	50	22	45	50	40	60	60	60	50
Centaurea diffusa[e]	diffuse knapweed	X					X			X					X	
Chondrilla juncea[e]	rush skeletonweed					X				X				X	X	
Chrysothamnus viscidiflorus	green rabbitbrush	X	X	X		X	2	X	+	5	2	2	X	1		
Cryptantha sp.										X						
Cryptantha circumscissa	matted cryptantha	+			X		X	X		X						
Cryptantha pterocarya	wingnut cryptantha				X		X									
Delphinium nuttallianum	upland larkspur									X						
Descurainia pinnata	western tansymustard						X			X				X		X
Descurainia sophia	herb sophia					X										
Draba verna	spring draba						X	X		X				X		
Elaeagnus angustifolia	Russian olive					X										
Ericameria nauseosa	rubber rabbitbrush	2	+	1	X	8	10	5	15	5	X	+	+	X	+	X
Eriogonum niveum	snow buckwheat	25	1	2	5		5	+	+	10	3	3	1	1	X	X
Erodium cicutarium	redstem stork's bill									X					X	
Erysimum asperum	western wallflower				X					X						
Fritillaria pudica	yellow fritillary									X					X	
Gilia sinuata	shy gilia				5					X						

Table A.4. (contd)

Species Name[a]	Common Name[a]	Polygon Number[b,c]														
		2	3	4	5	6	9	10	11	13	14	15	16	17	19	20
Hesperostipa comata	needle-and-thread grass		X					X		1	5	+	+			X
Holosteum umbellatum	jagged chickweed						X	X		X				X	X	
Hymenopappus filifolius	fineleaf hymenopappus									X		X				
Juniperus sp.	juniper					X										
Lactuca serriola	prickly lettuce					X				X					X	
Lomatium macrocarpum	bigseed biscuitroot														X	
Machaeranthera canescens	hoary aster	X	X		X		X	X		X	X	X	X	X	X	
Microsteris gracilis	pink microsteris				X		X			X						
Morus alba	white mulberry					X										
Oenothera pallida	pale evening primrose		X		X		X		X	X		X		X		
Opuntia polyacantha	plains pricklypear						X	X	X	X			X	X		X
Phacelia hastata	silverleaf phacelia	X					X			X						
Phacelia linearis	threadleaf scorpionweed				X					X						
Phlox longifolia	longleaf phlox						X	X		X				X		
Plantago patigonica	woolly plantain									X						
Poa sp.	bluegrass									X						
Poa bulbosa	bulbous bluegrass	X					X	X	X	X		X		X		
Poa secunda	Sandberg bluegrass	X	5	X	1	X	X	X	10	5	X	X	5	15	5	X
Pseudoroegneria spicata	bluebunch wheatgrass							X					X		X	X
Psoralidium lanceolatum	lemon scurfpea				10		X			X						
Pteryxia terebinthina	turpentine wavewing			X						X				X		
Purshia tridentata	antelope bitterbrush	X		+	X		1	X	X	5	3	3		5		
Robinia pseudoacacia	lack locust					X										
Salsola tragus	prickly Russian thistle		X	5		5	X	X	X	2	5	X	X		1	X
Sisymbrium altissimum	tall tumblemustard	X	10	X		2	X	X	X	3	+	3	1	1	1	X
Sphaeralcea munroana	Munro's globemallow									X						
Sporobolus cryptandrus	sand dropseed			X	X	X	X	X	X	X		X		X	X	
Tragopogon dubius	yellow salsify									X						
Triteleia grandiflora	largeflower triteleia				X		X	X		X				X	X	

Table A.4. (contd)

		Polygon Number[b,c]											
Species Name[a]	Common Name[a]	24	25	26	27	28	29	30	100	101	102	103	104
Achillea millefolium	common yarrow							X	X	X		X	X
Achnatherum hymenoides	Indian ricegrass	X	X										X
Acroptilon repens[e]	Russian knapweed		2	2				X					
Ambrosia acanthicarpa	flatspine bur ragweed							X					
Amsinckia sp.	fiddleneck								X	X		X	X
Amsinckia tessellata	bristly fiddleneck		X		X		X	X	X	X		X	X
Artemisia tridentata	big sagebrush		10	+	10	X	10		X	X	X		5
Balsamorhiza careyana	Carey's balsamroot												X
Bassia scoparia[e]	burningbush		X			X				X			
Bromus tectorum	cheatgrass	32	60	60	80	40	70	5	75	70	55		57
Centaurea diffusa[e]	diffuse knapweed					X			X	X			X
Chondrilla juncea[e]	rush skeletonweed		X	X	X	X		X	X	X			X
Chrysothamnus viscidiflorus	green rabbitbrush	X	X		X	2		X	X		1	X	1
Comandra umbellata	bastard toadflax										X		
Cryptantha circumscissa	matted cryptantha	X				X		+					X
Descurainia pinnata	western tansymustard							X				X	
Draba verna	spring draba		X		X		X		X	X		X	X
Ericameria nauseosa	rubber rabbitbrush	3	2	+	X	2	X	5	3	3	+		2
Erodium cicutarium	redstem stork's bill								X				X
Eriogonum niveum	snow buckwheat	4	X			5	X	7			1		4
Erysimum asperum	western wallflower							X					
Fritillaria pudica	yellow fritillary				X								
Hesperostipa comata	needle-and-thread grass	X	X	X	X	X	X	X		X		X	X
Hymenopappus filifolius	fineleaf hymenopappus												X
Holosteum umbellatum	jagged chickweed				X		X		X	X			X
Lactuca serriola	prickly lettuce								X	X			X
Lomatium macrocarpum	bigseed biscuitroot												X
Machaeranthera canescens	hoary aster		X			X		X	X	X		X	X
Melilotus officianalis	sweetclover												X
Oenothera pallida	pale evening primrose							X				X	X
Opuntia polyacantha	plains pricklypear					X					X	X	
Phacelia hastata	silverleaf phacelia	X											
Phacelia linearis	threadleaf phacelia							2					
Phlox longifolia	longleaf phlox				X		X	X					X
Plantago patigonica	woolly plantain		X										X

Table A.4. (contd)

Species Name[a]	Common Name[a]	Polygon Number[b,c]											
		24	25	26	27	28	29	30	100	101	102	103	104
Poa bulbosa	bulbous bluegrass		X		X	X	X		3	17	+		5
Poa secunda	Sandberg bluegrass	2	10	X	X		10	X	10	+	1		3
Poa sp.	bluegrass											X	
Pseudoroegneria spicata	bluebunch wheatgrass				X			X					X
Psoralidium lanceolatum	lemon scurfpea	5						10			X		
Pteryxia terebinthina	turpentine wavewing				X	X					X	X	X
Purshia tridentata	antelope bitterbrush		X		X	5		2			2		+
Salsola tragus	prickly Russian thistle	+	5	5	X	X	X		X	X			X
Sisymbrium altissimum	tall tumblemustard	X	+	X	X	X	X	X	X	X		X	X
Sphaeralcea munroana	Munro's globemallow									X			
Sporobolus cryptandrus	sand dropseed	X	X			X			+	+		X	X
Tragopogon dubius	yellow salsify								X	X			X
Triteleia grandiflora	largeflower triteleia				X				X	X	X		X

Table A.4. (contd)

Species Name[(a)]	Common Name[(a)]	Polygon Number[(b,c)]														
		105	106	107	108	109	110	111[d]	112	112a	114	115	116	117	118	119
Achillea millefolium	common yarrow	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Achnatherum hymenoides	Indian ricegrass	X		X		X		X		X			X			
Acroptilon repens[(e)]	Russian knapweed		X					X							X	
Ailanthus altissima	tree-of-heaven							X								
Allium sp.	onion					X										
Allium schoenoprasum	wild chives							X								
Amsinckia sp.	fiddleneck	X	X	X	X	X	X			X		X		X		
Amsinckia lycopsoides	tarweed fiddleneck							X								
Amsinckia tessellata	bristly fiddleneck	X	X		X	X	X		X	X	X	X			X	
Artemisia campestris	field sagewort							X								
Artemisia dracunculus	tarragon							X								
Artemisia tridentata	big sagebrush	X	5	18		3	15	X	13		10	25		20	X	
Asparagus officianalis	garden asparagus							X	X							
Astragalus caricinus	buckwheat milkvetch	X										X				
Balsamorhiza careyana	Carey's balsamroot	X	X	X					X		X	X				X
Bassia scoparia[(e)]	burningbush		X				X								X	
Bromus tectorum	cheatgrass	70	50	45	50	50	50	X	70	60	80	35	75	40	80	35
Centaurea diffusa[(e)]	diffuse knapweed	X	X		X			X							X	
Chondrilla juncea[(e)]	rush skeletonweed	X	X	X		X	X	X	X			X	X		X	X
Chrysothamnus viscidiflorus	green rabbitbrush	+	X	X	1	2	+		X	2	X	X	X			1
Cirsium sp.	thistle							X								
Clematis ligusticifolia	western white clematis							X								
Convolvulus arvensis	field bind weed							X								
Crepis atribarba	slender hawksbeard								X					X		
Cryptantha circumscissa	matted cryptantha	X														
Delphinium nuttallianum	upland larkspur								X			X				X
Descurainia pinnata	western tansymustard	X		X					X			X				X
Descurainia sophia	herb sophia			X				X				X				
Draba verna	spring draba	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Eleocharis sp.	spikerush							X								
Elymus elymoides	squirreltail															
Elymus lanceolatus	thickspike wheatgrass							X	X			X				
Epilobium paniculatum	tall annual willowherb								X							
Ericameria nauseosa	rubber rabbitbrush	3	15	X	7	+	1	X	3	2	X	X	4	X		X
Eriogonum niveum	snow buckwheat	1	1	X	+	2	+	X	+	2	X	X	2	X	X	10

Table A.4. (contd)

		Polygon Number[b,c]														
Species Name[a]	Common Name[a]	105	106	107	108	109	110	111[d]	112	112a	114	115	116	117	118	119
Ericameria teretifolia	green rabbitbrush							X								
Erodium cicutarium	redstem stork's bill	X	X		X	X			X						X	
Erysimum asperum	western wallflower															
Gaillardia aristata	blanketflower			X				X								
Gilia sinuata	shy gilia					X										
Hesperostipa comata	needle-and-thread grass	X	+	X	X	1	+	X	X	2	X		X	1		X
Holosteum umbellatum	jagged chickweed	X	X	X	X	X			X	X	X	X	X		X	X
Hymenopappus filifolius	fineleaf hymenopappus	X													X	
Hypericum perforatum	common St. Johnswort							X								
Iris missouriensis	Rocky Mountain iris							X								
Lactuca serriola	prickly lettuce	X	X	X	X	X			X			X			X	
Lepidium densiflorum	common pepperweed							X								
Lepidium perfoliatum	clasping pepperweed							X								
Lomatium macrocarpum	bigseed biscuitroot			X								X				
Machaeranthera canescens	hoary aster	X	X		X	X	X	X	X	X		X				
Medicago sativa	alfalfa								X							
Melilotus officianalis	sweetclover		X													
Microsteris gracilis	pink microsteris			X								X				X
Morus alba	white mulberry							X								
Oenothera pallida	pale evening primrose	X				X	X	X	X				X			
Opuntia polyacantha	plains pricklypear		X	X		X						X		X		X
Phacelia hastata	silverleaf phacelia	X				X							X			
Phalaris arundinacea	reed canarygrass							X								
Phlox longifolia	longleaf phlox		X	X		+	X		X	X	X	X				X
Plantago patagonica	woolly plantain	X	X			X	X	X		X						
Poa bulbosa	bulbous bluegrass	10	X		5	1	2	X	X	X	X	X			+	
Poa secunda	Sandberg bluegrass	5	X	5	2	10	7	X	8	15	X	10	4	8	3	10
Polemonium micranthum	annual polemonium			X												
Prunus virginiana	chokecherry							X								
Pseudoroegneria spicata	bluebunch wheatgrass		X	X			X		X	X		X		X		
Psoralidium lanceolatum	lemon scurfpea					X		X	X							
Pteryxia terebinthina	turpentine wavewing			X			X		X			X		X	X	X
Purshia tridentata	antelope bitterbrush	X	+	X	X	3	X	X	X	1	X					5
Rhus glabra	smooth sumac							X								
Robinia pseudoacacia	black locust							X								

Table A.4. (contd)

Species Name[(a)]	Common Name[(a)]	Polygon Number[(b,c)]														
		105	106	107	108	109	110	111[d]	112	112a	114	115	116	117	118	119
Rosa woodsia	Woods' rose							X								
Rubus armeniacus	Himalayan blackberry							X								
Rumex salicifolius	willow dock							X								
Rumex venosus	veiny dock							X								
Salix exigua	narrowleaf willow							X								
Salsola tragus	prickly Russian thistle	X	X			X	X				X	X	X		X	
Sisymbrium altissimum	tall tumblemustard	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Solanum dulcamara	climbing nightshade							X								
Solidago canadensis	Canada goldenrod							X								
Sphaeralcea munroana	Munro's globemallow	X	X					X						X		
Sporobolus cryptandrus	sand dropseed	5	X	X	17	+	X	X	X		X	X	X		X	X
Taraxacum officinale	common dandelion		X													
Tragopogon dubius	yellow salsify	X		X			X	X				X	X		X	
Triteleia grandiflora	largeflower triteleia	X	X			X	X		X	X	X	X	X		X	
Verbascum thapsus	common mullein							X								

Table A.4. (contd)

Species Name[(a)]	Common Name[(a)]	Polygon Number[(b,c)]								
		120	122	123	124	129	130	131	132	133
Achillea millefolium	common yarrow	X	X					X	X	X
Achnatherum hymenoides	Indian ricegrass	5		X	X	X		X		
Amsinckia sp.	fiddleneck						X			
Amsinckia tessellata	bristly fiddleneck		X		X			X	X	X
Artemisia tridentata	big sagebrush	X	+	X	15			15	10	20
Astragalus caricinus	buckwheat milkvetch	X				X				
Balsamorhiza careyana	Carey's balsamroot		X					+		
Bassia scoparia[(e)]	burningbush						X			
Bromus tectorum	cheatgrass	35	50	25	70	5	20	70	60	50
Centaurea diffusa[(e)]	diffuse knapweed				X		X			
Chondrilla juncea[(e)]	rush skeletonweed	X	X		X		X	X	X	X
Chrysothamnus viscidiflorus	green rabbitbrush	2	2	2	+	X	X	1		X
Cryptantha sp.	cryptantha		X							
Cryptantha circumscissa	matted cryptantha	X				X				
Delphinium nuttallianum	upland larkspur		X							
Descurainia pinnata	western tansymustard	X								
Draba verna	spring draba	X		X	X		X	X	X	X
Elymus elymoides	squirreltail					X				
Ericameria nauseosa	rubber rabbitbrush	10	2	5	+	10	13	+	+	5
Eriogonum niveum	snow buckwheat	10		5	1		10	+	+	X
Erodium cicutarium	redstem stork's bill				X		X		X	X
Erysimum asperum	western wallflower	X								
Gilia sinuata	shy gilia					X				
Hesperostipa comata	needle-and-thread grass	+	X	2	X	X	X	1	15	
Holosteum umbellatum	jagged chickweed	X	X		X		X	X	X	X
Hymenopappus filifolius	fineleaf hymenopappus	2				5				
Lactuca serriola	prickly lettuce				X					
Layia glandulosa	tidytips		X							
Microsteris gracilis	pink microsteris						X			
Oenothera pallida	pale evening primrose	X				X	X			
Opuntia polyacantha	plains pricklypear	X	X							
Phacelia hastata	silverleaf phacelia	X		X		X	X			
Phlox longifolia	longleaf phlox		X		X			X	X	
Plantago patagonica	woolly plantain						X			
Plectritis macrocera	longhorn plectritis		X		X			X		

Table A.4. (contd)

		Polygon Number[b,c]								
Species Name[a]	Common Name[a]	120	122	123	124	129	130	131	132	133
Poa bulbosa	bulbous bluegrass		X		X	X	X	X	X	2
Poa secunda	Sandberg bluegrass	10	25	20	5		15	+	5	10
Pseudoroegneria spicata	bluebunch wheatgrass				X			X		
Pteryxia terebinthina	turpentine wavewing	X	X							
Purshia tridentata	antelope bitterbrush	8	1		+	+	X	+	+	+
Salsola tragus	prickly Russian thistle				X					
Sisymbrium altissimum	tall tumblemustard	X	X	X	X		X	X	X	X
Sphaeralcea munroana	Munro's globemallow	X				X				
Sporobolus cryptandrus	sand dropseed		X	X			X			
Tragopogon dubius	yellow salsify				X					
Triteleia grandiflora	largeflower triteleia	X	X		X					
Vulpia sp.	sixweeks						X			

Table A.4. (contd)

Species Name[a]	Common Name[a]	Polygon Number[b,c]				
		201	202	208	209	211
Achillea millefolium	common yarrow			X	X	X
Amsinckia sp.	fiddleneck	+	X	X	X	X
Amsinckia tessellata	bristly fiddleneck	+	X		X	X
Bromus tectorum	cheatgrass	65	90	40	55	25
Centaurea diffusa[e]	diffuse knapweed	X		X	X	X
Chondrilla juncea[e]	rush skeletonweed		X	X	X	
Chorispora tenella	blue mustard	X	X		X	
Convolvulus arvensis	field bind weed					X
Cryptantha circumscissa	matted cryptantha				X	
Descurainia pinnata	western tansymustard			X	X	
Descurainia sophia	herb sophia	X				
Draba verna	spring draba	X		X	X	X
Ericameria nauseosa	rubber rabbitbrush			15	15	+
Erodium cicutarium	redstem stork's bill	+	+	X	X	X
Grindelia columbiana	Columbia River gumweed				X	X
Holosteum umbellatum	jagged chickweed	X	X	X	X	X
Hordeum jubatum	foxtail barley	X				
Lactuca serriola	prickly lettuce	X	X	X	X	X
Lamium amplexicaule	henbit deadnettle	X				
Machaeranthera canescens	hoary aster			X	X	
Medicago sativa	alfalfa					X
Melilotus officianalis	sweetclover		X		X	
Oenothera pallida	pale evening primrose				X	
Phacelia hastata	silverleaf phacelia				X	
Plantago patigonica	woolly plantain				X	X
Plantago lanceolata	English plantain		X			X
Poa bulbosa	bulbous bluegrass	3	5	X	2	40
Poa secunda	Sandberg bluegrass			X	X	
Salsola tragus	prickly Russian thistle		X			
Sisymbrium altissimum	tall tumblemustard	+	X	X	X	X
Sphaeralcea munroana	Munro's globemallow				X	X
Sporobolus cryptandrus	sand dropseed			X	1	5

Table A.4. (contd)

Species Name[a]	Common Name[a]	Polygon Number[b,c]				
		201	202	208	209	211
Taraxacum officinale	common dandelion	X	X			X
Tragopogon dubius	yellow salsify	X	X	X	X	X

(a) Nomenclature according to USDA (2017), Natural Resource Conservation Service Plants Database. http://plants.usda.gov/java/
(b) X= present
(c) + =<1 percent cover; numeric indicators are estimated percent cover
(d) Cover estimates not provided for habitat polygon 111 (riparian zone of the Columbia River), where cover varies widely north of Horn Rapids Road. Species present in 2015 are indicated.
(e) Noxious Weed Class B = Prevent spread and contain or reduce existing populations (WAC 16-750-011)

Note: All plant species observed on the approximate southern two-thirds of the portion of the project area located north of Horn Rapids Road during 2009–2015 are listed in Appendix C of Duncan et al. (2016).

Note: None of these species is state- or federally listed.

Table A.5. Birds Species Observed North of Horn Rapids Road, 2009–2015.

Species Name	Common Name
Actitis macularia	spotted sandpiper
Agelaius phoeniceus	red-winged blackbird
Artemisiospiza nevadensis[(a)]	sagebrush sparrow
Anas platyrhynchos	mallard
Ardea herodias	great blue heron
Asio flammeus	short-eared owl
Branta canadensis	Canada goose
Buteo jamaicensis	red-tailed hawk
Calidris bairdi	Baird's sandpiper
Calidris mauri	western sandpiper
Callipepla californica	California quail
Carpodacus mexicanus	house finch
Carduelis tristis	American goldfinch
Casmerodius albus	great egret
Charadrius vociferus	killdeer
Chordeiles minor	common nighthawk
Circus cyaneus	northern harrier
Colaptes auratus	northern flicker
Columbus livia	rock dove
Corvus brachyrhynchos	American crow
Corvus corax	common raven
Eremophila alpestris	horned lark
Haliaeetus leucocephalus[(b)]	Bald eagle
Hirundo pyrrhonota	cliff swallow
Hirundo rustica	barn swallow
Icterus galbula	Bullock's oriole
Larus californicus	California gull
Melospiza melodia	song sparrow
Mergus merganser	common merganser
Numenius americanus[(c)]	long-billed curlew
Nycticorax nycticorax[(c)]	black-crowned night-heron
Pandion haliaetus[(c)]	osprey
Passer domesticus	house sparrow
Pelecanus erythrorhynchos[(d)]	American white pelican
Phasianus colchicus	ring-necked pheasant
Pica pica	black-billed magpie
Riparia riparia	bank swallow
Sturnella neglecta	western meadowlark
Sturnus vulgaris	European starling
Turdus migratorius	American robin
Tyrannus tyrannus	eastern kingbird
Tyrannus verticalis	western kingbird
Zenaida macroura	mourning dove
Zonotrichia leucophrys	white-crowned sparrow

(a) State Candidate
(b) Federal Species of Concern
(c) State Monitor
(d) State Threatened

Table A.6. Mammal Species Observed north of Horn Rapids Road, 2009–2015.

Species Name	Common Name
Canis latrans	coyote
Castor canadensis	beaver
Erithizon dorsatum	porcupine
Lepus californicus[(a)]	black-tailed jackrabbit
Odocoileus hemionus	mule deer
Perognathus parvus	Great Basin pocket mouse
Sylvilagus nutalli	mountain cottontail
Taxidea taxus[(b)]	badger
Thomomys talpoides	northern pocket gopher

(a) State Candidate
(b) State Monitor
Note: None of these species is federally listed.

Table A.7. All Plant Species Observed north of Horn Rapids Road, 2009–2015.

Species Name[(a)]	Common Name[(a)]
Achillea millefolium	common yarrow
Achnatherum hymenoides	Indian ricegrass
Acroptilon repens[(b)]	Russian knapweed
Agoseris heterophylla	annual mountain dandelion
Agropyron cristatum	crested wheatgrass
Ailanthus altissima[(c)]	tree-of-heaven
Allium schoenoprasum	wild chives
Amaranthus albus	prostrate pigweed
Ambrosia acanthicarpa	flatspine bur ragweed
Amsinckia lycopsoides	tarweed fiddleneck
Amsinckia tessellata	bristly fiddleneck
Artemisia campestris	field sagewort
Artemisia dracunculus	tarragon
Artemisia lindleyana	Columbia river mugwort
Artemisia tridentata	big sagebrush
Asclepias speciosa	showy milkweed
Asparagus officinalis	garden asparagus
Astragalus caricinus	buckwheat milkvetch
Balsamorhiza careyana	Carey’s balsamroot
Bassia scoparia[(b)]	burningbush
Bromus tectorum	cheatgrass
Cardaria draba	whitetop
Centaurea diffusa[(b)]	diffuse knapweed
Chaenactis douglasii	hoary false yarrow
Chamaesyce serpyllifolia	thymeleaf sandmat

Table A.7. (contd)

Species Name[a]	Common Name[a]
Chenopodium leptophyllum	narrowleaf goosefoot
Chenopodium rubrum	red goosefoot
Chondrilla juncea[b]	rush skeletonweed
Chorispora tenella	blue mustard
Cichorium intybus	chichory
Cirsium sp.	thistle
Clematis ligusticifolia	western white clematis
Comandra umbellata	bastard toadflax
Convolvulus arvensis[c]	field bind weed
Conyza canadensis	Canadian horseweed
Coreopsis tinctoria var. atkinsoniana	Columbia tickseed
Crepis atribarba	slender hawksbeard
Cryptantha circumscissa	matted cryptantha
Cryptantha flaccida	weak-stemmed cryptantha
Cryptantha fendleri	Fendler's cryptantha
Cryptantha pterocarya	winged cryptantha
Dalea ornata	Blue Mountain prairie clover
Descurainia pinnata	western tansymustard
Descurainia sophia	herb sophia
Delphinium nuttallianum	upland larkspur
Draba verna	spring whitlowgrass
Eleocharis sp.	spikerush
Elymus elymoides	squirreltail
Elymus lanceolatus	thickspike wheatgrass
Epilobium brachycarpum	tall annual willowherb
Equisetum sp	horsetail
Ericameria nauseosa	rubber rabbitbrush
Ericameria teretifolia	green rabbitbrush
Erigeron filifolius	threadleaf fleabane
Eriogonum niveum	snow buckwheat
Eriogonum vimineum	broom buckwheat
Erodium cicutarium	redstem stork's bill
Fritillaria pudica	yellow fritillary
Gaillardia aristata	blanketflower
Gilia sinuata	shy gilia
Gratiola neglecta	American hedge-hyssop
Grayia spinosa	spiny hopsage
Gypsophila paniculata[c]	baby's breath
Hesperostipa comata	needle-and-thread grass
Holosteum umbellatum	jagged chickweed
Hymenopappus filifolius	fineleaf hymenopappus
Hypericum perforatum	common St. Johnswort
Iris missouriensis	Rocky Mountain iris
Koeleria macrantha	prairie junegrass
Lactuca serriola	prickly lettuce
Lagophylla rammosissima	rabbitleaf
Layia glandulosa	tidytips

Table A.7. (contd)

Species Name[a]	Common Name[a]
Lepidium densiflorum	common pepperweed
Lepedium latifolium[b]	broadleaf pepperweed
Lepidium perfoliatum	clasping pepperweed
Leptodactylon pungens	prickly phlox
Leymus cinereus	basin wildrye
Logfia arvensis	field fluffweed
Lomatium macrocarpum	bigseed desertparsley
Machaeranthera canescens	hoary aster
Malus pumila	apple
Medicago sativa	alfalfa
Melilotus officianalis	sweetclover
Mentzelia albicaulis	whitestem stickleaf
Microsteris gracilis	pink microsteris
Morus alba	white mulberry
Oenothera pallida	pale evening primrose
Opuntia polyacantha	plains pricklypear
Orobanche corymbosa	flat-top broomrape
Phacelia hastata	silverleaf phacelia
Phacelia linearis	threadleaf scorpionweed
Phalaris arundinacea[c]	reed canarygrass
Phlox longifolia	longleaf phlox
Plantago lanceolata	English plantain
Plantago patigonica	woolly plantain
Plectritis macrocera	white cupseed
Poa bulbosa	bulbous bluegrass
Poa secunda	Sandberg bluegrass
Polygonum convolvulus	climbing bindweed
Plantago patigonica	woolly plantain
Prunus virginiana	chokecherry
Pseudognaphalium stramineum	cottonbatting plant
Pseudoroegneria spicata	bluebunch wheatgrass
Psoralidium lanceolatum	lemon scurfpea
Pteryxia terebinthina	turpentine wavewing
Purshia tridentata	antelope bitterbrush
Robinia pseudoacacia	black locust
Rosa woodsii	Woods' rose
Rubus armeniacus[c]	Himalayan blackberry
Rumex salicifolius	willow dock
Rumex venosus	veiny dock
Salix exigua	narrowleaf willow
Salsola tragus	prickly Russian thistle
Senecio vulgaris	common groundsel
Sisymbrium altissimum	tall tumblemustard
Solidago canadensis	Canada goldenrod
Solanum dulcamara	climbing nightshade
Sphaeralcea munroana	Munro's globemallow
Sporobolus cryptandrus	sand dropseed

Table A.7. (contd)

Species Name[a]	Common Name[a]
Stephanomeria paniculata	tufted wirelettuce
Tragopogon dubius	yellow salsify
Tribulus terrestris[b]	puncturevine
Triteleia grandiflora	Douglas clusterlily
Ulmus pumila	Siberian elm
Verbascum thapsus	common mullein
Vulpia microstachys	small sixweeks
Vulpia octoflora	slender sixweeks
Zigadenus venenosus	meadow death camas

(a) Nomenclature according to USDA (2017), Natural Resource Conservation Service Plants Database. http://plants.usda.gov/java/.
(b) Noxious Weed Class B = Prevent spread and contain or reduce existing populations (WAC 16-750-011)
(c) Noxious Weed Class C = Weeds widespread, control methods available but not normally required (WAC 16-750-015).

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APPENDIX B– MITIGATION ACTION PLAN FOR PNNL RICHLAND CAMPUS FUTURE DEVELOPMENT, RICHLAND WASHINGTON

B.1 INTRODUCTION

Consistent with the phased buildout approach assessed in the Pacific Northwest National Laboratory (PNNL) Richland Campus Future Development Environmental Assessment (EA), the U.S Department of Energy (DOE) proposes to construct and operate multiple buildings on the campus, including research laboratories, office space, support buildings, and associated infrastructure. Site development includes infrastructure upgrades needed to support the operations of the new facilities, including installation of new roads, parking lots, and utilities (e.g., water, natural gas, electric, sewer, and communications). Construction and installation of infrastructure would precede building construction, and may proceed in phases large enough to accommodate multiple buildings constructed over several years, as occurred with Phase 2 of the Physical Sciences Facility Complex construction (DOE 2013). Construction of the new facilities and associated infrastructure will involve clearing and grading the footprint of the buildings and infrastructure, as well as clearing and grading land areas needed to support construction activities and material laydown during construction.

The total land area available for new facilities and associated infrastructure on the PNNL Richland Campus (campus) is 269 ha (664 ac). Habitats types in this area have been grouped into four resource categories (Figure B.1). Mature shrub-steppe habitat (described in Section 4.6) comprises all of resource category 1 outside the riparian zone of the Columbia River and is the subject of this mitigation action plan.

B.2 CULTURAL RESOURCE MITIGATION

DOE is working with the ACHP and consulting parties to develop mitigation actions for potential impacts to historic or cultural resources through a parallel National Historic Preservation Act (NHPA) Section 106 process..

B.3 BIOLOGICAL RESOURCE MITIGATION

B.3.1 Environmental Effects

Pacific Northwest Site Office (PNSO) has developed a biological resource management policy for the PNNL Richland Campus that includes mitigation for loss of priority habitats (DOE/PNSO 2015). Shrub-steppe is one of the priority habitat types within Washington State (WDFW 2008/2016). The campus future development includes the potential to clear approximately 54.2 ha (134.4 ac) of mature shrub-steppe within the campus.

Construction activities may occur on campus at various times over the next 20 years. The annual migratory bird nesting season begins around March 1 and extends through July 31; however, the locations and types of areas (e.g., shrub habitat or light poles) used by migratory birds for nesting may change from year to year based on species-specific factors and changing site conditions. Construction activities could potentially impact nesting birds. Ground-disturbing activities also present the potential for transporting, spreading, and increasing noxious weed species. Several species of Washington State – Class B and Class C noxious weeds (WAC 16-750-011) are located in portions of the project area (Section 4.6 and Appendix A).

B.3.2 Function of the Mitigation Action Plan

This mitigation action plan describes the compensatory mitigation and monitoring commitments under DOE resource management guidelines for the clearing and grading of areas that will result in the loss of mature shrub-steppe habitat on the PNNL Richland Campus (resource category 1 outside the Columbia River riparian zone). Mature shrub-steppe occurs only north of Horn Rapids Road and is juxtaposed with areas of intermediate shrub-steppe (resource category 2) that occur nearby. The spatial extent of mature shrub-steppe may be used for buildout planning. However, note that intermediate shrub-steppe may gradually become mature shrub-steppe within the 20-year period of the buildout. Thus, the actual extent of mature shrub-steppe that may be eligible for mitigation will be determined by a biological resources review conducted prior to each phase of buildout.

The purpose of this plan is to provide guidance for defining the following:

- mitigation requirements
- methods DOE will use to accomplish the mitigation actions
- metrics used to measure the success or failure of the mitigation actions.

The commitments made in this mitigation action plan are designed to mitigate the loss of shrub-steppe habitat, classified as priority habitat by the Washington State Department of Fish and Wildlife (WDFW 2008/2016), by replacement of the lost habitat value, reduction or elimination of the potential spread of noxious weeds, and avoidance of potential impacts to nesting migratory birds. This general mitigation action plan provides a framework for future development of individual mitigation action plans that address the needs of each phase of buildout over the next 20 years.

Note that this general, or any subsequent, buildout-phase-specific mitigation action plan will not supersede or be additive to an existing mitigation action plan that covers the same land area, such as the similar *Mitigation Action Plan for Phase II Build Out, North Federal Campus, PNNL Site, Richland Washington* (see Appendix B of the *Supplement Analysis to the Final Environmental Assessment of Construction and Operation of a Physical Sciences Facility at the Pacific Northwest National Laboratory, Richland, Washington* [DOE 2013]). Mitigation will occur only once for destruction of shrub-steppe habitat on lands covered by more than one mitigation action plan.

B.3.3 Mitigation Action Plan Annual Reporting

Commitments in this mitigation action plan include implementation of the mitigation measures and monitoring to assure that the mitigation actions achieve defined success standards. Beginning in the year following the initiation of site clearing and grading for each development phase, the status, endpoints, and effectiveness metrics for implementation of mitigation and/or monitoring results for this project will be included in the Annual NEPA Planning Summary (e.g., DOE 2016) and PNNL Annual Site Environmental Report (e.g., Duncan et al. 2016).

B.4 MITIGATION ACTIONS

Under current guidelines for the management of cultural and biological resources on the PNNL Richland Campus (DOE/PNSO 2015), impacts to important biological resources are to be avoided or minimized if possible. Therefore, when possible, development phases will be designed to avoid or minimize impacts to priority habitats and species. This could include developing lower quality habitat areas in preference to higher quality areas, or it could include timing the development to minimize impacts to migratory birds. It is PNSO policy that compensatory mitigation will be performed for unavoidable impacts (DOE/PNSO 2015). Potential environmental effects of the potential campus buildout activities and the mitigation actions planned to avoid and minimize impacts to biological resources are summarized in Table B.1.

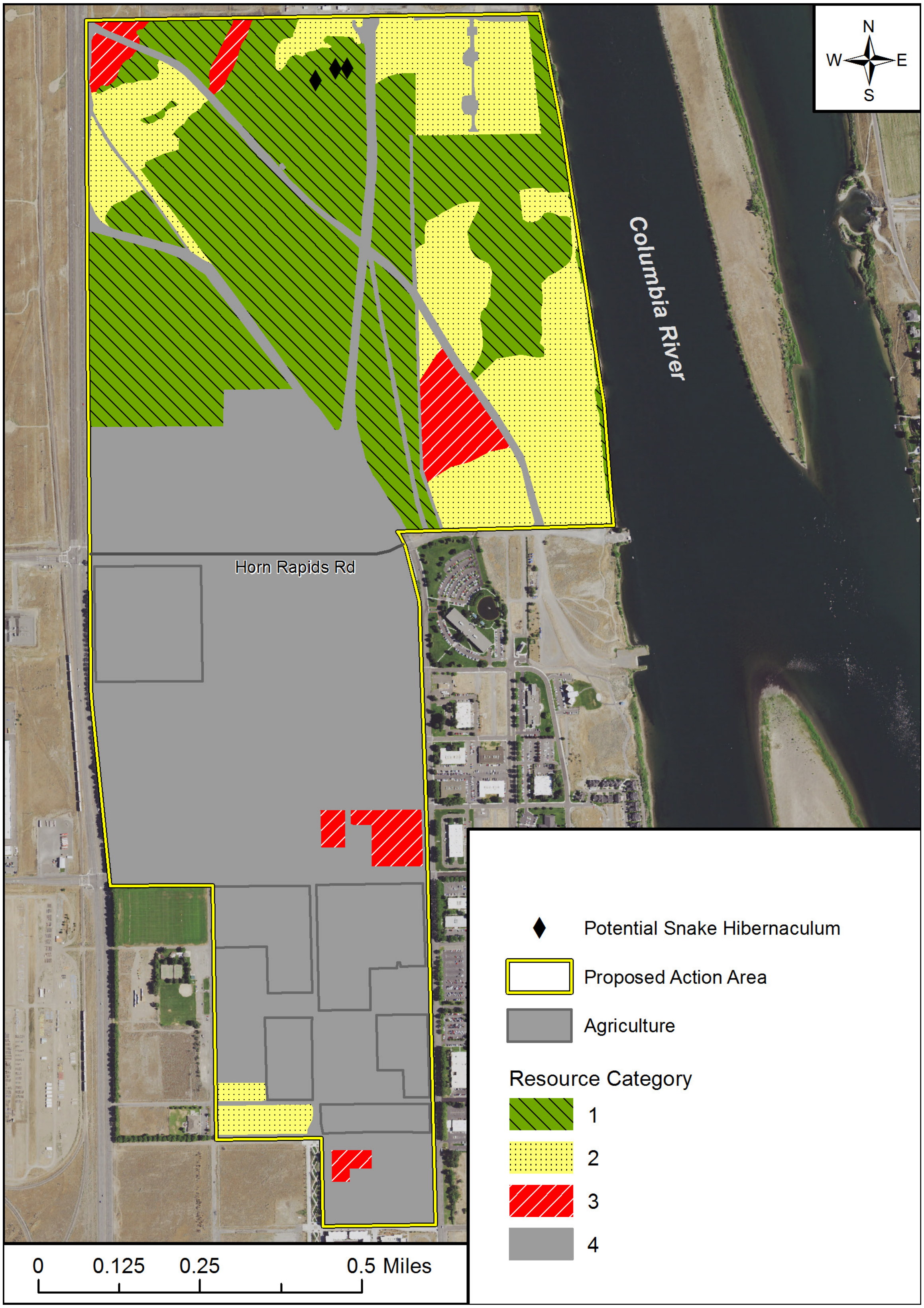

Figure B.1. Categories of Habitat Resources Located on the PNNL Richland Campus

Table B.1. Summary of Mitigation and Avoidance Measures

Environmental Resource	Mitigation Measure	Responsible Organization
Priority habitat	Conduct compensatory mitigation to replace and restore mature shrub-steppe habitat at a ratio of 3 replacement acres for every 1 ac of habitat destroyed. Develop an implementation plan and schedule as part of project planning and identify location(s) of compensatory mitigation. Develop a monitoring plan tailored to the specific compensatory mitigation action, and implement the monitoring plan for a minimum of 5 years.	PNSO and PNNL
Wildlife	Conduct biological surveys as needed before and during the project to identify potential impacts to wildlife, especially migratory birds. Schedule ground-disturbing activities to occur outside the nesting season to the extent feasible. Project staff will work with PNNL biologists to avoid any impacts to migratory nesting birds.	PNSO and PNNL
Noxious weeds	Avoid and minimize the spread of noxious weeds and non-native invasive species by minimizing off-road travel to avoid the spread of seeds. Construction equipment used to clear areas where noxious weeds are known to exist will be inspected and cleaned as necessary to prevent transport of seeds. Revegetation seeding will be reviewed by biologists to assure that seed mixes do not contain noxious weeds or other non-native invasive species that could potentially escape into native habitats.	PNNL and Subcontractor

B.4.1 Compensatory Mitigation Actions

The nature of some of the potential buildout activities (i.e., clearing, grading, and construction of new facilities and infrastructure) associated with buildout in mature sagebrush steppe portions of the campus is such that loss of mature shrub-steppe habitat cannot be avoided or rectified and, thus, will require compensatory mitigation.

PNSO will compensate for the loss of mature shrub-steppe at a minimum ratio of 3:1 (i.e., for each unit of mature shrub-steppe lost, a minimum of 3 units of mature shrub-steppe will be replaced or recreated). Compensatory mitigation will not be performed for individual actions that remove less than 0.4 ha (1 ac) of habitat, such as installation of a groundwater well. Several methods may be used to develop habitat that meets the criteria for mature shrub-steppe stands (required shrub densities and condition of the herbaceous understory). For planning purposes, a replacement unit for late-successional (mature) shrub-steppe will consist of the following or equivalent:

- 1,500 shrubs/ha (600 shrubs/ac)
- 1,500 forbs/ha (600 forbs/ac)
- native perennial grass understory (either already present or planted).

PNSO will consider all available options for implementing the mitigation actions, including but not limited to, PNNL-led restoration efforts, teaming with other agencies (e.g., the U.S. Fish and Wildlife Service or Washington Department of Fish and Wildlife), and third-party contracting through organizations such as the National Fish and Wildlife Foundation.

Sufficient land area for in-kind mitigation is not available on the PNNL Richland Campus, except for some portions of the preservation designated area that could receive habitat enhancement. PNSO and/or its collaborators may also identify the most suitable nearby locations for compensatory mitigation actions within Benton or Franklin County.

Compensatory mitigation actions will be implemented such that the mitigation actions occur on sites that can achieve in-kind habitat replacement, are relatively near the PNNL Richland Campus, and are not expected to be disturbed or destroyed by future anthropomorphic activities. Siting considerations for mitigation actions include the following:

- sites within DOE-administered or managed lands or on the Hanford Reach National Monument meet many of siting objectives (i.e., in-kind replacement, near to the PNNL Richland Campus, and would remain in federal control)
- the mitigation area is located near, within, and/or surrounding lands that possess significant habitat value
- the mitigation area is in an area designated for conservation or preservation.

Conduct of compensatory mitigation on lands other than the Hanford Reach National Monument or outside of lands owned and managed by DOE would require that protection provisions (e.g., deed restrictions or conservation easements) be included as part of the land-use agreements.

B.4.2 Monitoring

Monitoring is critical to determining if the objectives of compensatory mitigation actions have been met. Individual monitoring plans will be produced as part of the individual mitigation action plans that will be developed for each phase of buildout over the next 20 years. Each buildout phase monitoring plan will include a description of the specific metrics that will be used to measure mitigation success, and specific success criteria or target objectives for each metric at various intervals for at least 5 years. Monitoring metrics may include measures such as survivorship of transplanted material, plant density or cover in seeded areas, plant growth or shrub height, or other ecologically meaningful metrics.

If compensatory mitigation is performed via a third-party contractor arrangement, development and implementation of monitoring plans will be a required part of the statement of work for that contract.

B.4.3 Contingency Planning

If monitoring determines that one or more of the success criteria have not been met, additional mitigation actions will be performed to address areas where success was not achieved.

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APPENDIX C– CALCULATIONS SUPPORTING THE HYDROGEN ACCIDENT ANALYSIS

This appendix provides supporting calculations that were used in the high bay facility hydrogen accident analysis. Two bounding accident types were considered—vapor cloud explosion and vapor cloud fire. The supporting calculations are presented below.

C.1 VAPOR CLOUD EXPLOSION

The vapor cloud explosion scenario follows the guidance and methodologies presented in the Environmental Protection Agency (EPA) Risk Management Program Guidance for Offsite Consequence Analysis (OCA) (EPA 2009). For worst-case analysis, the total quantity of the flammable substance is assumed to form a vapor cloud. The entire contents of the cloud are assumed to be within the flammability limits, and the cloud is assumed to explode. The OCA method assumes 10 percent of the flammable vapor in the cloud participates in the explosion (i.e., the yield factor is 0.10). Consequence distances to an overpressure level of 1 pound per square inch (psi) may be determined using the following equation, which is based on the trinitrotoluene (TNT)-equivalency method (EPA 2009 Appendix C, Equation C-1):

$$D = 17\ x\ (0.1\ x\ W\ x\ HC_f\ x\ HC_{TNT})^{1/3}$$

where:

D	=	distance to overpressure of 1 psi (m)
W	=	weight of flammable substance (kg)
HC_f	=	heat of combustion of flammable substance (hydrogen: 119,950 kJ/kg; EPA 2009,Exhibit C-1)
HC_{TNT}	=	heat of explosion of TNT (4,680 kJ/kg; EPA 2009,Section C.1)

The distance to a 1 psi overpressure is provided in Section 5.2.16 for each scenario.

C.2 VAPOR CLOUD FIRE

The vapor cloud fire scenario follows the guidance and methodologies presented in the EPA OCA (EPA 2009). For a vapor cloud fire, the potential offsite hazard is from thermal radiation (i.e., heat) from dispersion of a cloud of flammable vapor and the subsequent ignition of the cloud following dispersion. The distance to the lower flammability level (LFL) represents the maximum distance based on the total quantity of flammable material could be released from a vessel or pipeline at which the radiant heat effects of a vapor cloud fire might have serious consequences. The LFL for hydrogen gas is 3.3 mg/L (EPA 2009, Exhibit C-2).

The OCA calculation of the distance to the LFL requires the estimation of a flammable gas release rate into the air. The release rate is the limiting condition of the entire inventory released in one minute or the choked flow release rate. The choked flow release rate for a gaseous release from a tank or pipe is given as (EPA 2009, Section 9.1):

$$QR = HA\ x\ P_t\ x\ \frac{1}{\sqrt{T_t}}\ x\ GF$$

where:

QR = release rate (lb/min)

HA = hole or puncture area (in^2; assume severed supply line of 0.5 in. Schd. 40 pipe, or 0.302 $in.^2$)

P_t = tank pressure (pounds per square inch absolute [psia]; assume 3,000 psia is bounding tank pressure in all scenarios)

T_t = tank temperature (K; assume ambient temperature of 298.15 K)

GF = gas factor (hydrogen: 5.0; EPA 2009, Exhibit C-2)

Based on the above equation and assumptions, the choked flow release rate (QR) for the hydrogen accident scenario was calculated to be 262 lb/min. The choked flow release rate was compared to a release rate assuming the entire inventory was released in one minute:

Table C.1. Hydrogen Accident Scenario Mass and Calculated Release Rates

Scenario	Mass (kg)	Mass (lb)	1-minute Release Rate (lb/min)	Choked Flow Release Rate (lb/min)	Limiting Release Rate (lb/min)
Cylinders	53	116	116	262	116
Multi-tube storage racks	94	207	207	262	207
Tube trailer[a]	154	340	340	262	262

(a) Choked flow limited release rate applies.

The OCA method for determining the distance to the LFL involves first taking the limiting release rate from Table C.1 and dividing it by the LFL for hydrogen (3.3 mg/L; EPA 2009, Exhibit C-2). The resulting values are then used in a reference table (EPA 2009, Table 26) for a neutrally buoyant gas that assumes neutral atmospheric stability and a wind speed of 3.0 m/s. LFL distances are provided in Section 5.2.16 for each scenario.

C.3 REFERENCES

EPA (U.S. Environmental Protection Agency). 2009. *Risk Management Program Guidance for Offsite Consequence Analysis.* EPA-550-B-99-009, Office of Solid Waste and Emergency Response, Washington, D.C. Accessed February 1, 2017, at https://www.epa.gov/sites/production/files/2013-11/documents/oca-chps.pdf.

APPENDIX D– COMMENTS ON THE DRAFT RICHLAND CAMPUS FUTURE DEVELOPMENT EA AND DOE RESPONSES

The *Draft Environmental Assessment for Pacific Northwest National Laboratory Richland Campus Future Development* (RCFD EA) was distributed for review and comment on May 23, 2017, and the formal comment period extended through July 22, 2017. Section D.1 lists comments received by the U.S. Department of Energy (DOE) Pacific Northwest Site Office (PNSO) on the draft RCFD EA and responses to those comments. Section D.2 shows the original comment letters in their entirety received as part of the comment period. Comments were received from the following:

- Gwen Clear, State of Washington, Union Gap, WA (June 19, 2017)
- Michael Sobotta, Nez Perce Tribe, Lapwai, ID (July 22, 2017)
- Rose Ferri, Yakama Nation, Union Gap, WA (July 21, 2017)
- Jill Nogi, US EPA Region 10, Seattle, WA (July 24, 2017)
- Stuart Arnold, Puget Sound Naval Shipyard and Intermediate Maintenance Facility, Bremerton, WA (April 21, 2017)

D.1 COMMENTS ON DRAFT PSF EA AND DOE RESPONSES

Glen Clear, State of Washington, Union Gap, WA
Comments received: June 19, 2017

Comment 1:

More information on the stormwater program may be found on Ecology's stormwater website at: http://www.ccy.wa.gov/programs/wq/stormwater/construction/. Please submit an application or contact Lloyd Stevens Jr. at the Dept. of Ecology

DOE Response:

Stormwater management is discussed in RCFD EA Sections 3.1.12, 5.2.4.1, and 5.2.4.2. Related permits are described in Section 6.0, and include the potential for a Construction Stormwater General Permit. Future PNNL Richland Campus buildout would occur over time as individual buildings or projects, as discussed in Section 3.1.1. As DOE authorizes buildings and projects for execution, project planning would include a determination of specific permits applicable to the project and initiate engagement with the authorizing regulatory agency. No changes to the RCFD EA were made in response to this comment.

Michael Sobotta, Nez Perce Tribe, Lapwai, ID
Comments received: July 22, 2017

Comment 1:

Wetlands - According to the report, there are no wetlands along the river due to the steep banks and high degree of fluctuation at the Columbia River's edge.

The report does not reference any field reconnaissance or pictures of the river edge to justify the lack of a wetlands reconnaissance or field surveys. The National Wetlands Inventory (NWI) was cited as a source for no wetlands in this reach. The NWI is not a tool for determining wetland presence or absence for projects. It is a resource used for tracking the trends in wetlands nationwide and does not have up-to-date accuracy for making wetland determinations.

Please document field reconnaissance and any associated wetlands if wetland resources are important attributes or credits as part of wildlife and cultural mitigation site. Any shoreline or near-shore plants would be suspect and need a wetland determination. Additionally, hydric soil conditions can form within 30-days of inundation. At present the EA makes no reference to field reconnaissance or wetland delineations. Please include a picture of typical shoreline conditions to communicate rationale for no delineations, if none are actually needed.

DOE Response:

The PNNL Richland Campus property line along the Columbia River is defined by the ordinary high water mark (OHWM), which lies near the bottom of a steep, approximately 20 ft tall, bluff along the entire eastern border of the PNNL Richland Campus. Because all PNNL property is above this OHWM, wetland hydrology (i.e., inundation or saturation of the surface for an amount of time sufficient to support the development of hydrophytic vegetation and/or hydric soils) is unlikely in the DOE-owned portion of the riparian zone. A thin band of wetland may occur below the OHWM; however, it would not be on DOE-owned or DOE-controlled property. Thus, even if wetlands exist along the river, they would not be affected by the potential PNNL Richland Campus development. Beyond the river shoreline, all plant communities on the PNNL Richland Campus have been mapped (see Figure 4.1) and no areas have been identified with vegetation suggestive of wetland conditions. Therefore, a formal delineation of wetlands is not needed to evaluate impacts of the Proposed Action. RCFD EA Section 4.7 has been revised to better reflect this information and will be tied to the biological field surveys mentioned in Section 4.6.2. A photo of the Columbia River Shoreline has been added to Section 4.7 to better illustrate the discussion.

Comment 2:

Floodplains: Document states the active 100-year flood plain lies within the steep river banks. Please include a photo showing the high bank condition and include a figure showing 100-year floodplain map that illustrates floodplain is within present river banks.

DOE Response:

As indicated in RCFD EA Section 4.4.2, no Federal Emergency Management Administration (FEMA) floodplain maps are available for the area north of Horn Rapids Road. Available floodplain maps for the area south of Horn Rapids Road indicate that the100-year floodplain does not overtop the bluff, which is similar to that present north of Horn Rapids Road. Therefore, DOE extrapolated from the available information to assume that none of the PNNL Richland Campus would be within the 100-year floodplain. As also indicated in Section 4.4.2, the portions of the campus where development may occur are above the level of the probable maximum flood for the area (which has a greater than 500-year recurrence interval). Section 4.7 has been revised to better reflect this information, and a photo of the shoreline has been included.

Comment 3:

Cultural Resources: The EA (final) will need to include Section 106 findings, the MOA agreement, and the details of mitigation elements.

DOE Response:

DOE is working with the ACHP and consulting parties to develop mitigation actions for potential impacts to historic or cultural resources through a parallel National Historic Preservation Act (NHPA) Section 106 process. Clarifications were made to the cultural resource sections of the RCFD EA in response to this comment.

Comment 4:

Biological Resources: It is not clear if the mitigation acres meet the 3:1 ratio requirements for displaced shrub-steppe habitat acres at full 20-year build-out. Please include similar narrative in mitigation plan as well.

DOE Response:

The Mitigation Action Plan (RCFD EA Appendix B) states that PNSO will compensate for the loss of mature shrub-steppe at a minimum ratio of 3:1 for all actions that result in the loss of at least 1 ac of habitat. Appendix B also states that compensatory mitigation for shrub-steppe habitats will be performed for facilities or development phases as they are added to the PNNL Richland Campus, with mitigation requirements calculated for each facility or phase. Each individual mitigation action will provide a minimum of 3:1 replacement of mature shrub-steppe habitat lost due to that facility or development phase. No changes to the RCFD EA were made as a result of this comment.

Comment 5:

The Mitigation plan could be improved if specific wildlife species (focal species) associated with the protected habitat types (mature and mid-seral shrub steppe) could be identified along with their vulnerability to traffic, noise, and habitat fragmentation. After 20-year build-out, the mitigation site will be impacted by changes in traffic patterns, increases in noise and light pollution, and habitat fragmentation. For instance, traffic is well documented to cause avoidance (noise) and high mortality (vehicle strikes). Noise/vibration impacts were analyzed only from a human perspective and not from a wildlife perspective at the mitigation site. Our recommendations would to have some baseline noise values at the mitigation boundary to compare with a noise levels at the same locations after 20-year potential buildout. The fundamental question is will the mitigation site be harmed, and if so, by how much from its present state? Please include discussion of these impacts cumulatively and to include impacts from projects similar to the Natural Gas Pipe Line project at Hanford.

DOE Response:

DOE assumed that comments in this comment letter referencing the “mitigation site” are concerned with the preservation designated area (PDA), where the tribes, working with DOE-RL, have proposed to perform mitigation for the land conveyance actions described separately in DOE/EA-1915 (DOE 2015). As described in the Mitigation Action Plan (RCFD EA Appendix B), a specific site has yet to be identified for performance of compensatory mitigation for impacts to shrub-steppe habitats within the potential buildout area, thus assessment of impacts to such a site from factors such as noise and traffic would not be possible. Section 5.2.6 was revised to include an evaluation of the impacts of noise and traffic on wildlife that would be disturbed by the buildout. Isolation of the habitat that would remain in the PDA, given past, present, and reasonably foreseeable future nearby projects (including the Proposed Action) that would fragment shrub-steppe habitat in the vicinity of the PNNL Richland Campus is considered in the cumulative impact analysis in Section 5.2.6.2.

Comment 6:

Transportation: Leaving highly valued shrub-steppe habitat along the river has its obvious benefits, but traffic associated with adjoining business park expansion needs to be described as requested above. Wildlife may be displaced by the traffic related noise and vibrations. Please describe how the mitigation site will be protected from traffic and related noise.

DOE Response:

RCFD EA Section 5.2.6 was revised to include an evaluation of the impacts of noise and traffic on wildlife that would be disturbed by the buildout, including in remaining habitats along the river.

Comment 7:

Noise and Vibration: The noise analysis is based on human thresholds only and does not analyze potential noise impacts to wildlife and the tribal mitigation sites. The 102-acre preservation designated area (PDA) could be impacted with the full 20-year build-out to its boundaries. It would be our recommendation that noise measures be taken at or near the boundary at peak times when noise from present activities can be captured. These values would be good baseline for comparison at various stages of build-out. Noise is a well-known disrupting agent to wildlife.

DOE Response:

RCFD EA Section 5.2.6 was revised to include an evaluation of the impacts of noise on wildlife that would be disturbed by the buildout, including in the remaining PDA along the river. Most studies concern the effects of vehicle or air traffic noise on birds. General sound intensity levels for construction equipment and vehicle traffic were used in the evaluation. Potential changes in avian use of habitat were discussed. The difference between the intensity of construction or traffic noise and baseline noise levels is not helpful in predicting the extent of wildlife response. DOE has determined that baseline noise investigations are not necessary.

Comment 8:
Table S.1: Update Table S.1 after addressing the following issues/concerns: The table should include non-replaceable resources, like acres of shrub-steppe habitats removed at 20-year build-out.

DOE Response:

Table S.1 summarizes impacts described in the RCFD EA. Construction impacts to shrub-steppe habitats, including acreages affected during construction, are presented in Section 5.2.6.1. No changes to the RCFD EA were made in response to this comment.

Comment 9:

Section 3.1.7: Please provide a figure presenting this information or provide a reference to another figure with this information.

DOE Response:

The site access roads are generally shown on Figure 1.2 in Section 1. No changes to the EA were made in response to this comment.

Comment 10:

Section 4.5: (pg 4-5) Cultural and Historic Resources
From a NEPA perspective, the final EA document needs to summarize mitigation elements.

DOE Response:

DOE is working with the ACHP and consulting parties to develop mitigation actions for potential impacts to historic or cultural resources through a parallel National Historic Preservation Act (NHPA) Section 106 process. Clarifications were made to the cultural resource sections of the RCFD EA in response to this comment.

Comment 11:

Section 4.6 Biological Resources (pg 4-14): The best valued habitat is the mature shrub-steppe. Figure 4.1 is a really good figure but it is difficult to identify those that are mature habitats from those that are indicative of disturbance. The figure could group habitats by “climax” and “subclimax” or as “undisturbed” and “previously disturbed” areas. There should then be a table summarizing displaced acres by these two groupings at full 20-year build-out.

DOE Response:

RCFD EA Figure 5.2 groups the habitat resources in Figure 4.1 into resource categories. Figure 5.2 distinguishes mature shrub-steppe habitat (resource category 1 [generally undisturbed or of much less disturbance]) from intermediate shrub-steppe (resource category 2 [areas of generally greater disturbance]) and areas of primarily non-native plants (resource category 3 [generally areas of even greater disturbance]). Table 5.3 summarizes acreages of disturbance of these resource categories from the buildout. No changes were made to the RCFD EA as a result of this comment.

Comment 12:

Federal and State listed species: Table 4.7 is a good start but doesn’t identify whether climax shrub-steppe is a limiting factor for these listed species. If so, then narrative needs to capture how mitigation acres are helping to address this loss for these species. This is doubly important if one or more listed species are culturally important. Mitigation acre and its replacement ratio may need to be higher if that is the case.

DOE Response:

Note that the Table 4.7 referred to in this comment is Table 4.4 in this final RCFD EA. RCFD EA Section 4.6 was revised to indicate whether mature shrub-steppe is a limiting factor for the species in Table 4.4. Section 5.2.6 was revised to indicate that mitigation for disturbance of mature shrub-steppe is expected to offset the loss of mature shrub-steppe for dependent species.

Comment 13:

Are any of the listed species in Table 4.7 also have special cultural significance for the affected Tribes? Bald Eagle does, but do any of the others? Table 4.7 should include that information.

DOE Response:

Note that the Table 4.7 referred to in this comment is Table 4.4 in this final RCFD EA. Other than the bald eagle, which is of cultural significance to many or most North American Tribes, DOE is not aware that any of the other species listed in Table 4.4 are of significance to affected Tribes. No specific information has been provided during this comment response process, thus DOE does not have data to fully evaluate such impacts. No changes to the EA were made in response to this comment.

Comment 14:

Section 4.7 Wetlands and Floodplains (pg 4-20): See general comments on wetlands above. The FWS 2017 Wetlands Inventory should not be used as a determination for wetlands. There is need for field reconnaissance including wetland delineations of any suspect sites. Pictures of shoreline would be helpful to articulate streambank conditions.

See general comment above on Floodplains

DOE Response:

The PNNL campus property line along the Columbia River is defined by the OHWM, which lies near the bottom of a steep, approximately 20 ft tall, bluff along the entire eastern border of the PNNL Richland Campus. Because all PNNL property is above the OHWM, the presence of wetland hydrology (i.e., inundation or saturation of the surface for an amount of time sufficient to support the development of hydrophytic vegetation and/or hydric soils) is unlikely. A thin band of wetland may occur below the OHWM; however, it would not be on DOE-owned or DOE-controlled property. In addition, the Proposed Action does not include any activities on or near the river shoreline; thus, even if present, no wetlands along the river would be affected by the potential PNNL Richland Campus development. Beyond the river shoreline, all plant communities on the PNNL Richland Campus have been mapped as shown in Figure 4.1, and no areas were identified that had vegetation suggestive of wetland conditions. Therefore, a formal delineation of wetlands is not needed to evaluate impacts of the Proposed Action. Section 4.7 has been revised to better reflect this information and will be tied to the biological field surveys mentioned in Section 4.6.2 of the RCFD EA.

Comment 15:

Section 4.8 Socio-economics (pg 4-20)

The discussion should be framed based on economic impacts and taxation relative to the local or regional economy. For instance, it would be more meaningful to compare PNNL's payroll and taxation to those of Benton and Franklin counties and not to the whole state of Washington.

DOE Response:

After the draft RCFD EA was published, new information about the local impact of PNNL in Benton and Franklin Counties was published. Approximately 82 percent of PNNL's employees reside in Benton County, and approximately 11 percent reside in Franklin County. This information has been summarized in Section 4.8 of the final RCFD EA.

Comment 16:

Section 4.9 Environmental Justice (pg 4-22 thru 4-24): Reviewing the broad regional subpopulation level as presented in this write-up is usually conducive to large broad-impacting projects like highways, airports, waste facilities, etc. This review of low and minority populations for this project does not answer the fundamental questions if specific low income or minority populations (trailer parks, housing developments) are negatively impacted by the project. For instance, does the project cause an unfair amount of negative impacts to these communities through actions like housing displacement, increased traffic, noise or air pollution on these specific communities, or creating large increases in travel distances for schools, hospitals, or emergency responders. These are the kind of questions this section should be trying to answer.

DOE Response:

The environmental justice analysis performed for the RCFD EA is comparable to those completed for other recent NEPA actions in the vicinity of the Proposed Action. For impact pathways to be established, low-income or minority populations have to be found in the vicinity. No environmental justice populations have been identified in the vicinity of the Proposed Action. As discussed in Section 5.2.9, no pathways to disproportionately high and adverse impacts have been identified. None of the impacts from the Proposed Action listed in the comment are expected to be anything but minor. No changes were made to the RCFD EA in response to this comment.

Comment 17:

Section 4.13: Noise and Vibration: (pg 4-29): Noise and vibrations needs to be evaluated at the mitigation site boundary from a habitat and a cultural perspective.

Present background noise levels at the edge of mitigation site at locations close to road traffic and other PNNL related noise generation sites. These values should be compared to literature on noise's influence on habitat use by birds and mammals that typically use mature shrub-steppe communities. There is literature out there that discuss changes in wildlife use of available habitat based on changes in noise/vibration levels. Having a mitigation site potentially uninhabitable based on noise and vibrations would defeat the purpose any mitigation site. There are research papers that discuss noise impacts on wildlife use of similar shrub-steppe habitats like those found at the mitigation site.

Section 4.13.1: There was no noise testing to determine baseline conditions at the proposed site or the Mitigation site. The write-up does not provide noise thresholds for wildlife, especially associated with the mitigation site. Literature can provide these wildlife thresholds for noise disturbance.

DOE Response:

RCFD EA Section 5.2.6 was revised to include an evaluation of the impacts of noise on wildlife that would be disturbed by the buildout, including in the remaining PDA along the river. Most studies concern the effects of vehicle or air traffic noise on birds. General sound intensity levels for construction equipment and vehicle traffic were used for the evaluation. Potential changes in avian use of habitat were discussed. The difference between the intensity of construction or traffic noise and baseline noise levels is not helpful in predicting the extent of wildlife response. Thus, DOE has determined that baseline noise investigations are not necessary.

Comment 18:

5.0 Environmental Consequences

Section 5.2.3 Soils and Geological Resources. There is no mention of a General Construction Permitting (GCP) process for disturbing soils and compliance with the GCP process during all phases of any future construction. A GCP is a permit by the State (or EPA) that shows temporary erosion control structures and practices while tracking progress of temporary erosion controls through and until permanent erosion control is in place across the entire building site.

DOE Response:

As described in Section 6.0, a Construction Stormwater General Permit, issued by WA Ecology, would be required for future construction at the site, and construction activities would be performed in accordance with the Stormwater Management Manual for Eastern Washington (WA Ecology 2004). The need for a Construction Stormwater General Permit was added to Section 5.2.4.1 of the RCFD EA.

Comment 19:

Section 5.2.5 Cultural and Historical (pg 5-11) the Section 106 MOA and Mitigation needs to be presented or reference in the document before this EA can receive its FONSI.

DOE Response:

DOE is working with the ACHP and consulting parties to develop mitigation actions for potential impacts to historic or cultural resources through a parallel National Historic Preservation Act (NHPA) Section 106 process. Clarifications were made to the cultural resource sections of the RCFD EA in response to this comment.

Comment 20:

Section 5.2.6 Biological Resources (pg 5-16) This section needs to better present the benefits of the mitigation site and provide narrative of potential impacts to it from potential expansion of proposal. Figure 5.2 needs to clearly label categories 1 and 2 as climax and non-climax shrub steppe communities. These two categories are of higher value and need to be related back to preferred species uses.

Table 5.3 needs to provide total acres of high quality climax habitats, acres of lower quality mid-seral habitats, total acres of displacement at full 20-year build-out, and total mitigation acres. Table 5.3 would be much more valuable if it was summarized by habitat acres of displacement and habitat acres with mitigation site. Appendix C (Biological Mitigation) states the mitigation ratio is 3 to 1. Table 5.3 provides no way of knowing acres displaced, mitigation acres, or whether this mitigation goal of 3-1 is accomplished.

DOE Response:

RCFD EA Section 5.2.6 was revised to include potential impacts of noise and traffic to wildlife in the PDA as part of project construction and operations, and how the buildout could affect the PDA in the future.

The resource categories in Figure 5.2 are well-defined and offer an appropriate degree of habitat resolution. Section 5.2.6 has been revised to indicate that mature shrub-steppe represents the climax plant community. Table 5.3 has been similarly revised.

Although the EA assumes the entire project area (644 ac) could ultimately be used for the buildout, it is not a certainty. In addition, Appendix B states that losses of mature shrub-steppe ≥1 ac would be mitigated, individual mitigation plans would be developed for each phase of buildout, and each mitigation plan would stipulate a replacement ratio of at least 3:1. Thus, while Table 5.3 currently provides displaced acreages of habitat resource categories assuming use of the entire project area (bounding scenario), it cannot be revised to also provide mitigation acreages as it is uncertain 1) whether all the mature shrub-steppe that could be disturbed will be disturbed and 2) whether the replacement ratio would always be 3:1—in some cases the replacement ratio may be greater, depending on the specific mitigation plan developed for each phase of development. [DOE NOTE: The Appendix C referred to in the comment is Appendix B in this final RCFD EA.]

Comment 21:

Section 5.2.6.2 Cumulative Impacts (pg 5-21) The buildout and incremental impacts to shrub-steppe habitats and associated wildlife should be summarized by acres lost to construction, acres in mitigation, and seral acres in mitigation that have potential to become climax habits during 20-year build-out. Please use summary information in Appendix C to address much of these Biological talking points mentioned above.

DOE Response:

RCFD EA Section 5.2.6.2 was revised to reference the affected acreages of shrub-steppe in Tables 5.3 and 5.4. As a bounding analysis, the EA assumes that the entire project area (644 ac) could ultimately be used for the buildout, which includes approximately 135 ac of category 1 habitat. If all 135 ac were replaced at 3:1, 405 ac would be in mitigation. Because of the slow growth rate typical of shrub-steppe habitats, these would all be seral, even after 20 years. However, that is a minimum estimate, and the number of mitigation acres may be considerably greater depending on the specific mitigation actions implemented for each phase of development. [DOE NOTE: The Appendix C referred to in the comment is Appendix B in this final RCFD EA.]

Comment 22:

Section 5.2.10 Traffic and Transportation: Cumulative Impacts (pg 5-25): this should reference literature about traffic-related noise and animal strikes that may limit wildlife use of the shrub-steppe habitats such as the PDA that contain the mitigation sites.

Section 5.2.13 Noise and Vibration (pg 5-34) Cumulative Impacts: There is no noise analysis that establishes present (background) condition for future analysis during 20-year build-out. Noise will likely have a negative impact over time on the mitigation site. One of the problems of NEPA process is it only assess potential impacts. But in this case of a 20-year time frame and our mitigation site being adjacent, we can actually capture noise levels over time and its potential impacts on the mitigation site.

DOE Response:

EA Section 5.2.6—not Section 5.2.10—was revised to include a discussion of the potential impacts of noise and traffic on wildlife, including effects on wildlife in the PDA, and to address how this might affect potential use of the PDA as a mitigation site.

NEPA is intentionally pre-decisional, to allow for the evaluation of the likely significance of potential impacts to support a decision about whether or not to implement a proposed action. Once the decision is made, there is usually little utility to continue measurements or monitoring unless it would be part of mitigation for potentially significant impacts. The EA evaluates construction and operation noise and traffic, and while construction noises may have temporary impacts on wildlife, operational noise is not expected to differ from current PNNL Richland Campus sound levels, which do not appear to have a long-term effect on wildlife. Traffic is not expected to differ significantly from existing conditions on the developed portion of the PNNL Richland Campus in terms of number of vehicles or the amount of noise and vibration generated. DOE has no reason to conclude that noise or traffic impacts are potentially large enough to warrant mitigation and long-term monitoring.

Comment 23:

Additional PNNL expansion topic:

During the DOE –PNNL quarterly meeting Wednesday June 28th it was brought up by NPT staff that during review of lead and arsenic soil sampling on old orchard grounds that additional testing Toxicity Characterization Leaching Procedure (TCLP) is requested to be performed. TCLP will identify the mobility of lead and arsenic, and needs to include testing of non-standard copper. The point to be made is that the originally presented lead and arsenic soils levels do not identify the potential harm. It is their mobility that is the real risk to humans and wildlife. This test is primarily a CERCLA requirement for determining if contaminant mobility is a risk to humans.

DOE Response:

Conducting toxicity characterization leaching procedure analyses on soil collected from the PDA is not necessary because initial screening of the soil, using a handheld x-ray fluorescence analyzer, did not indicate that the concentration of lead or arsenic is at high enough levels to indicate risk to humans (i.e., the levels do not exceed the Model Toxics Control Act Method A cleanup levels for unrestricted use of the soil (WAC 173-340-704)). Studies of vertical migration most relevant to the former orchard properties indicate that lead and arsenic have limited soil mobility (Peryea and Creger 1994; Yokel and Delistraty 2003). With the initial x-ray fluorescence results and knowledge of lead arsenate pesticide residuals and movement in local soils, there is no reason to determine if lead and arsenic mobility is an issue and no reason to collect soil samples to perform toxicity characterization leaching procedure analyses. No changes to the EA were made in response to this comment.

Rose Ferri, Yakama Nation, Union Gap, WA
Comments received: July 21, 2017

Comment 1:

The EA acknowledges actual and potential impacts on tribal treaty rights and cultural resources due to the proposed campus expansion, yet the EA does not present alternative ways of achieving the same purpose. Ultimately, the actions considered will result in some type of development with acknowledged and/or potential impacts to invaluable shrub-steppe habitat and areas of cultural significance.

DOE Response:

RCFD EA Section 3.3 considered two additional siting alternatives to the Proposed Action: (1) using existing federally owned facilities and land at or near the PNNL Richland Campus; and (2) using existing privately owned facilities at or near the PNNL Richland Campus. However, because neither of these alternatives was determined to be a reasonable alternative to the potential buildout, their environmental impacts were not evaluated in detail. Section 3.1 and 3.2 were revised to clarify that exiting PNNL facilities would continue to be occupied, maintained, and refurbished, if reasonable.

Comment 2:

Transferring or leasing of lands out of federal ownership would adversely impact the YN off-reservation treaty rights by diminishing the locations and access to areas where tribal members may exercise treaty rights. Any diminishment of treaty rights was not explicitly stated and the impacts thoroughly described and evaluated. We object to the transfer or lease of any land that affects the ability of the YN to exercise our Treaty rights throughout the Hanford site or that will result in loss or degradation of habitat, natural resources, and/or ecosystems. Land use that will result in any diminishment of treaty rights was not explicitly stated and the impacts thoroughly described and evaluated. We object to any uses that affects the ability of the YN to exercise our Treaty rights throughout the Hanford site or that will result in loss or degradation of habitat, natural resources, and/or ecosystems. Ensuring Treaty compliance is a critical intergovernmental concern. YN request an affirmation by USDOE of Treaty rights across all of Hanford and to subsequently transferred or otherwise utilized DOE/PNSO site lands.

DOE Response:

The Proposed Action has been modified to clarify that the scope of the RCFD EA only covers the potential lease of federal lands for uses that are compatible with the PNNL Richland Campus Master Plan. Federal requirements would remain for any lands under lease. Separate or additional NEPA analysis would be performed prior to the transfer of any PNNL lands out of federal ownership. The scope of the RCFD EA does not cover any portion of the Hanford Site, nor does PNSO have the authority to make affirmations concerning the Hanford Site. DOE continues to respect recognized treaty rights.

Comment 3:

Cultural Resources/Archeological and Historical Sites: In several instances, the EA states the potential for destruction of archeological sites and adverse effects to cultural resources. The philosophy underlying the cleanup of Hanford (including transfer of land ownerships) should be guided explicitly by the goal of allowing Native Peoples to safely live the lifestyle to which they are entitled according to their Treaty rights. This way of thinking is particularly important when considering how to incorporate non-quantitative elements as the spiritual or cultural value of site into land restrictions and/or mitigation actions that guarantee use of the land for specific purposes that are considered inseparable from the Yakama way of life.

Development decisions, restoration actions, vegetation management, land use plans, the use of barriers and run-off controls, etc. need to take into consideration the long-term potential adverse effects on Traditional Cultural Properties (TCPs), cultural resources, and the character defining features that make these sites eligible for listing on the National Register of Historic Places. Mitigation for these related impacts are to be detailed in the forthcoming MOA, mandated by the National Historic Preservation Act (NHPA) and implementing 36 CFR 800 and in mitigation action plans under NEPA. Additionally, the PNNL Richland Campus expansion boundary encompasses the PDA. YN has concerns regarding unlimited surrounding development infringing upon Tribal members' access as well as potential harmful impacts (visual, audio, and etc.) to the ongoing enhancement and protection of cultural and biological resource efforts in this area.

Furthermore, reliance on rather than discussion of any potential impacts of MOAs, IDPs, or programmatic agreements, etc, may underestimate the impacts and significance. YN requests completion of the MOA for this undertaking prior to finalization of the EA decision-making process. This document consistently defers to the NHPA process, therefore impacts to cultural resources/human environment cannot fully be considered until the NHPA process is completed.

DOE Response:

DOE is working with the ACHP and consulting parties to develop mitigation actions for potential impacts to historic or cultural resources through a parallel National Historic Preservation Act (NHPA) Section 106 process. Clarifications were made to the cultural resource sections of the RCFD EA in response to this comment.

Comment 4:

Environmental Justice: The YN has to assume total loss of natural and cultural resources on all acres; thus, YN bears a disproportionate burden of the loss and none of the benefits. All of Hanford's precedents (e.g., the 1100 Area, the DOE Land Conveyance to TRIDEC) point toward a significant trend and continued loss of access and resources, as well as denial of Treaty-reserved rights (despite promises to the contrary). While no access constraints would result from construction, the Proposed Action stated it may limit the Tribes' ability to practice traditional and religious activities on the PNNL Richland Campus. Construction-related activities would reduce the overall footprint of potential areas of interest to the Tribes for traditional use (due to the disturbance, construction, and buildout of large portions of previously undisturbed land on the campus).

DOE Response:

DOE is working with the ACHP and consulting parties to develop mitigation actions for potential impacts to historic or cultural resources through a parallel National Historic Preservation Act (NHPA) Section 106 process. Clarifications were made to the cultural resource sections of the RCFD EA in response to this comment.

Comment 5:

NEPA does not require relevant and reasonable mitigation to be adopted; just discussed. The YN disagrees with inclusion of the statement "Portions of the campus could be leased or transferred to other entities for development compatible with the PNNL Richland Campus Master Plan"; i.e. the concept of potential transfer of land from DOE oversight responsibilities.

The YN is concerned that transferring lands out of federal ownership adversely affects off-reservation treaty hunting and gathering rights by diminishing the locations and access to areas where Yakama tribal members may exercise those rights in the future. Ensuring protection of these rights is a critical intergovernmental concern. This diminishment of treaty rights was not explicitly stated and the impacts thoroughly described and evaluated. YN requests consultation with PNNL regarding locations, types of compensatory mitigation, monitoring, land-use agreements as discussed in Appendix C, as well as our suggested deed restrictions. YN believes this interaction is a critical step needed prior to final decisions on this EA.

DOE Response:

The Proposed Action has been modified to clarify that the scope of this EA only covers the potential lease of federal lands for uses compatible with the PNNL Richland Campus Master Plan. Federal requirements would remain for any lands that are under lease. Separate or additional NEPA analysis would be performed prior to the transfer of any PNNL lands out of federal ownership. [DOE NOTE: The Appendix C referred to in this comment is Appendix B in this final RCFD EA.]

Comment 6:

Habitat, Plants, and Wildlife: Operations of multiple development sites as proposed admittedly further fragments remaining habitats in the local area and degrade or eliminate connectivity in between adjacent habitats. Loss of these habitats may place further pressure on populations of some species that are already experiencing habitat loss in other parts of their range. The discussion of impacts in the EA does not provide a sufficiently detailed evaluation of the severity of impacts, and therefore does not provide a basis for determining the significance of the proposed action(s). It's unrealistic to ask the public to agree to statements inferring minimal impacts when it is unknown what types and the locations of facilities for the anticipated (i.e. proposed build-out) are defined as speculative and other statements indicate loss of irreplaceable habitats. The additional 1 million square feet in a number of facilities [~60] and... associated infrastructure indicates a significant footprint and a definitive loss of irreplaceable resources. Topography will be altered and roads, buildings, and parking lots constructed affecting not only the habitat, plants, wildlife but traditional cultural access routes in the area as well. Anticipated development will effectively amount to the complete destruction of vegetation.
As stated, in some instances unless mitigation measures are enforced, the impact becomes unavoidable and significant yet this is seemingly dismissed (e.g., The open areas on the PNNL Richland Campus, with grass or native vegetation, currently include about 148 ha (366 ac); this would decrease by 14 ha (35 ac) to 18 ha (45 ac) in the planned 20-year buildout.) This is a reduction to ~10-12% of current size. This is a significant impact on habitats rated primarily level 3-level thru 5 and which are in close proximity to a preservation area (the PDA), the Columbia River and its shoreline corridor of multiple resource levels and riparian vegetation types/and communities.

DOE Response:

RCFD EA Section 5.2.6.1.1 discusses the isolation and degradation of mature and intermediate shrub-steppe habitats in the project area and effects on wildlife that would result from the buildout. Section 5.2.6.2 discusses these concepts considering cumulative impacts to shrub-steppe and wildlife over a broader area. These evaluations assume complete removal of all habitat resources described in Section 5.2.6.1.1 across the entire (644 ac) project area as a bounding case. Some effects of the buildout on wildlife would be severe (e.g., mortality) to the individuals experiencing such effects, while some effects would likely be less severe (e.g., disturbance and displacement). Notwithstanding severe effects on some individuals, overall population and species-level effects are considered relatively minor because of the widespread occurrence of affected species populations in large, nearby areas of suitable habitat (e.g., the Hanford Site) and because PNSO will perform compensatory mitigation. As described in the Mitigation Action Plan (RCFD EA Appendix B), mitigation of shrub-steppe habitat at a minimum of a 3:1 replacement ratio is expected to offset losses of habitat and wildlife due to the buildout. RCFD EA Section 5.2.6 was revised to clarify these bases for the impact determination.

Comment 7:

The nature of the vegetation impacted maybe misrepresented. Every level of biological resources habitats identified in DOE/RL-86-32 (DOE's Biological Resources Mitigation Plan) including areas deemed irreplaceable resources are identified within or surrounding the boundaries encompassing this action (i.e. dune blowout & irreplaceable areas). There is a difference in compensatory mitigation, as BRMP calls for placement of mitigations at the highest habitat level identified. The potential for higher levels of habitat or species should be the guide for mitigation efforts. Levels 4/5 habitats at a higher ratio (5:1 compared to

3:1 for Level 3 habitat; full development of the 134 acres would need to be offset by 670 acres (~1.5 square miles) of mitigation). Recovery, even if mitigation were put in place, would take decades. Although PNSO has developed a biological resource management policy for the PNNL Richland Campus that includes mitigation for loss of priority habitats (DOE/PNSO 2015). This plan, though similar has differences in compensatory mitigation. Because the extension lands lie adjacent to the Hanford Site, it may be more appropriate to evaluate these resources using DOE's BRMP[1]. YN requests that a reevaluation of those areas within this campus expansion that have already evaluated under existing mitigation action plans to ensure consistency in approach and methodology.
[Footnote:] [1] Hanford Site Biological Resource Management Plan (BRMP) (DOE 2013a)

DOE Response:

DOE/RL's *Hanford Site Biological Resources Management Plan* (DOE 2013) is not applicable to lands managed by PNSO. PNSO's *Cultural and Biological Resources Management Plan* (DOE/PNSO 2015) was developed in consultation with the tribes and states that mitigation (i.e., avoidance, minimization, rectification, and/or compensation) will result in no net loss of habitat value or wildlife populations. The plan also states mitigation requirements for a project will be identified in the biological resources review (BRR) for that project. For the buildout in general, PNSO has set the lower limit on mitigation of mature shrub-steppe at a 3:1 replacement ratio for actions removing ≥ 1 ac of habitat. However, the specific mitigation requirements for each phase of the buildout will be set forth in the BRR for that phase. The objective of the BRRs for the various phases of the buildout will be to specify mitigation that will result in no net loss of habitat value or wildlife populations. No changes to the RCFD EA were made in response to this comment.

Comment 8:

Furthermore, potential injury or mortality to wildlife is expressed but, also seemingly dismissed with inconclusive statements reflective of the attitude that the Hanford Site or the surrounding areas including the Hanford Reach contain 'ample' foraging habitat for affected species or habitats of similar ecological value.

DOE Response:

Notwithstanding severe effects (e.g., mortality) on some individuals in the project area, overall wildlife population and species-level impacts are considered low because of the widespread occurrence of affected species populations in large nearby areas of suitable habitat (e.g., the Hanford Site) and PNSO's intention to perform compensatory mitigation. Mitigation of shrub-steppe habitat at a minimum of a 3:1 replacement ratio is expected to offset losses of habitat and wildlife due to the buildout. RCFD EA Section 5.2.6 was revised to clarify these bases for the impact determination.

Comment 9:

Lastly, the EA doesn't consider potential chemical or radiological exposures resulting from the use of traditional plants from other areas of the Hanford Site, or the availability of access to other areas. Traditional plant species used or that could be used by the Tribes will be removed and no longer available yet the statement "the Hanford site, however, includes large tracts of lands with similar plant communities" is supposed to reassure/ensure the sustainability of these resources for Tribal uses.

DOE Response:

The RCFD EA does not contain the statement "the Hanford site, however, includes large tracts of lands with similar plant communities."

DOE is working with the ACHP and consulting parties to develop mitigation actions for potential impacts to historic or cultural resources through a parallel National Historic Preservation Act (NHPA) Section 106 process. Clarifications were made to the cultural resource sections of the RCFD EA in response to this comment.

Comment 10:

Environmental Consequences and Cumulative Risk: YN believes a cumulative effects assessment should answer difficult and formerly unaddressed questions regarding combined risk burdens and disproportionate impacts. It should involve evaluation of collective effects of multiple agents or stressors -as opposed to individual effects of a single stressor. It should be broad enough to include not only any chemical contaminant risks (if any) but incorporate nonconventional stressors (e.g., the concept of vulnerability; differential biological susceptibility and exposure, as well as differential preparedness to withstand stressor effects and ability to recover from stressor effects) into the assessment. Analysis should be conducted on; if and how the effects or the risks from the various agents or stressors interact independently, in combination, or in synergy (e.g. 'storm water runoff would be minimized, combination of surface swales, etc' while not considering the diverse effects of soil and habitat removal, mixing of soil horizons, etc on ecological resources within the area holistically).

DOE Response:

It is not clear from the comment which impacts are believed to be not adequately addressed. The RCFD EA discusses cumulative effects for each resource area in Chapter 5, and vulnerability, biological susceptibility, and preparedness to withstand stressor effect are included in the assessment. For instance, Section 5.2.6 identifies specific acreages of habitats that would be disturbed during the potential 20-year campus buildout. Section 5.2.6 also identifies secondary impacts to remaining undisturbed habitats resulting from habitat loss—specifically, intermediate shrub-steppe and vulnerability of remaining habitat—and concludes "The reduction in size and distribution and the increase in isolation would tend to degrade the remaining intermediate shrub-steppe by making it more susceptible to invasion by weedy species (Section 4.6), which would reduce native forbs (and any associated pollinators [79 FR 35901]) and bunchgrasses and make the habitat less valuable to wildlife (Dobler et al. 1996)." In addition, Section 5.2.6 recognizes the "Installation of facilities and xeriscaping would increase habitat for avian species that nest on man-made structures and decrease habitat for shrub- and ground-nesting species (Section 4.6)". Overall, the RCFD EA considers the collective effects of PNNL Richland Campus buildout and the dynamic response of site habitats and populations. EAs are prepared according to a graded approach which limits assessment work to those areas which are judged to have clear bearing upon decisions about the Proposed Action. Finer or more extensive resolution of impacts doesn't necessarily provide decision-makers with more useful information. No changes to the RCFD EA were made in response to this comment.

Comment 11:

YN disagrees with several of the conclusions. This EA process is designed to evaluate the contexts in which impacts from proposed facilities and infrastructure envisioned in the current PNNL Richland Campus Master Plan Richland Campus. The EA describes the impacts (direct/indirect) but does not address the how the proposed action will significantly alter the environment. Analysis of significance

requires consideration of both context and intensity. Significance cannot be avoided by terming an action intermittent and temporary or by breaking it down into small component parts[2] (e.gs. identified cumulative impacts to the Shu Wipa TCP and the Yakama Nation TCP, construction/operational/ emission impacts to air quality, visual resources classification changes [Class III to Class IV[3]] due to impacts, noted permanent and irreplaceable impacts to rare plant and mature shrub-steppe habitats, 'farmland of statewide importance/prime farmland if irrigated' areas, water uses) or by excluding probable future actions of impact (e.g. redesigning of the Navy Haul Road within the PDA).[40 CFR 1508.27.]
Simplistic statements that activities within the PNNL Richland Campus would be incremental or consistent with adjacent land uses planned by the City of Richland and Benton County and that no incompatibility issues are anticipated does not sufficiently address NEPA -40 CFR 1508.27 requirements.

[Footnote:] [2] 40 CFR 1508.27
[3] Visual impacts are adverse effects to TCPs under the NHPA and need to be mitigated to comply with the statute as well as NEPA.

DOE Response:

This RCFD EA discloses the potential impacts of the potential 20-year buildout of the PNNL Richland Campus. This RCFD EA does not determine their significance. Following completion of this RCFD EA, DOE will assess the significance of the impacts and either issue a Finding of No Significant Impacts, or decide to prepare an environmental impact statement. No changes to the RCFD EA were made in response to this comment.

Comment 12:

Text in Section 3.1 eludes the need for an EIS. This EA cannot be deemed bounding if it cannot ensure there will be no future development outside the scope and associated impacts identified and evaluated within it (e.g., *Additional NEPA review would be conducted if it is determined that a new development proposal does not fall within the EA proposed action area (Figure 1.2), the development scope is different than that described in the following subsections of Section 3.1, or the environmental impacts are different than those described in Section 5.2*). Use of information from DOE/EA-1915D without further site-specific evaluation may not accurately capture what is anticipated to happen with the extension of the PNNL Richland campus (e.g., evaluations of Noise and Vibration, Acoustic Noise, Utilities and Infrastructure).

DOE Response:

The Proposed Action is the potential buildout of the campus over 20 years. This EA describes bounding impacts associated with known and potnetial future expansion activities over that period as described in Section 3.0. However, DOE's mission requirements may change over time, and these changes may result in PNNL Richland Campus expansion activities different than those described herein. DOE will evaluate all future PNNL Richland Campus expansion activities and if proposed actions are not consistent with the Proposed Action in this EA, DOE will determine whether additional NEPA review would be required prior to any decision to proceed. As part of this process, DOE may include project- and site-specific assessments of the noise and vibration, acoustic noise, utilities, and infrastructure impacts as new projects are proposed. No changes to the RCFD EA were made in response to this comment.

Comment 13:

The EA identifies net loss of sagebrush/steppe habitat and notes the importance of habitat yet dismisses the significance of losses associated with campus expansion. True, some past, present, and reasonably foreseeable future actions at the Hanford site, Benton County, and the surrounding region of interest (ROI) were included within the discussion of cumulative effects. However, other important considerations were not e.g., the potential impacts of other types of manufacturing were not identified [e.g., Port of Benton Rail expansion] nor DOE efforts for remediation, restoration, and preservation of natural resources of the Hanford site or failure of any DOE action on the Hanford site, or failure of suggested mitigations or the cumulative net loss of sagebrush/steppe habitant in the Columbia Basin Ecoregion.

DOE Response:

Table 5.1 includes the Port of Benton rail expansion: "Industrial/Infrastructure. Lands transferred from TRIDEC to the City of Richland, Port of Benton, and Energy Northwest may include future industrial development and its infrastructure and rail (Tangent 2017)." The EA does not define a "Region of Interest" for sagebrush/steppe or other biological habitats; however, the status of shrub-steppe habitat in the Columbia Basin ecoregion is discussed in the introduction to Section 4.6. The vicinity of the PNNL Richland Campus considered important in the cumulative impact analysis for biological habitats is shown in Figure 5.1. Local impacts to sagebrush/steppe habitat as a result of planned PNNL Richland Campus expansion activities would not contribute in a discernable way to the regional changes to this habitat type, as discussed in the introduction to Section 4.6, especially after mitigation actions are implemented as described in the Mitigation Action Plan (RCFD EA Appendix B). No changes to the RCFD EA were made in response to this comment.

Comment 14:

Another example of an area of important consideration not discussed in this EA is the need for water resources from the Columbia River. Withdrawal system under existing water rights is not arbitrary. In any case, if several actions taken together will indeed have a cumulatively significant effect.

DOE Response:

Columbia River water use on the PNNL Richland Campus is acknowledged in RCFD EA Sections 3.1.6 (for irrigation), 4.1.4 (description of City of Richland water system), 5.2.4.1 (for construction), 5.2.4.2 (for operation), and 5.2.4.3 (for future actions considered in cumulative impacts). As described in Section 5.2.4.2, future building water use with full buildout is expected to be similar to the water use in 2016. Irrigation water use is expected to be reduced from current usage. The City of Richland is planning for increased water use and the potential cumulative water uses are well within the City's existing Columbia River water right, as described in Section 5.2.4.3. No changes to the RCFD EA were made in response to this comment.

Comment 15:

Scope: YN believes the scope of the EA analysis to be too narrow and disagrees with the position that under the adverse impacts of the No Action Alternative DOE's ability to support DOE's strategic goals would be substantially reduced. DOE's & PNNL's current operational management policies require maintenance of these facilities in a manner protective of human health and the environment. This includes the possibility of refurbishing and/or replacement of facilities in support of mission goals. The current Richland Campus could be modified; expansion is not the only solution. Furthermore, the No Action Alternative should recognize that the lack of development will preserve any cultural and natural resources and the potential for honoring Treaty rights, whereas the conveyance of lands will result in a disproportionate burden of loss of benefits upon the Tribes.

DOE Response:

DOE considered refurbishing and/or replacement of facilities in support of mission goals. However, DOE has determined that without new state-of-the-science facilities, under the No Action Alternative at some time during the next 20 years PNNL would be unable to provide the scientific research required to meet DOE-'s future mission needs. The Proposed Action does not include conveyance of lands. Section 5.3.2 states that under the no action alternative "The shrub-steppe and other native habitat and cultural resources within the campus would be undisturbed, and emissions and noise from construction activities would not occur." Section 3.1 and 3.2 were revised to clarify that exiting PNNL facilities would continue to be occupied, maintained, and refurbished, if reasonable. The decision to refurbish or replace an existing facility would consider mission needs, lifecycle costs, and return on investment.

Comment 16:

- EA does not accurately reflect the legalities of suggested deed restrictions and/or mitigation measures and the likelihood of these mitigation measures being both effective and enforceable via permit or deed restrictions.

DOE Response:

The comment does not identify any aspects of the deed restrictions and mitigation measures listed in the RCFD EA that have been inaccurately characterized in terms of legality or enforceability. The EA does not suggest any deed restrictions, except in Appendix B in regard to the case of a mitigation site being selected off of federal-owned property. No changes to the RCFD EA were made in response to this comment.

Comment 17:

- Impacts, if any, associated with the 300 Area Record of Decision.

DOE Response:

The cumulative impact assessments in RCFD EA Section 5.0 include consideration of ongoing and reasonably-foreseeable projects in Table 5.1. The remaining remedial actions in the 300 Area have been added to Table 5.1. The cumulative impact assessments were reviewed for possible changes resulting from the inclusion of the 300 Area Record of Decision (DOE and EPA 2013). Because this ongoing remedial action was already generally considered part of the baseline activities at or near the PNNL Richland Campus, the assessments of cumulative impacts did not change in response to this comment.

Comment 18:

- DOE's ongoing mission to cleanup Hanford and to prevent contamination from leaving the site and needed changes to its various Hanford site-operating procedures as development occurs.

DOE Response:

RCFD EA Section 4.4.3 discusses groundwater concentrations of tritium, nitrate, and uranium above background levels. Current PNNL facilities and operations do not contribute to the existing groundwater contaminant plumes, and future PNNL facilities and operations would not contribute to these plumes.

Therefore, the Proposed Action would not contribute to cumulative impacts of other ongoing DOE Hanford remediation activities. No changes to the RCFD EA were made in response to this comment.

Comment 19:

- DOE's continuing responsibility to remediate the groundwater plume under-lying portions of the lands to be conveyed (trichloroethene (TCE) and nitrate plumes). DOE/RL-2016-33, Revision 0 Section 8.0: Groundwater Monitoring Hanford Site Environmental Report for CY 2015 Uranium and cis-1,2-dichloroethene continued to exceed Permit limits in 2015. Remediation will be coordinated under the 300-FF-5 Groundwater OU. Nitrate concentrations near the 618-11 Burial Ground also continued to exceed 45 mg/L. Uranium concentrations in Hanford Site wells near the DOE inactive Horn Rapids Landfill have increased gradually since 1996, exceeding the DWS in 2015.

DOE Response:

Current groundwater quality on the PNNL Richland Campus is described in RCFD EA Section 4.4.3, including the 2015 groundwater monitoring data as reported in DOE/RL-2016-09, *Hanford Site Groundwater Monitoring Report for 2015* (DOE 2016a), including measurements on and in the vicinity of the PNNL Richland Campus for tritium, nitrate, uranium, and trichloroethene. As described in DOE/RL-2016-09, the trichloroethene degradation product, cis-1,2-dichloroethene, was observed in 2015 to be above the cleanup level in one well; however, the well is well north of, and unlikely to affect groundwater quality at, the PNNL Richland Campus. Thus, it is not discussed in the EA. As described in Section 5.2.4, construction and operation of new PNNL Richland Campus facilities would not affect the groundwater, and neither existing nor new facilities would contribute contaminants to the groundwater. Remediation of groundwater plumes, if required, would be the responsibility of DOE-RL and is not part of the scope of the RCFD EA. No changes to the RCFD EA were made in response to this comment.

Comment 20:

- Effects of fertilizers/pesticides on plants and groundwater.

DOE Response:

Xeriscaping will be implemented for the buildout to the extent practicable. Use of fertilizers/pesticides and irrigation in xeriscaped areas is expected to be less than for typical landscaping around existing PNNL facilities. Thus, the potential effects of fertilizers/pesticides on plants (e.g., native plants in offsite areas) or on groundwater from the Proposed Action are expected to be negligible. No changes to the RCFD EA were made in response to this comment.

Comment 21:

- Impacts from spills/spill management.

DOE Response:

Spill management is described in RCFD EA Section 3.1.12. Described measures are expected to prevent and minimize the impacts of spills on water and other resources. No changes to the RCFD EA were made in response to this comment.

Comment 22:

- Impacts to the Hanford Site activities and the City of Richland from rerouting decisions on access routes (i.e. elimination of portion of George Washington Way, relocation, expansion, or upgrade of the Navy haul road, and similar impacts to the PDA and Tribal activities on the PDA and elsewhere).

DOE Response:

The actions expected related to George Washington Way and the Navy haul road are described in Sections 3.1.7 and 3.1.8 of the RCFD EA, respectively. Hanford Site- and City of Richland-related traffic north of Horn Rapids Road would be expected to take alternative routes, in light of the closure of George Washington Way. As indicated in Table 4.11, the average affected traffic volume is relatively low. Thus, the impacts suggested by the comment would be minor. These impacts have been clarified in Section 5.10 of the RCFD EA.

Comment 23:

Impacts to PNNL and surrounding areas due to infrastructure needs with campus expansion:

- DOE owns, operates, and maintains the water and sewer utility infrastructure in the 300 Area. The City of Richland owns, operates, and maintains the power, water, and sewer infrastructure for the balance of the PNNL campus in Richland. There is an unexamined over-reliance on City of Richland's intent to provide these services, and impacts should it not be able to do so. YN requests inclusion of reasonably foreseeable financial obligations for the City of Richland residents to support the necessary new, long-term utility demands.
- (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 utilizing long-haul services to a regional landfill (City of Richland 2011)). It is unclear how this proposal alters the City of Richland/PNNL relationship? It is unclear how will the City of Richland benefit or that is the City is capable of this extension without adversely affecting its citizens -their pocketbooks?
- Impacts of Battelle's exiting of non-DOE owned facilities that is and will continue to happen on the City of Richland social/economic development, and impacts to these areas and surrounding areas with demolition, etc.
- Impacts associated with 'new sewer lift stations and associated forced mains' not accounted for.
- Impacts associated with fiber optic communications not accounted for.
- Impacts associated with potential new BPA substation (#2) not accounted for.
- Impacts associated with the implementation of the 1-2017 Port of Benton/City of Richland 'Rail Master Plan.'

DOE Response:

The characterization of various utility impacts from the Proposed Action (i.e., water, sewer, solid waste, electricity, natural gas, and port services) is based on the best planning documentation currently available covering the affected resources. DOE relies on this information to make its impact assessment and does not speculate about the impacts if current published plans were to change in the future. As is current practice, DOE will continue to work in cooperation with the City of Richland and other related entities, as needed, to facilitate incorporation of future development plans into the affected planning processes. The financial obligations of City of Richland residents and other customers subject to the plans of the affected utilities and services are considered within the proceedings governing those utilities and services, and not the purview of DOE to consider under this Proposed Action. No changes to the RCFD EA were made in response to this comment.

Comment 24:

- The EA does not discuss a bounding accident scenario [radiological release] for Building 342 located on the Hanford Site, any resulting impacts, or necessary emergency actions to be taken. YN request this analysis be done for this facility and ongoing or planned actions (e.g. 618-11 waste site remediation) that might have radiological impact to the EA lands or co-located lands.

DOE Response:

DOE-RL has purview over the 324 Building, as well as other Hanford Site locations where remediation actions and operations are ongoing. Hanford Site facility emergency planning actions are evaluated under DOE-RL and are outside of the scope of this EA and PNSO. That said, emergency planning program staff at both sites are aware of the potential radiological risk posed by an event at each site, due to their close proximity. Both sites must comply with DOE requirements to maintain a Comprehensive Emergency Management System; at this time PNNL expects to have DOE O 151.1D (DOE 2016b) implemented by the end of fiscal year 2017, while the Hanford Site currently meets the requirements of DOE O 151.1C (DOE 2005). DOE O 151.1 covers planning for reentry, recovery, and post-emergency activities. The 618-11 remediation site is approximately 8 mi north of the PNNL campus, and is not expected to impact PNNL Richland Campus operations. No changes to the RCFD EA were made in response to this comment.

Comment 25:

- The EA does not discuss the impacts associated with the proposed natural-gas pipeline, yet lists it as an infrastructure source. YN requests this information be included.

DOE Response:

RCFD EA Table 5.1 includes the proposed natural-gas pipeline that would connect to an existing pipeline north of Pasco, before traversing 16 km (10 mi) to cross under the Columbia River, and continue 32 km (20 mi) to the Hanford Site 200 East Area. Projects included in Table 5.1 are discussed in Section 5.0 in each resource area under the resource-specific cumulative impacts sections. For instance, Section 5.2.6.2 describes construction-related impacts to biological resources from projects listed in Table 5.1. As explained in Section 5.2.14.1, natural gas for campus operations would be provided via extension of existing systems that service north Richland and facilities in the 300 Area, and would not connect to the proposed pipeline described above. No changes to the RCFD EA were made in response to this comment.

Comment 26:

- YN request a review (and evaluation/inclusion of information) of the ambient air monitoring program for radionuclide to ensure it adequately accounts for proposed facilities (e.g., reassessment of air model to predict how far contaminants could travel offsite Hanford without harming the public given that the land buffer has been reduced.

DOE Response:

The Washington State Department of Health has an existing approval process for licensing a new radioactive emission unit. RCFD EA Section 3.1.3 indicates regulatory requirements for new emissions units. To add an emission unit to the existing license, an evaluation of potential building emissions and the need for emissions controls, stack monitoring, and ambient monitoring are reviewed. The necessary steps are implemented prior to emissions unit use. The ambient monitoring program is reviewed through a Data Quality Objectives process when there are significant changes to campus emission units or boundaries (e.g., see Barnett et al. 2012). No changes to the RCFD EA were made in response to this comment.

Comment 27:

Mitigations by USDOE and/or future landowners or local, state jurisdictions are arguably potential deed restrictions.

- YN requests mitigation for related impacts which are to be detailed in the forthcoming MOA to prohibit construction activities and or utility development on lands for any future, and/or newly identified ecological resources (including vegetation, wildlife, birds, mammals, reptiles & amphibians, threatened & endangered species) found to be present. YN requests deed restrictions to that effect. Furthermore, YN requests mitigation actions performed and their monitoring and contingency planning to be included as deed restrictions.
- YN requests deed restrictions to prohibit construction activities and or utility development within swale and dune blowout areas and those areas identified to have similar plant species. YN requests track the unusual assemblage of plant species occurring in and around the swales to be included also. Particular protection should be given to those areas with suitable habitat for species of rare spring ephemeral annual plants, including Great Basin gilia, loeflingia, rosy pussypaws, and Suksdorf monkeyflower (WDNR 2017 and potential suitable snake hibernacula areas [e.g. the striped whipsnake (Masticophis taeniatus, Washington State candidate species)]).
- YN requests deed restrictions to ensure no future development of any facility designating as a Hazard Category 1, 2, or 3 or small modular reactor facilities on leased or transferred lands.
- YN requests deed restrictions to ensure no construction or operation of laboratories with BSL-3 or BSL-4 containment or a finding of significance and determination for the need of an NEPA EIS analysis. [This potential significant impact is not accounted for within this EA.]
- YN requests deed restrictions to ensure no use of groundwater beneath the PNNL Richland Campus is allowed. It is affected by the Hanford Site activities.
- YN notes the assumption that SEPA reviews would be done when Richland City or other local jurisdiction considers a need for additional infrastructure to the area. YN requests deed restriction for all those areas where potential SEPA reviews are suggested or indicated.
- YN requests deed restrictions to ensure no additional stormwater to be allowed to enter the City of Richland system.
- YN notes potential for site-specific deep excavation conditions that may extend to groundwater with required excavation dewatering and mitigation of some type. YN requests these be included as deed restrictions. Furthermore, this potential significant impact is not accounted for within this EA.
- Deed restrictions with requirement to be consistent with the Hanford Site Cultural Resources Management Plan (DOE 2003b). These lands will remain under DOE ownership and responsibility; YN wishes to discuss use of this document concurrent with mitigation efforts, Appendix C, and the PNSO Cultural and Biological Resources Management Plan (DOE/PNSO 2015) and how to ensure required mitigation efforts ‘run with the land.’
- Potential permitting needs: DOE guidance emphasizes not relying on compliance with applicable requirements (e.g., waste disposal permits, water or air emissions permits) as evidence that an analyzed alternative does not have potential for significant impact(s)[1]. YN requests obtainment and

compliance with all required Permits be included as deed restrictions. YN requests monitoring of Permitting requirements be included as an obligation in a deed restriction.

[Footnote:] 1 U.S. Department of Energy Environment, Safety and Health Office of NEPA Policy and Compliance, Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements, Second Edition, December 2004.

- Potential Mitigation Measures for pollution prevention and waste minimization/management: YN request that the assumptions/expectations/etc listed in Section 3.1.12 and 3.1. be included as deed restrictions.
- YN request the information regarding integration and coordination agreements between local, state, and DOE is included as deed restrictions.

DOE Response:

The Proposed Action has been modified to clarify that the scope of this RCFD EA only covers the potential lease of federal lands for uses compatible with the PNNL Richland Campus Master Plan. Federal requirements would remain for any lands that are under lease. Separate or additional NEPA review, including the need for appropriate deed restrictions, would be performed prior to the transfer of any PNNL lands out of federal ownership. [DOE NOTE: The Appendix C referred to in this comment is Appendix B in this final RCFD EA.]

Jill Nogi, US EPA Region 10, Seattle, WA
Comments received: July 24, 2017

Comment 1:

Water resources and impacts

The Draft EA indicates that water quality may be adversely affected if the project construction activities, including excavation, surface grading, surface pavement, and building rooftops alter the hydrology of springs and surface runoff such that erosion carries sediment and pollutants to surface waters and the underlying aquifer. In addition, land disturbance, material storage, waste disposal, inadvertent chemical or hazardous liquid spills, and compaction produced by vehicular traffic can all affect recharge to the local aquifer as well as groundwater quality. The State of Washington has promulgated surface water quality standards that must be met. In particular, impacts to the section of the Columbia River next to the project site should be avoided. If this section of the River meets the State of Washington water quality standards for surface waters (WQS), please note that antidegradation provisions of the Clean Water Act and the State of Washington WQS apply to waterbodies that currently meet the standards. Because the Columbia River is adjacent to the project site, we recommend that the DOE coordinate with Washington State Department of Ecology (Ecology), and all affected tribes, in order to assure that state and tribal water resources are protected throughout the project construction and operation activities.

The Draft EA discusses project impacts to water resources and provides appropriate information on measures to take to manage stormwater, including use of practices in the Stormwater Management Manual for Eastern Washington. We appreciate the information provided on stormwater, and we continue to suggest that a National Pollutant Discharge Elimination System (NPDES) permit from Ecology may be required for the project, because construction activities would disturb more than 1 acre of land (p. 3-2). Therefore, the Final EA should include information on the permit application process and recommended measures to protect water quality from stormwater runoff during construction. The proposed best management practices can lessen the impacts of storm water runoff from impervious surfaces, but pollutants may still reach surface waters and groundwater. We therefore recommend the consideration of Low Impact Development (LID) techniques[1] during the implementation of the project, potentially reducing stormwater volumes and helping to mimic natural conditions as closely as possible. The techniques can also lessen the impacts of stormwater runoff from impervious surfaces and can provide energy and other utility savings. Under Section 438 of the Energy Independence and Security Act (EISA), federal agencies have to reduce stormwater runoff from federal development projects in order to protect water resources. The EPA Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act can be accessed online[2].

Since the project site is within an area subject to environmental cleanup, due to high levels of radionuclide and chemical contamination of groundwater; including tritium, nitrate, and uranium, we recommend that DOE work with the EPA Hanford Office in order to ensure that the project is implemented in accordance with the requirements under the Comprehensive Environmental Response, Compensation, and Liability Act of1980 (CERCLA). The Draft EA indicates that groundwater beneath the project site contains concentrations of tritium, nitrate, and uranium above background levels and that construction activities could impact these contaminant plumes, especially where excavations would be necessary and the depth to groundwater is near the surface. During the project operation, underground injection wells would also be used to manage stormwater and it is possible that impacts to groundwater quality could be exacerbated. We recommend that the DOE work with Ecology's UIC Program on any concerns due to the use of injection wells during construction and operation of the project.

[FOOTNOTE:]
[1] http://www.epa.gov/owow/NPS/lid/
[2] https://www.epa.gov/nps/stormwater-management-federal-facilities-under-section-438-energy-independence-and-security-act

DOE Response:

Stormwater management is discussed in RCFD EA Sections 3.1.12, 5.2.4.1, and 5.2.4.2. Related permits are described in Section 6.0, and include the potential for a Construction Stormwater General Permit. Spill management is described in Section 3.1.12. Measures described in that section are expected to prevent and minimize the impacts of spills on water and other resources. As stated in Section 5.2.4.2, during operation, stormwater would be managed onsite either by directing runoff to grass or gravel swales for infiltration, or by the use of underground injection control wells, such as drywells and infiltration trenches (with perforated pipes). The use of underground injection control wells for stormwater management is regulated by WA Ecology, which includes the use of best management practices to protect groundwater and prevent the spread of any underlying groundwater contamination. In addition, current PNNL facilities and operations do not contribute to the existing groundwater contaminant plumes, and future PNNL facilities and operations would not contribute to these plumes. No discharges to the Columbia River would occur during construction or operation. Future PNNL Richland Campus buildout would occur over time as individual buildings or projects, as discussed in Section 3.1.1. As DOE authorizes buildings and projects for execution, project planning would include a determination of specific permits applicable to the project and initiate engagement with the authorizing regulatory agency. No changes to the RCFD EA were made in response to this comment.

Comment 2:

Air Quality Impacts

The Draft EA describes the current air quality conditions in the project area and indicates that the project is within an area designated as an unclassified/attainment area. This means that the air quality measures better than the minimum national standards for criteria air pollutants (p. 4-1), and that air quality impacts from the project would not exceed any national ambient air quality standards (NAAQS). Even though background concentrations of criteria pollutants within the project area and vicinity are currently within the standards, we recognize that there is the potential for considerable air emissions from the project due to fugitive dust releases during ground disturbing activities, as well as the cumulative impacts from road construction and site preparations, regular traffic on dirt roads, emissions from vehicles using local roads, agriculture, fire, and woodstoves in the area.

As the project area and vicinity would likely include sensitive receptors (i.e., children and the elderly), and the project would increase traffic by up to 31 percent (p. 5-24), it will be imp01iant to monitor air quality and take corrective action where necessary in order to prevent the deterioration of air quality in the area. Monitoring strategies should be tailored to local conditions because impacts can be substantial, even when the area-wide and/or long-term monitoring may show compliance with air quality regulatory requirements. We recommend that the DOE maximizes the implementation of mitigation measures described in the Draft EA in order to reduce the emissions associated with the proposed project. We also recommend that the DOE continues to coordinate with other entities in the area, especially Ecology, to assure that the project would meet both the state requirements and the NAAQS throughout its life cycle.

DOE Response:

Air-quality impacts from construction are discussed in RCFD EA Section 5.2.2.1. Site clearing and vehicle movement over unpaved surfaces can result in fugitive dust generation. In addition, windblown dust can be generated over disturbed surfaces that have not been properly stabilized. Regulations require that reasonable precautions be taken to prevent fugitive dust from becoming airborne to ensure that the dust does not move off property boundaries and impact others. As noted in Section 5.2.2.1, fugitive dust mitigation strategies, such frequent watering and the application of dust adhesion products, will be used to minimize airborne emissions. Other methods, such as sequencing operations to limit the size of cleared areas, enforcing site access restrictions, and reducing vehicle speed over disturbed areas, will also be considered to limit fugitive dust impacts. DOE will ensure that it maximizes the implementation of mitigation measures described in the RCFD EA to reduce fugitive dust emissions associated with the new construction. No changes to the RCFD EA were made in response to this comment.

Comment 3:

Energy efficiency and conservation

Since the proposed project would involve the construction, operation, and maintenance of buildings and facilities over a 20-year period, we recommend that the EA includes information related to energy use and conservation, and how the project would fully comply with Executive Order 13693, Planning for Federal Sustainability in the Next Decade. This E.O. requires federal agencies proposing construction projects to consider among other elements, the following:

- Increase energy efficiency;
- Measure, report, and reduce their greenhouse gas emissions from direct and indirect activities;
- Conserve and protect water resources through efficiency, reuse, and stormwater management;
- Leverage agency acquisitions to foster markets for sustainable technologies and environmentally preferable materials, products, and services;
- Design, construct, maintain, and operate high performance sustainable buildings in sustainable locations;
- Strengthen the vitality and livability of the communities in which federal facilities are located; and,
- Inform federal employees about and involve them in the achievement of these goals.

DOE Response:

Environmental sustainability is discussed in RCFD EA Section 5.2.18, which refers to PNNL's annually-updated Site Sustainability Plan and the PNNL Environmental Management System, which is certified to ISO 14001:2015 standards. Pursuant to Executive Order 13693 (80 FR 15871), the Site Sustainability Plan (PNNL 2015) describes PNNL's programs and planning efforts to improve energy efficacy and reports on PNNL's energy use and conservation. The established approach to planning, implementing, and monitoring actions directed at meeting the DOE sustainability goals would be applied to all new development on the campus. No changes to the RCFD EA were made in response to this comment.

Comment 4:

Land Use and Farmland Impacts

The Draft EA indicates that about 20 percent of the soils on the northern campus (7 5 acres) would be classified as prime farmland if irrigated, and that approximately 7 percent (25 acres) would be classified as farmland of statewide importance (p. 4-3). Even though some areas would be disturbed temporarily and be restored afterwards, other areas would be impacted permanently due to the proposed facilities.

The Farmland Protection Policy Act[3] requires federal agencies to design their projects in a manner compatible with state and local policies and programs to protect farmlands. When such lands are contiguous to sensitive areas, such as riparian areas and aquifer recharge zones, they play important roles in buffering these areas from development and should be protected. Because of potential impacts to farmlands by the project and subsequent loss of crops and wildlife habitat, we recommend that the DOE coordinates with the Farm Service Agency and the Natural Resources Conservation Service (NRCS) and/or USDA Service Center in assessing project impacts to farmlands and determining measures to be followed to avoid and minimize any significant impacts to farmlands. The final EA should include information about NRCS analysis and rating of the potential impacts, and what will be done to restore farmlands and compensate any owner for losses incurred due to the project.
[FOOTNOTE:]
[3] https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/landuse/fppa/

DOE Response:

Assumptions about the percentage of classified soils in the area north of Horn Rapids Road were speculative because no soil survey is available for this area. Statements about these percentages were removed from the Final RCFD EA. All active farming on the PNNL Richland Campus occurs south of Horn Rapids road, which is designated on the current U.S. Census Bureau map as an urbanized area and, thus, exempt from the Farmland Preservation Protection Act (FPPA) (7 CFR 658.2). The portion of the PNNL Richland Campus north of Horn Rapids Road that may be developed under the Proposed Action has not been farmed for at least 75 years. PNNL staff contacted the Natural Resources Conservation Service (NRCS) assistant state soil scientist to discuss the potential applicability of the FPPA to the area north of Horn Rapids Road. The NRCS uses a Land Evaluation and Site Assessment (LESA) process for determining if an area would be subject to the FPPA (7 CFR 658.5) that includes points for Relative Value assigned by NRCS (7 CFR 658.5a), and points derived from the site assessment criteria assigned by the federal agency (7 CFR 658.5b). Because no irrigation or agricultural-related infrastructure exists north of Horn Rapids road, the Proposed Action area is immediately adjacent to the urbanized area to the south and the remediated/industrial area to the north, and development would not alter the overall agricultural setting or economy of the area, the score based on the site assessment criteria is very low. The soils in the area north of Horn Rapids Road have not been mapped by the NRCS, therefore they would be unable to perform a relative value assessment. Even if NRCS could perform a relative value assessment, it would be highly unlikely to raise the overall impact rating score to the minimum level at which the provisions of the FPPA are applicable because the overall score from the site assessment criteria are so low. Therefore, DOE assumes that the FPPA is not applicable to the Proposed Action. A discussion of the FPPA has been added to RCFD EA Section 4.3.

Comment 5:

Impacts on cultural and heritage resources

The discussion of cultural and historical resources in the Draft EA indicates that the project would result in impacts to cultural and historical resources (i.e., the Shu Wipa property) eligible for listing under the National Register of Historic Places and that mitigation is required to avoid or minimize those impacts. We appreciate your efforts to establish a Memorandum of Agreement with the Washington State Historic Preservation Officer, the Advisory Council on Historic Preservation, and affected tribes to address protective requirements and related mitigation that address potential adverse effects to these resources. In addition, the final EA should include the results of the MOA development discussion, including the content of the agreement, and document SHPO's recommended measures protecting the cultural and historical resources from project impacts.

DOE Response:

DOE is working with the ACHP and consulting parties to develop mitigation actions for potential impacts to historic or cultural resources through a parallel National Historic Preservation Act (NHPA) Section 106 process. Clarifications were made to the cultural resource sections of the RCFD EA in response to this comment.

Stuart Arnold, Puget Sound Naval Shipyard and Intermediate Maintenance Facility, Bremerton, WA
Comments received: May 1, 2017

Comment 1:

Page 1-3, Figure 1.2, Proposed Action Area legend, last line: The April draft used the word "....... Corridor" but the May draft changed the word to "........ Center". Change the word Center back to Corridor.

Page 7-2, 8th bullet: Revise to say - Puget Sound Naval Shipyard and Intermediate Maintenance Facility

Pg. 3-8, Section 3.1.8 Navy Haul Road, 1st paragraph, last sentence: Replace "decommissioned Naval reactor compartments from barge…" to "decommissioned, defueled Naval reactor compartment packages from barge….."

Pg. 3-8, Section 3.1.8 Navy Haul Road, 2nd paragraph, 2nd sentence: Replace "typically one to three hours" to "typically less than one hour"

Pg. 4-1, Section 4.1 Land Use, towards middle of section, 5th bullet: Replace 1st sentence as follows: The Port of Benton docking facility, located east of the campus on the Columbia River, used for transferring Naval reactor compartment packages and other materials destined for the Hanford Site.

Pg. 5-3, Section 5.1.2 Cumulative Impacts, Table 5.1, last item – Transportation: Replace sentence as follows: The current Navy Haul Road used to transport decommissioned, defueled Naval reactor compartment packages from barge passage to the disposal site may be related.

Pg. 7-2. Section 7.0 Public, Agencies, and Tribal Government Notifications, 4th bullet from top: Replace "Navy Puget Sound Naval Shipyard and ……" with "Puget Sound Naval Shipyard and ….." and relocate to new location between Private citizens and State of Oregon…

DOE Response:

Changes made as suggested.

D.2 ORIGINAL COMMENT LETTERS

D.2.1 Gwen Clear, State of Washington, Union Gap, WA (June 19, 2017)

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
1250 W Alder St • Union Gap, WA 98903-0009 • (509) 575-2490

June 19, 2017

US Department of Energy
Pacific Northwest Site Office
PO Box 350, K9-42
Richland, WA 99354

Re: DOE/EA-2025

To whom it may concern:

Thank you for the opportunity to comment on the Draft PNNL Richland Campus Future Development EA. We have reviewed the draft assessment and have the following comment.

WATER QUALITY

Project with Potential to Discharge Off-Site
The NPDES Construction Stormwater General Permit from the Washington State Department of Ecology is required if there is a potential for stormwater discharge from a construction site with disturbed ground. This permit requires that the SEPA checklist fully disclose anticipated activities including building, road construction and utility placements. Obtaining a permit is a minimum of a 38 day process and may take up to 60 days if the original SEPA does not disclose all proposed activities.

The permit requires that Stormwater Pollution Prevention Plan (Erosion Sediment Control Plan) is prepared and implemented for all permitted construction sites. These control measures must be able to prevent soil from being carried into surface water (this includes storm drains) by stormwater runoff. Permit coverage and erosion control measures must be in place prior to any clearing, grading or construction.

More information on the stormwater program may be found on Ecology's stormwater website at: http://www.ecy.wa.gov/programs/wq/stormwater/construction/. Please submit an application or contact **Lloyd Stevens Jr.** at the Dept. of Ecology, (509) 574-3991, with questions about this permit.

Sincerely,

Gwen Clear

Gwen Clear
Environmental Review Coordinator
Central Regional Office
(509) 575-2012
crosepacoordinator@ecy.wa.gov

6537

D.2.2 Michael Sobotta, Nez Perce Tribe, Lapwai, ID (July 22, 2017)

-----Original Message-----
From: Michael Sobotta [mikes@nezperce.org]
Sent: Saturday, July 22, 2017 11:39 PM Eastern Standard Time
To: McDermott, Tom
Cc: Kennedy, Ellen P
Subject: The Nez Perce Tribes Comments on the PNNL Richland Campus Future Expansion-EA

The Nez Perce Tribes Comments on the PNNL Richland Campus Future Expansion-EA
General Comments:
Wetlands- According to the report, there are no wetlands along the river due to the steep banks and high degree of fluctuation at the Columbia River's edge.
The report does not reference any field reconnaissance or pictures of the river edge to justify the lack of a wetlands reconnaissance or field surveys. The National Wetlands Inventory (NWI) was cited as a source for no wetlands in this reach. The NWI is not a tool for determining wetland presence or absence for projects. It is a resource used for tracking the trends in wetlands nationwide and does not have up-to-date accuracy for making wetland determinations.
Please document field reconnaissance and any associated wetlands if wetland resources are important attributes or credits as part of wildlife and cultural mitigation site. Any shoreline or near-shore plants would be suspect and need a wetland determination. Additionally, hydric soil conditions can form within 30-days of inundation. At present the EA makes no reference to field reconnaissance or wetland delineations. Please include a picture of typical shoreline conditions to communicate rationale for no delineations, if none are actually needed.
Floodplains: Document states the active 100-year flood plain lies within the steep river banks. Please include a photo showing the high bank condition and include a figure showing 100-year floodplain map that illustrates floodplain is within present river banks.
Cultural Resources: The EA (final) will need to include Section 106 findings, the MOA agreement, and the details of mitigation elements.
Biological Resources: It is not clear if the mitigation acres meet the 3:1 ratio requirements for displaced shrub-steppe habitat acres at full 20-year build-out. Please include similar narrative in mitigation plan as well.
The Mitigation plan could be improved if specific wildlife species (focal species) associated with the protected habitat types (mature and mid-seral shrub steppe) could be identified along with their vulnerability to traffic, noise, and habitat fragmentation. After 20-year build-out, the mitigation site will be impacted by changes in traffic patterns, increases in noise and light pollution, and habitat fragmentation. For instance, traffic is well documented to cause avoidance (noise) and high mortality (vehicle strikes). Noise/vibration impacts were analyzed only from a human perspective and not from a wildlife perspective at the mitigation site. Our recommendations would to have some baseline noise values at the mitigation boundary to compare with a noise levels at the same locations after 20-year buildout. The fundamental question is will the mitigation site be harmed, and if so, by how much from its present state? Please include discussion of these impacts cumulatively and to include impacts from projects similar to the Natural Gas Pipe Line project at Hanford.
Transportation: Leaving highly valued shrub-steppe habitat along the river has its obvious benefits, but traffic associated with adjoining business park expansion needs to be described as requested above. Wildlife may be displaced by the traffic related noise and vibrations. Please describe how the mitigation site will be protected from traffic and related noise.
Noise and Vibration: The noise analysis is based on human thresholds only and does not analyze potential noise impacts to wildlife and the tribal mitigation sites. The 102-acre preservation designated area (PDA) could be impacted with the full 20-year build-out to its boundaries. It would be our recommendation that noise measures be taken at or near the boundary at peak times when noise from present activities can be captured. These values would be good baseline for comparison at various stages of build-out. Noise is a well-known disrupting agent to wildlife

Specific Comments:
Table S.1: Update Table S.1 after addressing the following issues/concerns: The table should include non-replaceable resources, like acres of shrub-steppe habitats removed at 20-year build-out.
Section 3.1.7: Please provide a figure presenting this information or provide a reference to another figure with this information.
Section 4.5: (pg 4-5) Cultural and Historic Resources
From a NEPA perspective, the final EA document needs to summarize mitigation elements.
Section 4.6 Biological Resources (pg 4-14): The best valued habitat is the mature shrub-steppe. Figure 4.1 is a really good figure but it is difficult to identify those that are mature habitats from those that are indicative of disturbance. The figure could group habitats by "climax" and "subclimax" or as "undisturbed" and "previously disturbed" areas. There should then be a table summarizing displaced acres by these two groupings at full 20-year build-out.
Federal and State listed species: Table 4.7 is a good start but doesn't identify whether climax shrub-steppe is a limiting factor for these listed species. If so, then narrative needs to capture how mitigation acres are helping to address this loss for these species. This is doubly important if one or more listed species are culturally important. Mitigation acre and its replacement ratio may need to be higher if that is the case.
Are any of the listed species in Table 4.7 also have special cultural significance for the affected Tribes? Bald Eagle does, but do any of the others? Table 4.7 should include that information.
Section 4.7 Wetlands and Floodplains (pg 4-20): See general comments on wetlands above. The FWS 2017 Wetlands Inventory should not be used as a determination for wetlands. There is need for field reconnaissance including wetland delineations of any suspect sites. Pictures of shoreline would be helpful to articulate streambank conditions.
See general comment above on Floodplains
Section 4.8 Socio-economics (pg 4-20)
The discussion should be framed based on economic impacts and taxation relative to the local or regional economy. For instance, it would be more meaningful to compare PNNL's payroll and taxation to those of Benton and Franklin counties and not to the whole state of Washington.
Section 4.9 Environmental Justice (pg 4-22 thru 4-24): Reviewing the broad regional subpopulation level as presented in this write-up is usually conducive to large broad-impacting projects like highways, airports, waste facilities, etc. This review of low and minority populations for this project does not answer the fundamental questions if specific low income or minority populations (trailer parks, housing developments) are negatively impacted by the project. For instance, does the project cause an unfair amount of negative impacts to these communities through actions like housing displacement, increased traffic, noise or air pollution on these specific communities, or creating large increases in travel distances for schools, hospitals, or emergency responders. These are the kind of questions this section should be trying to answer.
Section 4.13: Noise and Vibration: (pg 4-29): Noise and vibrations needs to be evaluated at the mitigation site boundary from a habitat and a cultural perspective.
Present background noise levels at the edge of mitigation site at locations close to road traffic and other PNNL related noise generation sites. These values should be compared to literature on noise's influence on habitat use by birds and mammals that typically use mature shrub-steppe communities. There is literature out there that discuss changes in wildlife use of available habitat based on changes in noise/vibration levels. Having a mitigation site potentially uninhabitable based on noise and vibrations would defeat the purpose any mitigation site. There are research papers that discuss noise impacts on wildlife use of similar shrub-steppe habitats like those found at the mitigation site.
Section 4.13.1: There was no noise testing to determine baseline conditions at the proposed site or the Mitigation site. The write-up does not provide noise thresholds for wildlife, especially associated with the mitigation site. Literature can provide these wildlife thresholds for noise disturbance.
5.0 Environmental Consequences
Section 5.2.3 Soils and Geological Resources. There is no mention of a General Construction Permitting (GCP) process for disturbing soils and compliance with the GCP process during all phases of any future construction. A GCP is a permit by the State (or EPA) that shows temporary erosion control structures and practices while tracking progress of temporary erosion controls through and until permanent erosion control is in place across the entire building site.
Section 5.2.5 Cultural and Historical (pg 5-11) the Section 106 MOA and Mitigation needs to be presented or reference in the document before this EA can receive its FONSI.

Section 5.2.6 Biological Resources (pg 5-16) This section needs to better present the benefits of the mitigation site and provide narrative of potential impacts to it from potential expansion of proposal. Figure 5.2 needs to clearly label categories 1 and 2 as climax and non-climax shrub steppe communities. These two categories are of higher value and need to be related back to preferred species uses.

Table 5.3 needs to provide total acres of high quality climax habitats, acres of lower quality mid-seral habitats, total acres of displacement at full 20-year build-out, and total mitigation acres. Table 5.3 would be much more valuable if it was summarized by habitat acres of displacement and habitat acres with mitigation site. Appendix C (Biological Mitigation) states the mitigation ratio is 3 to 1. Table 5.3 provides no way of knowing acres displaced, mitigation acres, or whether this mitigation goal of 3-1 is accomplished.

Section 5.2.6.2 Cumulative Impacts (pg 5-21) The buildout and incremental impacts to shrub-steppe habitats and associated wildlife should be summarized by acres lost to construction, acres in mitigation, and seral acres in mitigation that have potential to become climax habits during 20-year build-out.

Please use summary information in Appendix C to address much of these Biological talking points mentioned above.

Section 5.2.10 Traffic and Transportation: Cumulative Impacts (pg 5-25): this should reference literature about traffic-related noise and animal strikes that may limit wildlife use of the shrub-steppe habitats such as the PDA that contain the mitigation sites.

Section 5.2.13 Noise and Vibration (pg 5-34) Cumulative Impacts: There is no noise analysis that establishes present (background) condition for future analysis during 20-year build-out. Noise will likely have a negative impact over time on the mitigation site. One of the problems of NEPA process is it only assess potential impacts. But in this case of a 20-year time frame and our mitigation site being adjacent, we can actually capture noise levels over time and its potential impacts on the mitigation site.

Additional PNNL expansion topic:

During the DOE –PNNL quarterly meeting Wednesday June 28th it was brought up by NPT staff that during review of lead and arsenic soil sampling on old orchard grounds that additional testing Toxicity Characterization Leaching Procedure (TCLP) is requested to be performed. TCLP will identify the mobility of lead and arsenic, and needs to include testing of non-standard copper. The point to be made is that the originally presented lead and arsenic soils levels do not identify the potential harm. It is their mobility that is the real risk to humans and wildlife. This test is primarily a CERCLA requirement for determining if contaminant mobility is a risk to humans.

D.2.3 Rose Ferri, Yakama Nation, Union Gap, WA (July 21, 2017)

Confederated Tribes and Bands of the Yakama Nation

Established by the Treaty of June 9, 1855

July 21, 2017

Tom McDermott
PNSO
P.O Box 350, K9-42
Richland, WA 99352

Dear Mr. McDermott;

The Confederated Tribes and Bands of the Yakama Nation (YN) appreciates the opportunity to review and provide comments on the Draft Environmental Assessment (EA) for *Pacific Northwest National Laboratory Richland Campus Future Development*-DOE/EA-2025, May 2017.

YN areas of major concern:

Treaty Rights and Land Use: Archaeological evidence demonstrates the importance of these lands to the Yakama Nation (YN), whose presence can be traced since time immemorial. The EA acknowledges actual and potential impacts on tribal treaty rights and cultural resources due to the proposed campus expansion, yet the EA does not present alternative ways of achieving the same purpose. Ultimately, the actions considered will result in some type of development with acknowledged and/or potential impacts to invaluable shrub-steppe habitat and areas of cultural significance.

Transferring or leasing of lands out of federal ownership would adversely impact the YN off-reservation treaty rights by diminishing the locations and access to areas where tribal members may exercise treaty rights. Any diminishment of treaty rights was not explicitly stated and the impacts thoroughly described and evaluated. We object to the transfer or lease of any land that affects the ability of the YN to exercise our Treaty rights throughout the Hanford site or that will result in loss or degradation of habitat, natural resources, and/or ecosystems. Land use that will result in any diminishment of treaty rights was not explicitly stated and the impacts thoroughly described and evaluated. We object to any uses that affects the ability of the YN to exercise our Treaty rights throughout the Hanford site or that will result in loss or degradation of habitat, natural resources, and/or ecosystems. Ensuring Treaty compliance is a critical intergovernmental concern. YN request an affirmation by USDOE of Treaty rights across all of Hanford and to subsequently transferred or otherwise utilized DOE/PNSO site lands.

YN stated our position on the use of the Comprehensive Land Use Plan (CLUP) in a letter to DOE Manager John Wagoner, dated June 30, 1998. Our position remains unchanged.

Cultural Resources/Archeological and Historical Sites: In several instances, the EA states the potential for destruction of archeological sites and adverse effects to cultural resources. The

Post Office Box 151, Fort Road, Toppenish, WA 98948 (509) 865-5121

philosophy underlying the cleanup of Hanford (including transfer of land ownerships) should be guided explicitly by the goal of allowing Native Peoples to safely live the lifestyle to which they are entitled according to their Treaty rights. This way of thinking is particularly important when considering how to incorporate non-quantitative elements as the spiritual or cultural value of site into land restrictions and/or mitigation actions that guarantee use of the land for specific purposes that are considered inseparable from the Yakama way of life.

Development decisions, restoration actions, vegetation management, land use plans, the use of barriers and run-off controls, etc need to take into consideration the long term potential adverse effects on Traditional Cultural Properties (TCPs), cultural resources, and the character defining features that make these sites eligible for listing on the National Register of Historic Places. Mitigation for these related impacts are to be detailed in the forthcoming MOA, mandated by the National Historic Preservation Act (NHPA) and implementing 36 CFR 800 and in mitigation action plans under NEPA. Additionally, the PNNL Richland Campus expansion boundary encompasses the PDA. YN has concerns regarding unlimited surrounding development infringing upon Tribal members' access as well as potential harmful impacts (visual, audio, and etc.) to the ongoing enhancement and protection of cultural and biological resource efforts in this area.

Furthermore, <u>reliance on</u> rather than <u>discussion of</u> any potential impacts of MOAs, IDPs, or programmatic agreements, etc, may underestimate the impacts and significance. YN requests completion of the MOA for this undertaking prior to finalization of the EA decision-making process. This document consistently defers to the NHPA process, therefore impacts to cultural resources/human environment cannot fully be considered until the NHPA process is completed.

Environmental Justice: The YN has to assume total loss of natural and cultural resources on all acres; thus, YN bears a disproportionate burden of the loss and none of the benefits. All of Hanford's precedents (e.g., the 1100 Area, the DOE Land Conveyance to TRIDEC) point toward a significant trend and continued loss of access and resources, as well as denial of Treaty-reserved rights (despite promises to the contrary). While no access constraints would result from construction, the Proposed Action stated it may limit the Tribes' ability to practice traditional and religious activities on the PNNL Richland Campus. Construction-related activities would reduce the overall footprint of potential areas of interest to the Tribes for traditional use (due to the disturbance, construction, and buildout of large portions of previously undisturbed land on the campus).

NEPA does not require relevant and reasonable mitigation to be adopted; just discussed. The YN disagrees with inclusion of the statement "Portions of the campus could be leased or transferred to other entities for development compatible with the PNNL Richland Campus Master Plan"; i.e. the concept of potential transfer of land from DOE oversight responsibilities.

The YN is concerned that transferring lands out of federal ownership adversely affects off-reservation treaty hunting and gathering rights by diminishing the locations and access to areas where Yakama tribal members may exercise those rights in the future. Ensuring protection of these rights is a critical intergovernmental concern. This diminishment of treaty rights was not explicitly stated and the impacts thoroughly described and evaluated. YN requests consultation with PNNL regarding locations, types of compensatory mitigation, monitoring, land-use agreements as discussed in Appendix C, as well as our suggested deed restrictions. YN believes this interaction <u>is a critical step needed prior</u> to final decisions on this EA.

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Habitat, Plants, and Wildlife: Operations of multiple development sites as proposed admittedly further fragments remaining habitats in the local area and degrade or eliminate connectivity in between adjacent habitats. Loss of these habitats may place further pressure on populations of some species that are already experiencing habitat loss in other parts of their range. The discussion of impacts in the EA does not provide a sufficiently detailed evaluation of the severity of impacts, and therefore does not provide a basis for determining the significance of the proposed action(s). It's unrealistic to ask the public to agree to statements inferring minimal impacts when it is unknown what types and the locations of facilities for the anticipated (i.e. proposed build-out) are defined as *speculative and other statements* *indicate loss of irreplaceable habitats.* The additional *1 million square feet in a number of facilities [~60] and... associated infrastructure* indicates a significant footprint and a definitive loss of irreplaceable resources. Topography will be altered and roads, buildings, and parking lots constructed affecting not only the habitat, plants, wildlife but traditional cultural access routes in the area as well. Anticipated development will effectively amount to the complete destruction of vegetation.

As stated, in some instances unless mitigation measures are enforced, the impact becomes unavoidable and significant yet this is seemingly dismissed (e.g., The open areas on the PNNL Richland Campus, with grass or native vegetation, currently include about 148 ha (366 ac); this would decrease by 14 ha (35 ac) to 18 ha (45 ac) in the planned 20-year buildout.) This is a reduction to ~10-12% of current size. This is a significant impact on habitats rated primarily level 3-level thru 5 and which are in close proximity to a preservation area (the PDA), the Columbia River and its shoreline corridor of multiple resource levels and riparian vegetation types/and communities.

The nature of the vegetation impacted maybe misrepresented. Every level of biological resources habitats identified in DOE/RL-86-32 (DOE's Biological Resources Mitigation Plan) including areas deemed *irreplaceable resources* are identified within or surrounding the boundaries encompassing this action (i.e. *dune blowout & irreplaceable* areas). There is a difference in compensatory mitigation, as BRMP calls for placement of mitigations at the highest habitat level identified. The potential for higher levels of habitat or species should be the guide for mitigation efforts. Levels 4/5 habitats at a higher ratio (5:1 compared to 3:1 for Level 3 habitat; full development of the 134 acres would need to be offset by 670 acres (~1.5 square miles) of mitigation). Recovery, even if mitigation were put in place, would take decades.

Although PNSO has developed a biological resource management policy for the PNNL Richland Campus that includes mitigation for loss of priority habitats (DOE/PNSO 2015). This plan, though similar has differences in compensatory mitigation. Because the extension lands lie adjacent to the Hanford Site, it may be more appropriate to evaluate these resources using DOE's BRMP[1]. YN requests that a reevaluation of those areas within this campus expansion that have already evaluated under existing mitigation action plans to ensure consistency in approach and methodology.

Furthermore, potential injury or mortality to wildlife is expressed but, also seemingly dismissed with inconclusive statements reflective of the attitude that the Hanford Site or the surrounding areas including the Hanford Reach contain 'ample' foraging habitat for affected species or habitats of similar ecological value.

Lastly, the EA doesn't consider potential chemical or radiological exposures resulting from the use of traditional plants from other areas of the Hanford Site, or the availability of access to other

[1] Hanford Site Biological Resources Management Plan (BRMP) (DOE 2013a)

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areas. Traditional plant species used or that could be used by the Tribes will be removed and no longer available yet the statement "the Hanford site, however, includes large tracts of lands with similar plant communities" is supposed to reassure/ensure the sustainability of these resources for Tribal uses.

Environmental Consequences and Cumulative Risk: YN believes a cumulative effects assessment should answer difficult and formerly unaddressed questions regarding combined risk burdens and disproportionate impacts. It should involve evaluation of collective effects of multiple agents or stressors – as opposed to individual effects of a single stressor. It should be broad enough to include not only any chemical contaminant risks (if any) but incorporate nonconventional stressors (e.g., the concept of vulnerability; differential biological susceptibility and exposure, as well as differential preparedness to withstand stressor effects and ability to recover from stressor effects) into the assessment. Analysis should be conducted on; if and how the effects or the risks from the various agents or stressors interact independently, in combination, or in synergy (e.g. 'stormwater runoff would be minimized, combination of surface swales, etc' while not considering the diverse effects of soil and habitat removal, mixing of soil horizons, etc on ecological resources within the area holistically).

YN disagrees with several of the conclusions. This EA process is designed to evaluate the contexts in which impacts from proposed facilities and infrastructure envisioned in the current PNNL Richland Campus Master Plan Richland Campus. The EA describes the impacts (direct/indirect) but does not address the how the proposed action will significantly alter the environment. Analysis of significance requires consideration of both context and intensity. Significance cannot be avoided by terming an action intermittent and temporary or by breaking it down into small component parts[2] (e.gs. identified cumulative impacts to the *Shu Wipa* TCP and the Yakama Nation TCP, construction/operational/ emission impacts to air quality, visual resources classification changes [Class III to Class IV[3]] due to impacts, noted permanent and irreplaceable impacts to rare plant and mature shrub-steppe habitats, 'farmland of statewide importance/prime farmland if irrigated' areas, water uses) or by excluding probable future actions of impact (e.g. redesigning of the Navy Haul Road within the PDA).[40 CFR 1508.27.]

Simplistic statements that activities within the PNNL Richland Campus would be incremental or consistent with adjacent land uses planned by the City of Richland and Benton County and that no incompatibility issues are anticipated does not sufficiently address NEPA -40 CFR 1508.27 requirements.

Text in Section 3.1 eludes the need for an EIS. This EA cannot be deemed *bounding* if it cannot ensure there will be no future development outside the scope and associated impacts identified and evaluated within it (e.g., *Additional NEPA review would be conducted if it is determined that a new development proposal does not fall within the EA proposed action area (Figure 1.2), the development scope is different than that described in the following subsections of Section 3.1, or the environmental impacts are different than those described in Section 5.2*). Use of information from *DOE/EA-1915D* without further site-specific evaluation may not accurately capture what is anticipated to happen with the extension of the PNNL Richland campus (e.g., evaluations of Noise and Vibration, Acoustic Noise, Utilities and Infrastructure).

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[2] 40 CFR 1508.27
[3] Visual impacts are adverse effects to TCPs under the NHPA and need to be mitigated to comply with that statute as well as NEPA.

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The EA identifies net loss of sagebrush/steppe habitat and notes the importance of habitat yet dismisses the significance of losses associated with campus expansion. True, some past, present, and reasonably foreseeable future actions at the Hanford site, Benton County, and the surrounding region of interest (ROI) were included within the discussion of cumulative effects. However, other important considerations were not e.g., the potential impacts of other types of manufacturing were not identified [e.g., Port of Benton Rail expansion] nor DOE efforts for remediation, restoration, and preservation of natural resources of the Hanford site or failure of any DOE action on the Hanford site, or failure of suggested mitigations or the cumulative net loss of sagebrush/steppe habitant in the Columbia Basin Ecoregion. Another example of an area of important consideration not discussed in this EA is the need for water resources from the Columbia River. Withdrawal system under existing water rights is not arbitrary. In any case, if several actions taken together will indeed have a cumulatively significant effect.

Scope: YN believes the scope of the EA analysis to be too narrow and disagrees with the position that under the adverse impacts of the *No Action Alternative* DOE's ability to support DOE's strategic goals would be substantially reduced. DOE's & PNNL's current operational management policies require maintenance of these facilities in a manner protective of human health and the environment. This includes the possibility of refurbishing and/or replacement of facilities in support of mission goals. The current Richland Campus could be modified; expansion is not the only solution. Furthermore, the *No Action Alternative* should recognize that the lack of development will preserve any cultural and natural resources and the potential for honoring Treaty rights, whereas the conveyance of lands will result in a disproportionate burden of loss of benefits upon the Tribes.

Additional comments are attached. YN ERWM technical and cultural staff request further consultation to resolve stated concerns. This EA defers substantially to the NHPA process and to ensure proper integration of NEPA and NHPA more consultation is warranted. Please contact me at 509-452-2502.

Sincerely,

Rose Ferri

Rose Ferri
Yakama Nation ERWM Project Tracking/Resource Analyst

cc:
Phil Rigdon, DNR Superintendent
Rose Longoria, ERWM Interim Program Manager

Administrative Record

Attachments:
#1: Areas of potential impact incompletely or not accounted for in the EA and potential deed restrictions;

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Attachment 1: Areas of potential impact incompletely or not accounted for in the EA and potential deed restrictions:
<u>These need to be fully discussed within the EA:</u>

- EA does not accurately reflect the legalities of suggested deed restrictions and/or mitigation measures and the likelihood of these mitigation measures being both effective and enforceable via permit or deed restrictions.
- Impacts, if any, associated with the *300 Area Record of Decision.*
- DOE's ongoing mission to cleanup Hanford and to prevent contamination from leaving the site and needed changes to its various Hanford site-operating procedures as development occurs.
- DOE's continuing responsibility to remediate the groundwater plume under-lying portions of the lands to be conveyed (trichloroethene (TCE) and nitrate plumes). DOE/RL-2016-33, Revision 0 Section 8.0: Groundwater Monitoring Hanford Site Environmental Report for CY 2015 Uranium and cis-1,2- dichloroethene continued to exceed Permit limits in 2015. Remediation will be coordinated under the 300-FF-5 Groundwater OU. Nitrate concentrations near the 618-11 Burial Ground also continued to exceed 45 mg/L. Uranium concentrations in Hanford Site wells near the DOE inactive Horn Rapids Landfill have increased gradually since 1996, exceeding the DWS in 2015.
- Effects of fertilizers/pesticides on plants and groundwater.
- Impacts from spills/spill management.
- Impacts to the Hanford Site activities and the City of Richland from rerouting decisions on access routes (i.e. elimination of portion of George Washington Way, relocation, expansion, or upgrade of the Navy haul road, and similar impacts to the PDA and Tribal activities on the PDA and elsewhere).
- Impacts to PNNL and surrounding areas due to infrastructure needs with campus expansion:
    - DOE owns, operates, and maintains the water and sewer utility infrastructure in the 300 Area. The City of Richland owns, operates, and maintains the power, water, and sewer infrastructure for the balance of the PNNL campus in Richland. There is an unexamined over-reliance on City of Richland's intent to provide these services, and impacts should it not be able to do so. YN requests inclusion of reasonably foreseeable financial obligations for the City of Richland residents to support the necessary new, long-term utility demands.
        - (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 utilizing long-haul services to a regional landfill (City of Richland 2011)). It is unclear how this proposal alters the City of Richland/PNNL relationship? It is unclear how will the City of Richland benefit or that is the City is capable of this extension without adversely affecting its citizens -their pocketbooks?
    - Impacts of Battelle's exiting of non-DOE owned facilities that is and will continue to happen on the City of Richland social/economic development, and impacts to these areas and surrounding areas with demolition, etc.
    - Impacts associated with 'new sewer lift stations and associated forced mains' not accounted for.
    - Impacts associated with fiber optic communications not accounted for.
    - Impacts associated with potential new BPA substation (#2) not accounted for.
    - Impacts associated with the implementation of the 1-2017 Port of Benton/City of Richland 'Rail Master Plan.'
- The EA does not discuss a bounding accident scenario [radiological release] for Building 342 located on the Hanford Site, any resulting impacts, or necessary emergency actions to be taken. YN request this analysis be done for this facility and ongoing or planned actions (e.g. 618-11 waste site remediation) that might have radiological impact to the EA lands or co-located lands.
- The EA does not discuss the impacts associated with the proposed natural-gas pipeline, yet lists it as an infrastructure source. YN requests this information be included.
- YN request a review (and evaluation/inclusion of information) of the ambient air monitoring program for radionuclide to ensure it adequately accounts for proposed facilities (e.g., reassessment of air model to predict how far contaminants could travel offsite Hanford without harming the public given that the land buffer has been reduced.

1

Potential mitigations: YN requests discussion of the following with PNNL for incorporated into Appendix C.
Mitigations by USDOE and/or future landowners or local, state jurisdictions are arguably potential deed restrictions.

- YN requests mitigation for related impacts which are to be detailed in the forthcoming MOA to prohibit construction activities and or utility development on lands for any future, and/or newly identified ecological resources (including vegetation, wildlife, birds, mammals, reptiles & amphibians, threatened & endangered species) found to be present. YN requests deed restrictions to that effect. Furthermore, YN requests mitigation actions performed and their monitoring and contingency planning to be included as deed restrictions.
- YN requests deed restrictions to prohibit construction activities and or utility development within *swale* and *dune blowout* areas and those areas identified to have similar plant species. YN requests track the unusual assemblage of plant species occurring in and around the swales to be included also. Particular protection should be given to those areas with suitable habitat for species of rare spring ephemeral annual plants, including Great Basin gilia, loeflingia, rosy pussypaws, and Suksdorf monkeyflower (WDNR 2017 and potential suitable snake hibernacula areas [e.g. the striped whipsnake (*Masticophis taeniatus*, Washington State candidate species)]).
- YN requests deed restrictions to ensure no future development of any facility designating as a Hazard Category 1, 2, or 3 or small modular reactor facilities on leased or transferred lands.
- YN requests deed restrictions to ensure no construction or operation of laboratories with BSL-3 or BSL-4 containment or a finding of significance and determination for the need of an NEPA EIS analysis. [This potential significant impact is not accounted for within this EA.]
- YN requests deed restrictions to ensure no use of groundwater beneath the PNNL Richland Campus is allowed. It is affected by the Hanford Site activities.
- YN notes the assumption that SEPA reviews would be done when Richland City or other local jurisdiction considers a need for additional infrastructure to the area. YN requests deed restriction for all those areas where potential SEPA reviews are suggested or indicated.
- YN requests deed restrictions to ensure no additional stormwater to be allowed to enter the City of Richland system.
- YN notes potential for site-specific deep excavation conditions that may extend to groundwater with required excavation dewatering and mitigation of some type. YN requests these be included as deed restrictions. Furthermore, this potential significant impact is not accounted for within this EA.
- Deed restrictions with requirement to be consistent with the *Hanford Site Cultural Resources Management Plan* (DOE 2003b). These lands will remain under DOE ownership and responsibility; YN wishes to discuss use of this document concurrent with mitigation efforts, Appendix C, and the PNSO Cultural and Biological Resources Management Plan (DOE/PNSO 2015) and how to ensure required mitigation efforts 'run with the land.'
- Potential permitting needs: DOE guidance emphasizes not relying on compliance with applicable requirements (e.g., waste disposal permits, water or air emissions permits) as evidence that an analyzed alternative does not have potential for significant impact(s)[1]. YN requests obtainment and compliance with all required Permits be included as deed restrictions. YN requests monitoring of Permitting requirements be included as an obligation in a deed restriction.
- Potential Mitigation Measures for pollution prevention and waste minimization/management: YN request that the assumptions/expectations/etc listed in Section 3.1.12 and 3.1. be included as deed restrictions.
- YN request the information regarding integration and coordination agreements between local, state, and DOE is included as deed restrictions.

[1] U.S. Department of Energy Environment, Safety and Health Office of NEPA Policy and Compliance, Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements, Second Edition, December 2004.

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D.2.4 Jill Nogi, US EPA Region 10, Seattle, WA (July 24, 2017)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL REVIEW
AND ASSESSMENT

July 21, 2017

Roger E. Snyder, Manager
Department of Energy
Pacific Northwest Site Office
P.O. Box 350, K9-42
Richland, Washington 99352

Dear Mr. Snyder:

The U.S. Environmental Protection Agency (EPA) has reviewed the Department of Energy (DOE) Draft Environmental Assessment (EA) for the proposed Future Development of Facilities and Infrastructure project (EPA Region 10 Project Number 16-0019-DOE) at the Pacific Northwest National Laboratory (PNNL) Richland Campus in Benton County, WA. Our review was conducted in accordance with our responsibilities under Section 309 of the Clean Air Act and the National Environmental Policy Act.

The Draft EA evaluates the potential environmental impacts associated with the construction and operation of multiple buildings; including research laboratories, office space, support buildings, and related infrastructure at the PNNL Richland Campus over the next 20 years. The PNNL Richland Campus covers about 664 acres. The buildout of the project would involve construction of up to three small buildings (75,000 ft^2) every year and larger buildings (60,000 - 200,000 ft^2) every 2-3 years for a total buildout of 1 million ft^2, depending on funding availability. The project activities would also include for the decontamination and demolition of buildings no longer needed. The proposed project would allow the DOE to meet its goals to enable discovery and advance science while also providing the necessary infrastructure.

The Draft EA includes a good description of the natural resources located within the project area, an analysis of the potential environmental impacts of the project, and potential actions to address the identified impacts. We appreciate the inclusion of a mitigation action plan addressing project impacts and the commitment to monitor its effectiveness. We also appreciate the commitment in the Draft EA to take additional measures to address issues related to the project when necessary. We note that the Draft EA addresses many of the issues that we raised during the project scoping period in March, 2016, including potential effects of climate change and cumulative effects, and we appreciate the changes incorporated to date.

Overall, most of the impacts of the project are related to construction activities, which would generate both temporary and permanent environmental impacts, due to the project footprint. We therefore recommend that the final EA include more clarifying information as discussed in the following comments:

Water resources and impacts
The Draft EA indicates that water quality may be adversely affected if the project construction activities, including excavation, surface grading, surface pavement, and building rooftops alter the hydrology of springs and surface runoff such that erosion carries sediment and pollutants to surface waters and the

underlying aquifer. In addition, land disturbance, material storage, waste disposal, inadvertent chemical or hazardous liquid spills, and compaction produced by vehicular traffic can all affect recharge to the local aquifer as well as groundwater quality. The State of Washington has promulgated surface water quality standards that must be met. In particular, impacts to the section of the Columbia River next to the project site should be avoided. If this section of the River meets the State of Washington water quality standards for surface waters (WQS), please note that antidegradation provisions of the Clean Water Act and the State of Washington WQS apply to waterbodies that currently meet the standards. Because the Columbia River is adjacent to the project site, we recommend that the DOE coordinate with Washington State Department of Ecology (Ecology), and all affected tribes, in order to assure that state and tribal water resources are protected throughout the project construction and operation activities.

The Draft EA discusses project impacts to water resources and provides appropriate information on measures to take to manage stormwater, including use of practices in the Stormwater Management Manual for Eastern Washington. We appreciate the information provided on stormwater, and we continue to suggest that a National Pollutant Discharge Elimination System (NPDES) permit from Ecology may be required for the project, because construction activities would disturb more than 1 acre of land (p. 3-2). Therefore, the Final EA should include information on the permit application process and recommended measures to protect water quality from stormwater runoff during construction. The proposed best management practices can lessen the impacts of stormwater runoff from impervious surfaces, but pollutants may still reach surface waters and groundwater. We therefore recommend the consideration of Low Impact Development (LID) techniques[1] during the implementation of the project, potentially reducing stormwater volumes and helping to mimic natural conditions as closely as possible. The techniques can also lessen the impacts of stormwater runoff from impervious surfaces and can provide energy and other utility savings. Under Section 438 of the Energy Independence and Security Act (EISA), federal agencies have to reduce stormwater runoff from federal development projects in order to protect water resources. The EPA Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act can be accessed online[2].

Since the project site is within an area subject to environmental cleanup, due to high levels of radionuclide and chemical contamination of groundwater; including tritium, nitrate, and uranium, we recommend that DOE work with the EPA Hanford Office in order to ensure that the project is implemented in accordance with the requirements under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). The Draft EA indicates that groundwater beneath the project site contains concentrations of tritium, nitrate, and uranium above background levels and that construction activities could impact these contaminant plumes, especially where excavations would be necessary and the depth to groundwater is near the surface. During the project operation, underground injection wells would also be used to manage stormwater and it is possible that impacts to groundwater quality could be exacerbated. We recommend that the DOE work with Ecology's UIC Program on any concerns due to the use of injection wells during construction and operation of the project.

Air Quality Impacts

The Draft EA describes the current air quality conditions in the project area and indicates that the project is within an area designated as an unclassified/attainment area. This means that the air quality measures better than the minimum national standards for criteria air pollutants (p. 4-1), and that air quality impacts

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[1] http://www.epa.gov/owow/NPS/lid/

[2] https://www.epa.gov/nps/stormwater-management-federal-facilities-under-section-438-energy-independence-and-security-act

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from the project would not exceed any national ambient air quality standards (NAAQS). Even though background concentrations of criteria pollutants within the project area and vicinity are currently within the standards, we recognize that there is the potential for considerable air emissions from the project due to fugitive dust releases during ground disturbing activities, as well as the cumulative impacts from road construction and site preparations, regular traffic on dirt roads, emissions from vehicles using local roads, agriculture, fire, and woodstoves in the area.

As the project area and vicinity would likely include sensitive receptors (i.e., children and the elderly), and the project would increase traffic by up to 31 percent (p. 5-24), it will be important to monitor air quality and take corrective action where necessary in order to prevent the deterioration of air quality in the area. Monitoring strategies should be tailored to local conditions because impacts can be substantial, even when the area-wide and/or long-term monitoring may show compliance with air quality regulatory requirements. We recommend that the DOE maximizes the implementation of mitigation measures described in the Draft EA in order to reduce the emissions associated with the proposed project. We also recommend that the DOE continues to coordinate with other entities in the area, especially Ecology, to assure that the project would meet both the state requirements and the NAAQS throughout its life cycle.

Energy efficiency and conservation
Since the proposed project would involve the construction, operation, and maintenance of buildings and facilities over a 20-year period, we recommend that the EA includes information related to energy use and conservation, and how the project would fully comply with Executive Order 13693, *Planning for Federal Sustainability in the Next Decade*. This E.O. requires federal agencies proposing construction projects to consider among other elements, the following:

- Increase energy efficiency;
- Measure, report, and reduce their greenhouse gas emissions from direct and indirect activities;
- Conserve and protect water resources through efficiency, reuse, and stormwater management;
- Leverage agency acquisitions to foster markets for sustainable technologies and environmentally preferable materials, products, and services;
- Design, construct, maintain, and operate high performance sustainable buildings in sustainable locations;
- Strengthen the vitality and livability of the communities in which federal facilities are located; and,
- Inform federal employees about and involve them in the achievement of these goals.

Land Use and Farmland Impacts
The Draft EA indicates that about 20 percent of the soils on the northern campus (75 acres) would be classified as prime farmland if irrigated, and that approximately 7 percent (25 acres) would be classified as farmland of statewide importance (p. 4-3). Even though some areas would be disturbed temporarily and be restored afterwards, other areas would be impacted permanently due to the proposed facilities.

The Farmland Protection Policy Act[3] requires federal agencies to design their projects in a manner compatible with state and local policies and programs to protect farmlands. When such lands are contiguous to sensitive areas, such as riparian areas and aquifer recharge zones, they play important roles in buffering these areas from development and should be protected. Because of potential impacts to farmlands by the project and subsequent loss of crops and wildlife habitat, we recommend that the DOE

[3] https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/landuse/fppa/

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coordinates with the Farm Service Agency and the Natural Resources Conservation Service (NRCS) and/or USDA Service Center in assessing project impacts to farmlands and determining measures to be followed to avoid and minimize any significant impacts to farmlands. The final EA should include information about NRCS analysis and rating of the potential impacts, and what will be done to restore farmlands and compensate any owner for losses incurred due to the project.

Impacts on cultural and heritage resources
The discussion of cultural and historical resources in the Draft EA indicates that the project would result in impacts to cultural and historical resources (i.e., the *Shu Wipa* property) eligible for listing under the National Register of Historic Places and that mitigation is required to avoid or minimize those impacts. We appreciate your efforts to establish a Memorandum of Agreement with the Washington State Historic Preservation Officer, the Advisory Council on Historic Preservation, and affected tribes to address protective requirements and related mitigation that address potential adverse effects to these resources. In addition, the final EA should include the results of the MOA development discussion, including the content of the agreement, and document SHPO's recommended measures protecting the cultural and historical resources from project impacts.

Thank you for the opportunity to review the Draft EA. If you have questions about our comments, please contact Theo Mbabaliye, of my staff, at (206) 553-6322 or at mbabaliye.theogene@epa.gov, or contact me at (206) 553-1841 or at nogi.jill@epa.gov.

Sincerely,

Jill A. Nogi, Manager
Environmental Review and Sediment Management Unit

4

D.2.5 Stuart Arnold, Puget Sound Naval Shipyard and Intermediate Maintenance Facility, Bremerton, WA (April 21, 2017)

-----Original Message-----
From: Arnold, Stuart G CIV PSNS, Code 2312 [mailto:stuart.arnold@navy.mil]
Sent: Wednesday, June 28, 2017 8:26 AM
To: McDermott, Tom <Tom.McDermott@Science.doe.gov>
Subject: FW: PNNL RCFD EA

Tom,

We took another quick look at the May 2017 version of the draft PNNL RCFD EA and had a few more comments as follows:

1. Page 1-3, Figure 1.2 , Proposed Action Area legend, last line: The April draft used the word "....... Corridor" but the May draft changed the word to "........ Center". Change the word Center back to Corridor.

2. Page 7-2, 8th bullet: Revise to say - Puget Sound Naval Shipyard and Intermediate Maintenance Facility

Regards,

Stuart
Stuart Arnold
PSNS&IMF C/2312.2
360-476-8882

-----Original Message-----
From: Arnold, Stuart G CIV PSNS, Code 2312
Sent: Monday, May 01, 2017 9:08 AM
To: 'McDermott, Tom'
Subject: RE: PNNL RCFD EA

Tom,

Attached are the PSNS & IMF comments to the draft PNNL RCFD EA. Thank you for giving us the opportunity to review this document.

Sincerely,

Stuart Arnold
PSNS&IMF C/2312.2
360-476-8882

Puget Sound Naval Shipyard & Intermediate Maintenance Facility (PSNS&IMF) comments to the Pacific Northwest National Laboratory Richland Campus Future Development, Draft Environmental Assessment (EA)

	EA Page/Section	Comment/Proposed Resolution
1	Pg. 3-8, Section 3.1.8 Navy Haul Road, 1st paragraph, last sentence	Replace "decommissioned Naval reactor compartments from barge…" to "decommissioned, defueled Naval reactor compartment packages from barge….."
2	Pg. 3-8, Section 3.1.8 Navy Haul Road, 2nd paragraph, 2nd sentence	Replace "typically one to three hours" to "typically less than one hour"
3	Pg. 4-1, Section 4.1 Land Use, towards middle of section, 5th bullet	Replace 1st sentence as follows: The Port of Benton docking facility, located east of the campus on the Columbia River, used for transferring Naval reactor compartment packages and other materials destined for the Hanford Site.
4	Pg. 5-3, Section 5.1.2 Cumulative Impacts, Table 5.1, last item - Transportation	Replace sentence as follows: The current Navy Haul Road used to transport decommissioned, defueled Naval reactor compartment packages from barge passage to the disposal site may be relocated.
5	Pg. 7-2. Section 7.0 Public, Agencies, and Tribal Government Notifications, 4th bullet from top	Replace "Navy Puget Sound Naval Shipyard and ……" with "Puget Sound Naval Shipyard and ….." and relocate to new location between Private citizens and State of Oregon…

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U.S. Department of Energy
Finding of No Significant Impact

Pacific Northwest National Laboratory
Richland Campus Future Development
(DOE/EA-2025)

AGENCY: U.S. Department of Energy

ACTION: Finding of No Significant Impact

DESCRIPTION OF THE PROPOSED ACTION

Proposed Action: The United States Department of Energy (DOE) would construct and operate multiple buildings on the Pacific Northwest National Laboratory (PNNL) Richland Campus, including research laboratories, office space, and support buildings. Future development could provide approximately one-million square feet of additional usable space. Individual development projects would be subject to the PNNL Campus Development Strategic Objectives contained in the 2017 *Pacific Northwest National Laboratory Richland Campus Master Plan* as well as to DOE authorization and the availability of funds.

New buildings constructed over the next 20 years would typically be one or two stories high and constructed using a combination of brick/metal sided and glass fronts with earth-tone color combinations, similar to the exterior of the current PNNL buildings. New facilities with high bays could extend as tall as 15 m (50 ft) to accommodate relocated or new research and development (R&D) projects. With the exception of exhaust stacks or potential new or replacement communication towers, no structures would be so high as to require nighttime lighting or any form of guy wires or tie downs. Some buildings may be constructed with basements; in those cases, the maximum excavation depth would be 15 m (50 ft). New infrastructure necessary to support the proposed buildout includes extension of service roads and utilities such as water (e.g., fire protection, potable, and irrigation), sanitary and process sewer, electrical power, communications, and natural gas.

While the actual construction schedule would be driven by funding availability, the plan could include continuous construction of smaller (< 1,860 m^2 [20,000 ft^2]) buildings, with the construction of an occasional larger (5,570 to 18,600 m^2 [60,000 to 200,000 ft^2]) building, for a total buildout of 92,900 m^2 (1.0 million ft^2). A likely construction scenario would include one to three buildings totaling approximately 6,970 m^2 (75,000 ft^2) being under construction every year over the next 20 years, with an average construction time of 14 to 16 months per building. Larger buildings would take two to three years to complete.

The Proposed Action also includes:

- Maintenance and refurbishment of existing facilities. The decision to build new facilities or refurbish existing ones would be based on mission needs, overall lifecycle costs, and expected return on investment.
- Associated site preparation, utilities, infrastructure, landscaping, and standard environmental protection measures
- Potential decontamination and demolition of buildings that DOE determines no longer support mission needs.
- Potential lease of property to other entities for development compatible with the PNNL Richland Campus Master Plan.
- Continued use of the Navy haul road.

No activities would occur within the preservation designated area (PDA) except the continued use of a segment of the Navy haul road, ongoing DOE activities, and actions to protect, preserve, and perpetuate cultural and biological resources. Non-Tribal public access within the preservation designated area would not be allowed with the exception of emergency services.

Purpose and Need: To meet the long-term federal agency mission need to enable discovery and advance science, DOE needs to provide laboratory space and associated infrastructure for existing and future R&D capabilities at the PNNL Campus located in Richland, Washington.

Alternatives: In addition to the No Action Alternative, DOE considered two alternatives to the Proposed Action:

1) using existing federally owned facilities and land at the Hanford Site
2) using existing privately owned facilities at or near the campus.

Because neither of these alternatives was determined to be a reasonable alternative to the proposed campus buildout, potentially associated environmental impacts were not evaluated in detail. Considerations included:

- Co-location of technical capabilities on the campus would promote collaboration and efficient use of unique or common resources.
- Renovations to off-site federally or privately owned buildings would be costly and operations would be more limited and inefficient than in new purpose-built campus facilities.

ENVIRONMENTAL IMPACTS

Resource Area	Impact Summary
Land Use	The activities within the PNNL Richland Campus would be consistent with adjacent land uses planned by the City of Richland and Benton County.
Air Quality	Emissions from construction activities would be intermittent and occur over months, and as a result would not be expected to cause any air-quality standards to be exceeded. The future potential buildout of the PNNL Richland Campus would result in minimal increases in PNNL staffing levels. Consequently, there may be a minimal increase in vehicle or other emissions from the Proposed Action.
Soils and Geological Resources	About 9 ha (22 ac) of soils classified as “prime farmland if irrigated” and about 5 ha (12 ac) of soils classified as “farmland of statewide importance” could be affected by construction. No surface soils would be mined for offsite uses and no offsite materials would be required.
Water Resources	Future development is anticipated to replace existing structures, with minimal increase in PNNL staffing levels and minimal change to the PNNL water use for non-irrigation purposes. Irrigation water requirements are expected to be somewhat reduced from current levels by increasing the proportion of the campus using xeriscaping or rock landscaping. Excavations for new facilities are not expected to extend into the groundwater.
Cultural and Historical Resources	Protective requirements and associated mitigation options to resolve potential adverse effects to National Register of Historic Places-eligible properties from the Proposed Action would be addressed in a parallel NHPA Section 106 process. The National Register of Historic Places-eligible traditional cultural property, *Shu Wipa*, would be directly and indirectly impacted by construction activities occurring outside of the preservation designated area and would require mitigation. Construction and operations-related activities occurring outside of the preservation area would impact the Yakama Nation traditional cultural property. The parallel NHPA Section 106 process will mitigate for the anticipated adverse effects to both of these traditional cultural properties.
Biological Resources	Development in the project area would remove native shrub-steppe habitats. Wildlife present west of George Washington Way could suffer direct mortality, disturbance, and displacement. A mitigation action plan would be implemented to mitigate for habitat loss and potential impacts to wildlife, including migratory birds.
Wetlands and Floodplains	There are no wetlands or floodplains in the project area.
Socioeconomics	Based on construction workforce estimates, construction activities would likely have little effect on the existing community. The new facilities would house existing research staff and a minimal number of new research staff. Consequently, no impacts on socioeconomics or community infrastructure would be expected from operations.
Environmental Justice	The Proposed Action, when considered with mitigation, would not result in disproportionately high and adverse effects on minority or low-income populations.
Transportation and Traffic	Potential increases in traffic during peak construction represent an approximately 23 to 31 percent increase over current average daily traffic on Horn Rapids Road. During non-peak construction periods, the increase over current average daily traffic on Horn Rapids Road would be about 12 to 15 percent.
Human Health and Safety	The radiological impact to construction workers would be negligible and would be similar to that of members of the public in the vicinity of the PNNL Richland Campus. There would be no appreciable difference in operational impacts on human radiological health and safety.

Resource Area	Impact Summary
Visual Resources	Development would be consistent with the visual resource goals of the City of Richland Comprehensive Land Use Plan.
Noise and Vibration	Construction activities would generate noise typical of using heavy equipment and transport of materials. The commercial limit of 65 dBA would apply to facilities on campus.
Utilities and Infrastructure	Additional water, electrical, communication and other infrastructure may have to be constructed to support new facilities.
Waste Generation and Disposition	Effluents and wastes generated during construction would be minimized to the extent practicable and would be managed using existing facilities. New and replacement facilities would result in minimal increases in industrial waste streams (e.g., liquid wastewater, radioactive and mixed waste volumes).
Accidents	Accidents in new facilities are unlikely. However, two accidents associated with hydrogen gas storage (i.e., a vapor cloud explosion and vapor cloud fire) were considered. Consequences could affect nearby onsite workers, but impacts would not pose undue risk to members of the general public.
Intentional Destructive Acts	Although an intentional act is unlikely, an intentional destructive act targeting the PNNL Richland Campus is possible. However, the Proposed Action would not increase the likelihood of an intentional destructive act or the resulting consequences.
Cumulative Impacts	The contribution of the Proposed Action to the cumulative impacts from other past, present, and reasonably foreseeable future actions in the vicinity of the PNNL Richland Campus would be low.

PUBLIC COMMENT ON THE DRAFT EA

On May 23, 2017, DOE announced via e-mail to various state and federal government officials and other stakeholders the availability of the EA for a 30-day review period and two associated public meetings. DOE NEPA regulations require minimally a 14-day review. The public meetings were held during the afternoon and evening of June 8, 2017, at the Washington State University Tri-Cities Campus Consolidated Information Center. The Nez Perce Tribe requested a 30-day extension to the public comment period, which was granted. No comments were received during the public meetings, however, correspondence containing comments in the noted subject areas was received from the:

Nez Perce Tribe:

- Wetlands
- Floodplains
- Cultural Resources
- Biological Resources
- Transportation
- Noise and Vibration
- Federal and State Listed Species
- Environmental Consequences

Confederated Tribes and Bands of the Yakama Nation:

- Treaty Rights and Land Use
- Cultural Resources/Archeological and Historic Sites
- Environmental Justice

- Habitat, Plants and Wildlife
- Environmental Consequences and Risk
- Scope

State of Washington, Department of Ecology:

- Off-site stormwater discharge

Environmental Protection Agency, Region 10:

- Water Resources and Impacts
- Air Quality Impacts
- Energy Efficiency and Conservation
- Land Use and Farmland Impacts
- Impacts on Cultural and Heritage Resources

The Puget Sound Naval Shipyard and Intermediate Maintenance Facility:

- Navy Haul Road

The comments and associated responses are presented in the Final EA, Appendix D. As a result of the comments, in some instances changes/additions were made from the Draft EA. These are marked in the Final EA with a line in the outside margin.

MITIGATION

DOE shall implement a Mitigation Action Plan (MAP) pursuant to 10 CFR 1021.331. The MAP is located in Appendix B of the EA. DOE makes the following mitigation commitments:

1) PNSO will continue to work with the Native American Tribes, the Washington State Historic Preservation Officer, the Advisory Council on Historic Preservation, and possibly other consulting parties to develop options to mitigate potential adverse impacts to historic and cultural properties, pursuant to Section 106 of the National Historic Preservation Act. Discussions are on-going.

2) PNSO has developed a biological resource management policy for the PNNL Richland Campus that includes mitigation for loss of priority habitats (DOE/PNSO 2015). Shrub-steppe is one of the priority habitat types within Washington State (WDFW 2008/2016). The proposed campus future development includes the potential to clear approximately 54.2 ha (134.4 ac) of mature shrub-steppe within the campus.

3) The biological resources commitments made in the MAP are designed to mitigate for the loss of shrub-steppe habitat, classified as priority habitat by the Washington State Department of Fish and Wildlife (WDFW 2008/2016), by replacement of the lost habitat value, reduction or elimination of the potential spread of noxious weeds, and avoidance of potential impacts to nesting migratory birds. The MAP plan provides a framework for future development of individual

mitigation action plans that address the needs of each phase of buildout over the next 20 years.

DETERMINATION

The Environmental Assessment for PNNL Richland Campus Future Development is hereby approved. Based on the analysis contained therein, consideration of comments received on the draft, and mitigation commitments, DOE has determined that the Proposed Action does not constitute a major Federal action that would individually or cumulatively have a significant effect on the quality of the human environment within the meaning of the National Environmental Policy Act of 1969, 42 U.S.C 4321 et seq. Therefore, preparation of an environmental impact statement is not required. With this determination, DOE may proceed with the Proposed Action except where a given project includes the kinds of activities (e.g., ground disturbance) where, in the event cultural/historical resources are present, there would be a possibility for an irreversible or irretrievable commitment of those resources. Once the Section 106 process referred to above is executed, any and all activities consistent with the Proposed Action and the Section 106 agreement may proceed.

Although NEPA compliance on the Proposed Action has been achieved through preparation of the EA, my observation is that most or all projects within the scope of the EA would fall within the bounds of 10 Code of Federal Regulations, Section 1021, Subpart D, Appendix B; Categorical Exclusions Applicable to Specific Agency Actions, assuming, B. Conditions That Are Integral Elements of the Classes of Actions in Appendix B, are met. To ensure the Proposed Action, as implemented, retains compliance, an evaluation shall be performed prior to the implementation decision for each new proposed development project to determine whether the scope and any associated impacts would be bounded by the scope and impacts described in the EA. Additional NEPA review shall be conducted if it is determined that a new development proposal would not fall within the scope of the proposed action described in Section 3.1(including sub-sections) or the environmental impacts would be substantially different than those described in Section 5.2 (including sub-sections).

PUBLIC AVAILABILITY

The EA may be viewed on-line at https://science.energy.gov/pnso/nepa-documents/pnso-ea-eis/.

Copies of the EA are available by contacting:

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For further information regarding the PNNL Richland Campus Future Development Environmental Assessment process or the DOE NEPA process in general, contact:

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Issued in Richland, Washington, this 28th day of September 2017.

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