Appendix I: Environmental Health and Safety Technical Resource Report

For Programmatic Environmental Impact Statement on Utility-Scale Solar Energy Facilities in Washington State

By

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For the

Shorelands and Environmental Assistance Program

Washington State Department of Ecology

Olympia, Washington

June 2025, Publication 25-06-002

DEPARTMENT OF ECOLOGY
State of Washington

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Acronyms and Abbreviations List

BESS	battery energy storage system
BLM	Bureau of Land Management
BMP	best management practice
BMS	battery management system
CFR	*Code of Federal Regulations*
DDT	dichlorodiphenyltrichloroethane
DNR	Washington Department of Natural Resources
Ecology	Washington State Department of Ecology
EHS	environmental health and safety
FIFRA	Federal Insecticide, Fungicide, and Rodenticide
GHG	greenhouse gas
HMTA	Hazardous Materials Transportation Act
IEA	International Energy Agency
MTCA	Model Toxics Control Act
MW	megawatt
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PEIS	Programmatic Environmental Impact Statement
PPE	personal protective equipment
PV	photovoltaic
RCP	representative concentration pathway
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
SFMO	State Fire Marshalls Office
SPCC	Spill Prevention, Control, and Countermeasure
SWPPP	Stormwater Pollution Prevention Plan
UFC	United Facilities Criteria
USC	*United States Code*
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
WAC	Washington Administrative Code

Summary

This technical resource report describes the conditions of environmental health and safety (EHS) in the study area. It also describes the regulatory context, potential impacts, and measures to avoid or reduce impacts.

EHS risks in the study area consist of wildfire risks from and to projects and management of hazardous materials and battery energy storage systems. Sites contaminated with hazardous materials are present sparsely across most of the study area with a higher concentration in more developed areas. Worker health and safety risks are minimal because the projects need maintenance but operational staff numbers would be low. The study area is mostly rural and agricultural land that is undeveloped or has low-intensity land uses. For all types of impacts, existing EHS laws, regulations, and industry standards greatly reduce risks and establish a framework under which significant impacts should be avoidable. Despite these safeguards, releases of hazardous materials could occur, though these would likely be in relatively small quantities and to secondary containment or nearby areas and able to be cleaned up. Thermal runaway events, where lithium-ion batteries overheat due to damage or failure of battery management systems (BMSs), could affect emergency responders due to releases of hazardous air emissions.

Findings for EHS impacts described in this technical resource report are summarized as follows:

- Through compliance with laws and permits and with the implementation of measures to avoid and reduce impacts, most construction, operations, and decommissioning activities would likely result in **less than significant impacts** related to hazardous materials and health and safety.
- Depending on the specific location, severity, and fire response capacity, there is the potential that construction, operations, and decommissioning of a project would have **less than significant** to **potentially significant adverse impacts** of wildfire due to risk of ignition.
- A thermal runaway event due to damage or BMS failure at a co-located lithium-ion battery energy storage system would have **potentially significant adverse impacts** related to hazardous air emission risks for emergency responders.

Construction, operation, and decommissioning may result in **potentially significant and unavoidable adverse impacts** related to wildfires if there are new ignition sources in remote locations with limited response capabilities. Determining if mitigation options would reduce or eliminate impacts below significance would be dependent on the specific project and site.

Demand for emergency response during incidents (including wildfires or battery incidents) is considered in the *Public Services and Utilities Technical Resource Report* (Appendix P).

Crosswalk with Environmental Health and Safety Technical Resource Report for Utility-Scale Onshore Wind Energy

Two Programmatic Environmental Impact Statements (PEISs) are being released at the same time, one for utility-scale solar energy facilities and one for utility-scale onshore wind energy facilities. This crosswalk identifies the areas with substantial differences between the EHS technical resource reports for each PEIS.

Utility-Scale Solar Energy PEIS (this document)	**Utility-Scale Onshore Wind Energy PEIS**
• Some differences in specific hazardous materials, health and safety hazards, and wildfire risks • Some differences in measures to avoid and reduce impacts	• Some differences in specific hazardous materials, health and safety hazards, and wildfire risks • Some differences in measures to avoid and reduce impacts

1 Introduction

This technical resource report describes environmental health and safety (EHS) within the study area and assesses potential impacts associated with types of facilities (alternatives), and a No Action Alternative. Chapter 2 of the State Environmental Policy Act Programmatic Environmental Impact Statement (PEIS) provides a description of the types of facilities evaluated (alternatives).

This section provides an overview of the aspects of EHS evaluated and lists relevant regulations that contribute to the evaluation of potential impacts.

1.1 Resource description

EHS refers to the risks or hazards that threaten the well-being of people or other elements of the environment. Workplace accidents or system failures can result in EHS hazards, such as fires, explosions, hazardous material spills, injury, or structural damage.

In this programmatic analysis of the construction, operation, and decommissioning of utility-scale solar energy facilities in Washington, EHS includes the following:

- Hazardous materials and toxic substances exposure associated with photovoltaic (PV) cells and battery systems
- Worker health and safety
- Wildfire hazards

The following resources could have impacts that overlap with impacts to EHS. Impacts on these resources are reported in their respective technical resource reports:

- **Air quality and greenhouse gases:** Discussion of greenhouse gas (GHG) emissions and air contaminants are provided in the *Air Quality and Greenhouse Gases Technical Resource Report* (Appendix E).
- **Biological resources:** Fire-adapted natural communities are discussed in additional detail in the *Biological Resources Technical Report* (Appendix G).
- **Aesthetics and visual quality:** Consideration of impacts from glare on nearby land uses or vehicular travel is included in the *Aesthetics/Visual Quality Technical Resource Report* (Appendix L).
- **Public services and utilities:** Emergency response capabilities and information on lithium-ion battery energy storage system (BESS) incidents, including guidance for first responders, are discussed in the *Public Services and Utilities Technical Resource Report* (Appendix P).

1.2 Regulatory context

Federal, state, and local regulations for health and safety apply to solar energy projects in Washington. Table 1 lists the statutes, regulations, and other requirements related to EHS.

Table 1. Laws, plans, and policies applicable to EHS

Regulation, statute, guideline	Description
Federal	
Comprehensive Environmental Response, Compensation, and Liability Act (as amended by the Superfund Amendments Reauthorization Act of 1986 and the Community Environmental Response Facilitation Act of 1992)	Provides a federal “Superfund” to clean up uncontrolled or abandoned hazardous waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment.
Clean Water Act	Establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.
Safe Drinking Water Act	Protects public health by regulating the nation’s public drinking water supply.
Emergency Planning and Community Right-to-Know Act	Authorized by Title III of the Superfund Amendments and Reauthorization Act to help communities plan for chemical emergencies. It requires industry to report on the storage, use, and releases of certain chemicals to federal, state, Tribal, territorial, and/or local governments. It also requires these reports to be used to prepare for and protect their communities from potential risks.
Resource Conservation and Recovery Act (RCRA)	Gives the U.S. Environmental Protection Agency (USEPA) the authority to control hazardous waste from cradle to grave. This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also establishes a framework for the management of non-hazardous solid wastes.
Hazardous Materials Transportation Act (HMTA) of 1975	Empowered the Secretary of Transportation to designate as hazardous material any “particular quantity or form” of a material that “may pose an unreasonable risk to health and safety or property.” Hazardous materials regulations are subdivided by function into four basic areas: Procedures and/or Policies 49 *Code of Federal Regulations* (CFR) Parts 101, 106, and 107. Material Designations 49 CFR Part 172. Packaging Requirements 49 CFR Parts 173, 178, 179, and 180. Operational Rules 49 CFR Parts 171, 173, 174, 175, 176, and 177. The HMTA is enforced by use of compliance orders [49 *United States Code* (USC) 1808(a)], civil penalties [49 USC 1809(b)], and injunctive relief (49 USC 1810). The HMTA (Section 112, 40 USC 1811) preempts state and local governmental requirements that are inconsistent with the statute, unless that requirement affords an equal or greater level of protection to the public than the HMTA requirement.

Regulation, statute, guideline	Description
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and Federal Food, Drug, and Cosmetic Act	FIFRA provides for federal regulation of pesticide distribution, sale, and use. All pesticides distributed or sold in the United States must be registered (licensed) by USEPA. Before USEPA may register a pesticide under FIFRA, the applicant must show, among other things, that using the pesticide according to specifications "will not generally cause unreasonable adverse effects on the environment." FIFRA defines the term "unreasonable adverse effects on the environment" to mean: "(1) any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide, or (2) a human dietary risk from residues that result from a use of a pesticide in or on any food inconsistent with the standard under Section 408 of the Federal Food, Drug, and Cosmetic Act."
49 CFR 173.185, which regulates the transportation of lithium-ion batteries	Regulations on how these types of batteries are classified and packaged.
49 CFR 173.159, which regulates the transportation of lead-acid batteries	Regulations on how these types of batteries may be packaged and transported.
29 CFR 1910.269, Electric Power Generation, Transmission, and Distribution standard	This section of the code covers the operation and maintenance of electric power generation, control, transformation, transmission, and distribution lines and equipment.
Occupational Safety and Health Act of 1970	Ensures employers provide their workers a place of employment free from recognized hazards to safety and health, such as exposure to toxic chemicals, excessive noise levels, mechanical dangers, heat or cold stress, or unsanitary conditions.
2018 International Wildland-Urban Interface Code	Establishes regulations to safeguard life and property from the intrusion of wildland fire and to prevent structure fires from spreading to wildland fuels. Regulates defensible space and provides ignition-resistant construction requirements to protect against fire exposure and resist ignition by burning embers. Provides standards for emergency access, water supply, and fire protection. Provides requirements for automatic fire suppression and safe storage practices.
American National Standards Institute, design standards	Safety standards on construction sites and safe work environments; building and design standards that reduce expenses while raising quality.
American Society of Mechanical Engineers, design standards	Standards that enhance public safety, health, and quality of life, as well as to facilitate innovation, trade, and competitiveness, including energy storage.
Institute of Electrical and Electronics Engineering Guide for Substation Fire Protection (979-2012)	Guide developed to identify substation fire protection practices that generally have been accepted by industry.
International Building Code	Code preserving public health and safety that provides safeguards from hazards associated with the built environment.
International Fire Code	Establishes minimum requirements for fire prevention and fire protection systems using prescriptive and performance-related provisions.

Regulation, statute, guideline	Description
National Electric Safety Code	Sets the ground rules and guidelines for practical safeguarding of utility workers and the public during the installation, operation, and maintenance of electric supply, communications lines, and associated equipment.
National Fire Protection Association (NFPA) Standards (NFPA 1141 Protection for Land Development, NFPA 1144 Reducing Structure Ignition Hazards)	Provides a methodology for assessing wildland fire ignition hazards around existing structures and provides requirements for new construction to reduce the potential of structure ignition from wildland fires.
National Institute for Occupational Safety and Health	Research, programs, and publications addressing occupational health and safety problems for workers.
United Facilities Criteria (UFC) for Fire Protection Engineering for Facilities (UFC 3-600-01)	This UFC must be used as the minimum standard for the planning and development of projects and design, construction, and commissioning documentation used for the procurement of facilities. It is the primary fire protection criteria reference document for services provided by architectural and engineering firms and consultants in the development of both design-bid-build and design-build contracts.
NFPA 855 Standards for Installation of Energy Storage Systems	Applies to facilities with co-located battery energy storage systems.
State	
Chapter 70.94 Revised Code of Washington (RCW), Washington Clean Air Act	These regulations secure and maintain levels of air quality that protect human health and safety, including the most sensitive members of the population, to comply with the requirements of the federal Clean Air Act, to prevent injury to plants, animal life, and property; to foster the comfort and convenience of Washington's inhabitants; to promote the economic and social development of the state; and to facilitate the enjoyment of the natural attractions of the state.
Chapter 70.95 RCW, Solid Waste Management Act	These regulations establish a comprehensive statewide program for solid waste handling, solid waste recovery, and recycling.
Chapter 70.105 RCW, Hazardous Waste Management Act	These regulations establish a comprehensive statewide framework for the planning, regulation, control, and management of hazardous waste.
Chapter 70.105D RCW, Model Toxics Control Act (MTCA)	MTCA funds and directs the investigation, cleanup, and prevention of sites that are contaminated by hazardous substances.
Chapter 173-340 Washington Administrative Code (WAC), MTCA	These regulations establish administrative processes and standards to identify, investigate, and clean up sites where hazardous substances are located. Chapter 173-340 WAC implements MTCA in Chapter 70A.305 RCW.
Chapter 70.107 RCW, Washington State Noise Control Act	These regulations expand statewide efforts directed toward the abatement and control of noise.
Chapter 173-60 WAC, Maximum Environmental Noise Levels	These rules establish maximum noise levels and provide use standards relating to the reception of noise.

Regulation, statute, guideline	Description
Chapter 90.48 RCW, Water Pollution Control Act	The Water Pollution Control Act sets standards to ensure the purity of all waters of the state and to work cooperatively with the federal government where interest overlaps in a joint effort to extinguish the sources of water quality degradation.
Chapter 173-303 WAC, Dangerous Waste Regulations	These regulations implement Chapter 70.105 RCW and designate policies for dangerous solid waste.
Chapter 173-350 WAC, Solid Waste Handling Standards	These regulations set performance standards, functions, priorities, and responsibilities for solid waste.
WAC 51-54A-8200, International Wildland-Urban Interface Code	The International Wildland-Urban Interface Code sets additional requirements code officials can require for structures and subdivisions located within the wildland-urban interface areas. These include a site plan, vegetation management plan, vicinity plan, fire apparatus access roads, and water supply.
Chapter 51-54A WAC, State Building Code Adoption and Amendment of the 2021 Edition of the International Fire Code	These regulations promote the health, safety, and welfare of the occupants or users of buildings through building codes. This includes regulations related to lithium batteries.
Chapter 332-24 WAC, Forest Protection	These regulations are related to forest protection including burning permits, outdoor permits, forest debris, felling of snags, and burning plans.
Chapter 296-155 WAC, Safety Standards for Construction Work	These standards are minimum safety requirements for construction, alteration, demolition, related inspection, and/or maintenance and repair work performed in the state of Washington.
Local	
Comprehensive plan goals and objectives, and local codes and requirements pertaining to environmental health and safety	Some local land use and environmental regulations may establish additional requirements on the storage and use of hazardous materials. Many counties and cities in Washington defer to state regulations for environmental health and safety.

2 Methodology

This section provides an overview of the process for evaluating potential impacts and the criteria for determining the occurrence and degree of impact.

2.1 Study area

The study area for EHS includes the overall solar geographic scope of study (Figure 1), as well as surrounding areas, for the purpose of evaluating wildfire risk, such as associated transmission lines and power stations, and regions at risk of wildfires as defined by the U.S. Department of Agriculture and Washington Department of Natural Resources (DNR). The study area also includes local disposal capacity for solid and hazardous wastes generated from construction and/or decommissioning.

The PEIS geographic scope of study includes various federal, state, and locally managed lands; however, Tribal reservation lands; national parks, wilderness areas, and wildlife refuges; state parks; and areas within cities and urban growth areas were excluded.

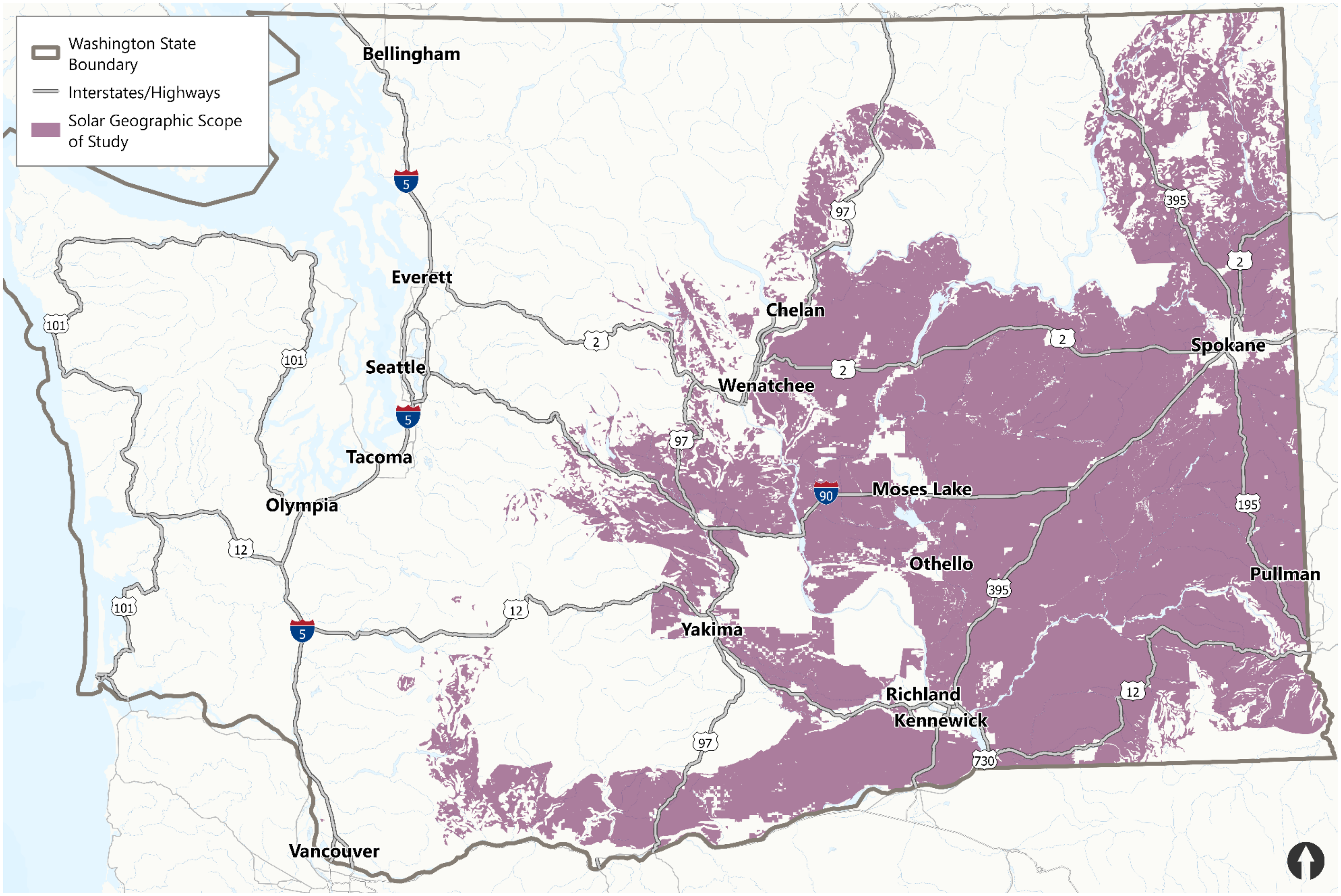

Figure 1. Solar Energy Facilities PEIS – geographic scope of study

2.2 Technical approach

The analysis was based on assumptions using similar projects and activity types and their identified impacts. The best available science, publicly available data, and reference materials that informed impact assessments for other utility-scale solar energy projects informed this analysis. A qualitative assessment is provided of potential existing hazards in the study area, those that may result from typical construction, operation, and decommissioning activities, and the potential for public exposure to hazards or hazardous materials. Regulations and policies were reviewed for guidelines that may impact project design, documentation, and reporting requirements, and best management practices (BMPs) for occupational safety. Research was conducted into additional considerations for activity types where agricultural and energy uses overlap.

2.3 Impact assessment approach

The PEIS analyzes a time frame of up to 20 years of potential project construction and up to 30 years of potential project operations (totaling up to 50 years into the future). For the purposes of this assessment, a potentially significant impact would occur if a project resulted in the following:

- Release of hazardous materials that increases the risk of environmental contamination (e.g., air or water) or increased threats to human health and safety
- Increase in physical safety risks resulting in a high likelihood of harm to workers or the public
- Increase in wildfire risk and associated hazard conditions

3 Technical Analysis and Results

3.1 Overview

This section describes the affected environment and potential EHS impacts that might occur for utility-scale solar energy facilities analyzed in the PEIS. This section also evaluates measures to avoid, minimize, or reduce the identified impacts and potential unavoidable significant adverse impacts.

3.2 Affected environment

The affected environment represents existing conditions at the time this study was prepared. This section describes the major EHS hazards in the study area: hazardous materials, health and safety risks, and wildfires. Much of the study area is rural consisting mostly of low-intensity land uses, especially agriculture, and undeveloped land. The presence of EHS hazards in the study area is mainly associated with former or existing development or other land use activities, whereas wildfire may be more prevalent in undeveloped areas. Emergency response is also briefly discussed, and these capabilities are further described in the *Public Services and Utilities Technical Resource Report*.

3.2.1 Hazardous materials

The quantities and use of hazardous materials vary greatly by land use. Large concentrations of hazardous materials can be present at industrial sites, as well as commercial and agricultural land uses. Hazardous materials that could be present at businesses or other sites may include, but are not limited to, petroleum products (such as gasoline, diesel, or oil); heavy metals (such as lead, cadmium, mercury, or arsenic); pesticides; solvents; compressed gases; and batteries. Hazardous materials may also be present along roads as a result of vehicular activity. This could include heavy metals, petroleum products, or hydraulic fluids. Hazardous materials could also be present in isolated areas away from current or past development as a result of human activity, such as illegal dumping.

The storage, use, and disposal of hazardous materials are regulated and monitored by the Washington State Department of Ecology (Ecology) under hazardous materials management programs. Sites with hazardous materials present or involved in other activities regulated by Ecology are listed in the Facility/Site Interaction database (Ecology 2024). Local land use and environmental regulations may establish additional requirements on the storage and use of hazardous materials.

Many active land uses in the study area are currently permitted to store, use, or dispose of hazardous materials or are required to document the presence of hazardous materials. A large portion of these hazardous materials are associated with agricultural land uses in rural areas. Hazardous materials associated with agriculture include pesticides, petroleum products, and fertilizers. The use of hazardous materials by farms in the study area largely falls under the jurisdiction of the federal Emergency Planning and Community Right-to-Know Act, which requires businesses that store hazardous materials over certain volumes to annually report the chemicals present on site to the state Emergency Response Commission, local emergency planning committees, and local fire departments for emergency planning. Parts of the study area along major roads or near concentrated development have a wider variety of land uses and associated hazardous materials uses, such as utility and fuel companies, which are often regulated as entities that generate, store, or dispose of hazardous waste (Ecology 2024).

Active and inactive land uses that are designated as toxic substance cleanup sites are documented by Ecology’s Contaminated Site Register. Ecology’s Toxics Cleanup Program documents and oversees cleanups of hazardous materials including petroleum, heavy metals, pesticides, and persistent organic pollutants. Cleanup sites may contain hazardous materials that are no longer permitted, many of which are classified as persistent organic pollutants, such as dichlorodiphenyltrichloroethane (DDT) and polychlorinated biphenyls (PCBs; Ecology 2020a).

Cleanup sites are present at a low density throughout the study area, with higher concentrations of cleanup sites in areas of concentrated development. Use of any cleanup sites could pose risks of exposure to or release of hazardous materials. Use of these sites or development on former industrial sites could require remediation before construction or mitigation measures to reduce adverse impacts from disturbing contaminated sites.

The study area contains six cleanup sites on the National Priorities List under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as Superfund sites. These sites have hazardous material contamination present in the soil, surface water, or groundwater. Following remediation, some Superfund sites may be viable locations for utility-scale solar energy facilities. Superfund sites in the study area are detailed in Table 2.

Table 2. Superfund sites in the study area

Superfund site name and description	Site location description	Hazard ranking score (of 100)
Mica Landfill: 161-acre former municipal landfill.	Approximately 11 miles southeast of Spokane and 1.5 miles north of the Town of Mica. It is generally bounded on all sides by forest areas. Rural Route 7 runs parallel to the site to the west.	34.64
Colbert Landfill: 40-acre capped former municipal and commercial landfill.	Bordered by low-density residential properties and forested areas to the north, the North Elk Chattaroy Road to the south and east, and Spokane County Regional Solid Waste and North Newport Highway to the west.	41.59
Pasco Sanitary Landfill: The site is nearly 200 acres and was used as an open burning dump followed by a sanitary landfill.	In Franklin County, approximately 1.5 miles northeast of Pasco, Washington. It is surrounded by agriculture and commercial businesses.	44.46
Hanford 300-Area, Department of Energy: The 300-Area contained the reactor fuel manufacturing plants and the research and development laboratories. A 19,000-acre portion of this area is available for lease for clean energy use.	Benton County, north of the city of Richland. Barren environment with isolated areas of intense development.	65.23

Sources: Energy 2024a; USEPA 2024a

3.2.2 Health and safety risks

Hazardous materials may affect workers and emergency responders. Solar panels and electrical components and structures may pose risks of electrical hazards and accidents during maintenance activities. Distance from emergency services due to the rural nature of much of the study area is also a factor in considering occupational health and safety.

3.2.3 Wildfire risk

Wildland fires affect grasslands, forests, and brushlands, as well as any structures on these lands. They carry the potential for injury, loss of life, and damage. Such fires can occur from human or natural causes. The type and amount of topography (e.g., slope, elevation, and aspect), weather/climate conditions (e.g., wind, temperature, and humidity), and vegetation/fuels are the primary factors influencing the degree of fire risk and fire behavior in an area. The combination of these factors, described in more detail below, can fuel or arrest the spread of wildfire if it occurs. The sections below also discuss wildfires and air pollution, as well as climate change and fire risk.

Washington has experienced many extreme fire events in recent years, partly attributed to climate change effects and the legacy of forest fire suppression practices, and this trend is expected to increase in the future. The combination of longer fire seasons, population growth, declining forest health, and other changing risk factors has made wildfire considerations a top priority in the state, as outlined in the *Washington State Wildland Fire Protection 10-Year Strategic Plan*. The plan recognizes the need for proactive management of the landscape, the importance of maintaining a highly capable fire response workforce, and the need to prepare for expected increases in wildland fires in future years, among other considerations (DNR 2019). In addition to the DNR mapping tools, a statewide energy safety workgroup (established by the Washington Department of Commerce) is developing risk maps for natural hazards, including wildfire.

3.2.3.1 Topography

Topography is the shape of the land including elevation (height above sea level), slope (the steepness of the land), aspect (the direction a slope faces), and features such as canyons and valleys. Topography can strongly influence fire behavior, including how fast a fire moves through an area; fire typically moves more quickly as it travels uphill compared to either downhill or across flat terrain. As heat rises in front of the fire, it preheats and dries upslope fuels, resulting in their rapid combustion (Bennett 2017).

Topography also influences patterns of precipitation and temperature. Washington can be categorized into geographic regions with respect to topography and the associated considerations for wildfire. The forested central Cascade Mountain region poses a relatively higher risk for extreme wildfire events compared to other parts of the state. However, due to the presence of forests and steeper slopes in the mountains, fewer of these lands are included in the study area. Lands on the eastern slopes of the Cascade Range are subject to dry continental climate conditions with extreme temperatures and receive less precipitation due to the topographic rain shadow effect.

3.2.3.2 Weather/climate

Weather conditions such as wind, temperature, and humidity also influence fire behavior. Much of eastern Washington is included in the study area, and it is the most arid region of the state and the region with the highest fire risk. Due to the relatively dry conditions, wildfires in eastern Washington are more common relative to other parts of the state. Fuels in hotter and drier temperatures are more susceptible to ignition and catch fire more readily than fuels in moister and/or cooler temperature conditions.

Climate change impacts multiple variables related to fire risk, including air temperature, precipitation, humidity, wind, solar radiation, and other interactive issues, such as forest health, invasive species infestations, and prolonged drought. Climate change also has an influence on forests and fire behavior because prolonged drought and invasive species infestations change conditions in a way that can exacerbate fires and lead to more extreme forest fires.

The University of Washington has conducted climate resilience mapping to model wildfire risk across the state through time. The map shows the projected change in high fire-danger days[1] compared to historical (1971 to 2000) averages. An increase in high fire-danger days indicates a greater potential for wildfire danger to damage infrastructure, interrupt businesses, and affect public health and well-being (UW 2024). Although the severity of fire risk varies across the geography of the state, it is notable that all counties show a large increase in the projected number of high fire days between the years 2040 and 2069, within the time frame of the solar energy facility lifespans.[2] The higher GHG scenario[3] causes more warming by the end of the century than the lower GHG scenario;[4] thus, there is a notable difference in the high fire day projections across these scenarios depending on the level of projected emissions. Additional discussion of GHG emissions is provided in the *Air Quality and Greenhouse Gases Technical Resource Report*.

The regions most at risk for wildfire are the Eastern Slope of the Cascades, Okanogan Big Bend, northeastern Washington, and the Blue Mountains of the southeastern Palouse. Among these regions, as of 2050, the likelihood of weather and fuel conditions conducive to wildfire are projected to range from 39% to 85% depending on location and scenario. As of 2075, conditions are projected to range between 42% and 90%. For reference, fire risk for these same four regions ranged from 11% to 63% during the 1980 to 2009 reference period (Hammerschlag

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[1] A high fire-danger day is defined by UW in the context of climate resilience mapping as a day in which 100-hour fuel moisture (i.e., the amount of water in fuel/vegetation available for combustion) is less than the historical 20th percentile.
[2] To assess fire risk probability (based on the UW data) the Climate Background Report (Hammerschlag 2024) used the year 2050 as a linear interpolation between the years 2030 to 2059 and 2040 to 2069 "normals."
[3] The higher GHG emissions scenario is also referred to as the representative concentration pathways (RCP) 8.5 scenario or, more commonly, as the "business as usual" scenario. This scenario assumes that use of coal and other carbon-based pollutants may continue to dominate the energy sector in the future.
[4] The lower GHG scenario is also referred to as the RCP 4.5 climate modeling scenario. RCP 4.5 assumes that climate policies are invoked (or implemented) to achieve the goal of limiting emissions and radiative forcing.

2024). A marked increase in conditions conducive to wildfire is projected to occur within the operational time frame of the solar energy facilities.

3.2.3.3 Vegetation/fuels

Fuel is the material that feeds a fire and is a key factor in wildfire behavior. Fuel sources are diverse and include dead tree leaves, twigs, branches, and standing trees; live trees; brush; and dry grasses. Additional fuel sources can include structures such as homes, buildings, and other associated combustible materials. Natural communities in the eastern Cascades and the foothill region, as noted in the *Biological Resources Technical Report*, contain vegetation highly susceptible to wildfire conditions. Fire-adapted natural communities are discussed in additional detail in the *Biological Resources Technical Report*.

DNR has developed a mapping tool in collaboration with the U.S. Forest Service (USFS) to depict the wildland-urban interface in the state. The wildland-urban interface refers to the areas where wildlands and structures or developed, human-inhabited areas meet or intermingle. For planning purposes, the wildland-urban interface can be evaluated at the county level using the mapping tool and is illustrated on Figures 2a and 2b. Wildlands include many types of natural communities where roughly 50% of the ground surface is vegetated. Wildlands in the state include forests, woodlands, sagebrush-steppe, and open grasslands, among others. The interface is often located along the fringe of urban development. To be considered interface, development/structures must border the wildlands on at least one side. Low-density, undeveloped pockets of urban areas are referred to as wildland-urban "intermix" for mapping purposes. These areas include structures surrounded on two or more sides by wildlands (DNR 2022).

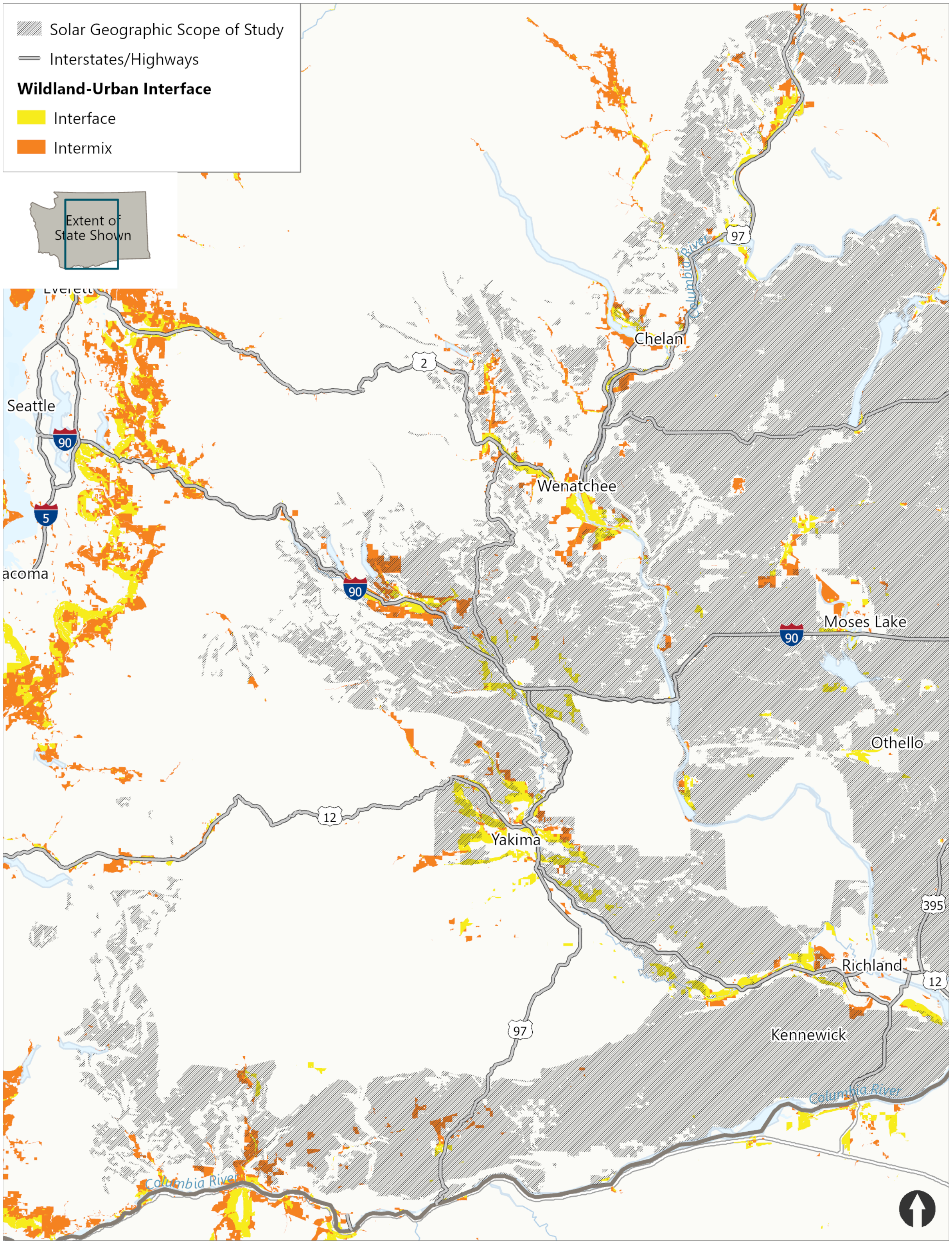

Figure 2a. Wildland-Urban Interface – western Washington

Data sources: USFS 2023; DNR 2022
Note: The figure shows the western extent of the solar geographic scope of study.

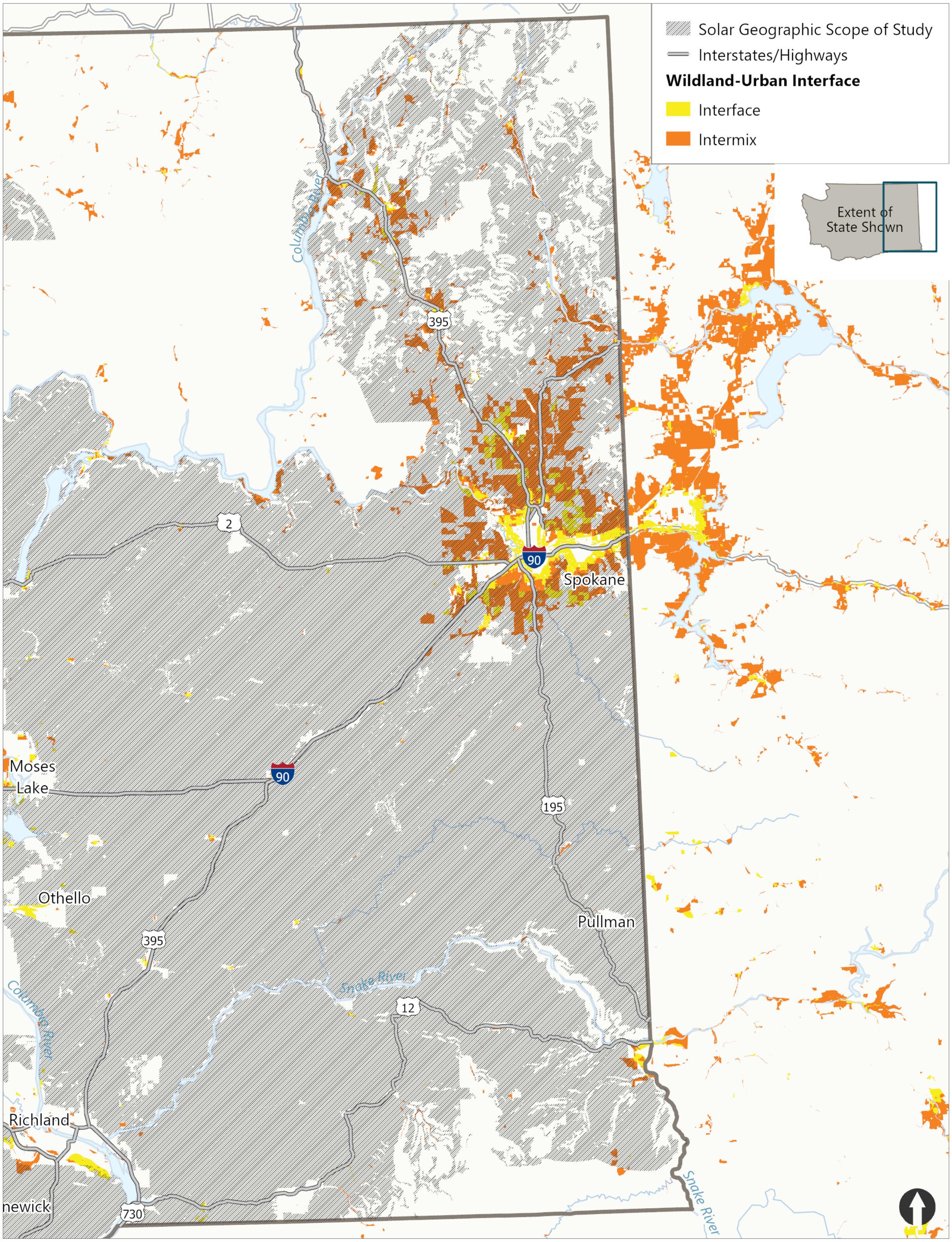

Figure 2b. Wildland-Urban Interface – eastern Washington

Data sources: USFS 2023; DNR 2022

3.2.3.4 Wildfires and air pollution

Smoke generated through wildfires is composed of a mixture of gaseous pollutants (e.g., carbon monoxide), hazardous air pollutants (e.g., polycyclic aromatic hydrocarbons), water vapor, and particle pollution. Particle pollution is the main component of wildfire smoke and the principal concern for public health. The wildfire crisis is considered a public health crisis; as wildfires increase in their size and severity over time, the related public health effects are anticipated to increase. As of 2024, wildland fires and prescribed fires account for 44% of the nation's primary emissions of fine particulate matter (USEPA 2024b). As wildfires burn fuel, large amounts of carbon dioxide, black carbon, brown carbon, and ozone precursors are released into the atmosphere. Additionally, wildfires emit a substantial amount of volatile and semivolatile organic materials and nitrogen oxides that form ozone and organic particulate matter. These emissions can lead to harmful exposures for first responders, nearby residents, and populations in regions that are farther from the wildfires (NOAA 2021). Exposure to these pollutants can generate asthma attacks, coughing, and shortness of breath. Refer to the *Air Quality and Greenhouse Gases Technical Resource Report* for additional information about potential air contaminants.

3.2.3.5 Wildfire response capabilities

Portions of the study area are not under local jurisdiction for fire response. Lands in or near national forests or Bureau of Land Management (BLM) land are under USFS or BLM jurisdiction for fire response. At the state level, DNR provides fire protection on properties it manages. DNR works with other state, federal, and local agencies to respond to wildfires and offers local fire districts and volunteer units with support with fire protection and safety equipment requirements. DNR implements industrial fire precaution levels to limit certain activities as conditions warrant in lands under their jurisdiction.

DNR manages an aviation response and helitack program available for dispatch throughout Washington state. Crews are staged in multiple locations statewide during the fire season and respond to threats to human life, property, and natural resources. Helitack crews are teams of firefighters who are transported by helicopter to wildfires. Available for dispatch throughout all of Washington state, these small teams provide initial attack capacity to fires occurring in areas not easily reached by ground (Figure 3).

Figure 3. Example of type of helicopter used to respond to wildfires

Image source: DNR 2024

DNR Wildfire Aviation is a highly trained air-ground firefighting team available for initial attack rapid response to wildland fires (Figure 4). Wildfire Aviation has 10 UH-1H(M) Huey helicopters modified for water/suppressant delivery in remote locations with the capability to deliver helitack crews into otherwise unreachable terrain. The primary aviation bases are in Olympia and Yakima. Historically, DNR helitack program crews have been staged in Omak, Deer Park, Dallesport, Pomeroy, Wenatchee, Colville, and Olympia (DNR 2024).

Figure 4. Example of aerial firefighting response

Image source: DNR 2024

DNR implements industrial fire precaution levels to limit certain activities as conditions warrant in a given region. USFS and BLM also provide aerial fire response through aviation and helitack operations for lands under federal jurisdiction.

The *Washington State Wildland Fire Protection 10-Year Strategic Plan* recognizes the need for proactive management of the landscape, the importance of maintaining a highly capable fire response workforce, and the need to prepare for expected increases in wildland fires in future years (DNR 2019). Figure 5 depicts large fires that have occurred near the study area in recent decades.

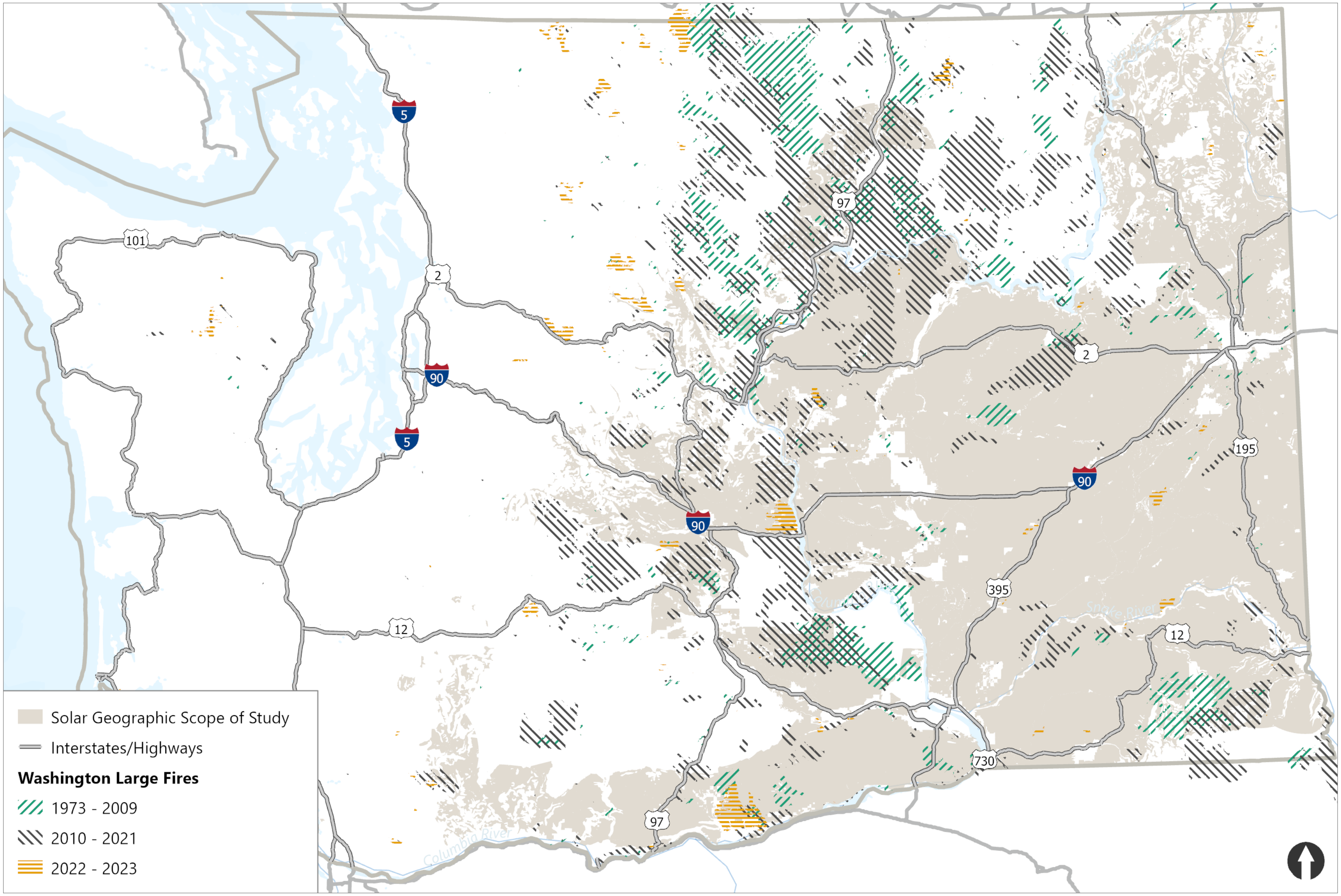

Figure 5. Washington large fires

Data sources: DNR 2023

3.2.4 Emergency response services

Emergency response in the study area includes law enforcement, fire departments, and emergency medical services. Impacts to emergency response services are addressed in the *Public Services and Utilities Technical Resource Report*.

3.3 Potentially required permits and approvals

The following permits related to EHS would potentially be required for construction, operation, or decommissioning activities:

- **Clean Water Act Section 402 National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit (Ecology):** Required for construction that disturbs more than one acre of land and has potential to discharge stormwater to state surface waters or construction disturbance of any size that has the potential to be a significant contributor of pollutants or may be expected to cause a violation of any water quality standard (including groundwater standards). Requires Stormwater Pollution Prevention Plans (SWPPPs) be prepared and implemented to ensure compliance with state and federal water quality standards.
- **Clean Water Act Section 402 NPDES Industrial Stormwater Permit (Ecology):** Required to operate sites with certain industrial activities that could discharge stormwater pollutants to surface waters of the state or certain facilities that have the potential to be significant contributors of pollutants or may be expected to cause a violation of any water quality standard (including groundwater standards). Requires a SWPPP.
- **Clean Water Act Section 402 NPDES Individual Permit (Ecology):** Ecology prepares individual NPDES water quality permits for one entity when discharge characteristics are variable and do not fit a general permit category.
- **Construction and development permits (e.g., road access, grading, building, mechanical, lights, signage) (local agency):** Various project construction activities and placement of new or modification of existing facilities would be subject to local permits to ensure compliance with land use, grading and drainage, stormwater management, building standards, fire codes, etc.
- **Electrical permits (Washington State Department of Labor and Industries):** These permits ensure all electrical installations meet federal and state safety standards.
- **Land use permits (e.g., comprehensive plan amendments, conditional use permit/special use permit, or zoning amendments) (local agency):** Required if changes to a comprehensive plan or zoning designation and/or if a conditional use permit, special use permit, or variance is required for the project. The use permit process would include review of EHS considerations.
- **Right-of-way or lease (federal state, or local agency):** Placement of infrastructure such as roads, generating facilities, and transmission lines on lands under federal, state, or local agency management jurisdiction requires approval from the applicable land manager.

- **State Waste Discharge Permit (Ecology):** Required for discharge to either groundwater or publicly owned treatment works.

3.4 Utility-scale solar facilities

This section describes potential impacts on EHS due to construction, operation, and decommissioning activities.

3.4.1 Impacts from construction and decommissioning

3.4.1.1 Hazardous materials

Hazardous materials may be present in solar modules, including cadmium telluride, copper indium diselenide, and copper-indium gallium selenide. Hazardous materials in solar modules are typically only present in small amounts, and some modules do not contain hazardous materials or contain them in amounts small enough to not be classified as hazardous (USEPA 2023a; International Renewable Energy Agency 2016).

The potential for accidental releases of hazardous materials from individual cells or modules during construction is small, but the number of incidents that could produce EHS hazards will be greater for larger projects than for smaller ones. Similarly, decommissioning of larger projects would include disposal of more solid and hazardous waste, and the risk would be greater than that of smaller projects. Also, while the scale of the project could result in longer decommissioning processes, this would be unlikely to result in risk of environmental contamination or an increase in threats to human health and safety.

Failure of or damage to PV solar equipment is rare, but the potential for damage that could release hazardous materials may be increased during transport and installation during construction phases or during incidents like wildfires. The International Energy Agency (IEA) conducted a study titled *Human Health Risk Assessment Methods for PV Part 2: Breakage Risks* in 2019 (Sinha et al. 2019). PV modules are designed and tested for long-term durability in harsh outdoor environments. The IEA found 0.04% may break during installation or annually while in operation. Of this percentage, over one-third occur during shipping and installation and are removed prior to operation, and the breakage rate declines after installation. The IEA scenarios assumed a broken module would remain undetected and in the field for 1 year, though these would likely be identified during routine maintenance more frequently. Higher breakage rates are possible given extreme weather and wildfire events, but these would be subject to emergency response and cleanup. That would limit the likelihood of broken modules remaining undetected for a long period of time.

The IEA assumed the primary mechanism by which chemicals would be released is by leaching by rainwater that falls on broken modules, with breakage defined as modules with cracked glass or broken module pieces. In this case, chemicals could be transported in runoff from the modules to the soil and soil porewater, which further could be transported to groundwater. In addition, once in the soil, the particles could be emitted to air by wind. The IEA evaluated potential health effects through a comparison of predicted exposure point concentrations in soil, air, and water with risk-based screening levels published by the U.S. Environmental Protection Agency (USEPA). It looked at exposure point concentrations of lead and cadmium for crystalline-silicon and cadmium telluride PV modules and found that for utility-scale system, exposure was several orders of magnitude below USEPA health screening values in soil, air, and groundwater. These values account for chronic exposure to chemicals, protective of both cancer and noncancer endpoints. Table 3 lists the types of hazardous materials that may be used in construction and decommissioning.

Table 3. Common hazardous materials used or present in solar energy construction and decommissioning

Materials	Typical use
Compressed gases: oxygen, acetylene, and nitrogen	Welding, cutting, and purging
Fuels: diesel, gasoline, kerosene, and propane	Vehicles, generators, and maintenance equipment
Vehicle and equipment fluids: lubricants, hydraulic fluids, brake fluids, and coolants	Used for typical functions and maintenance of vehicles and equipment
Solvents and cleaning agents	Cleaning, maintaining, and preparing surfaces for paint or other treatment
Paints, primers, thinners, corrosion control coatings, sealants, and adhesives	Weatherproofing and preservation of equipment and structures, other construction and maintenance processes
Herbicides and pesticides	Vegetation and insect control
Battery electrolytes	Vehicle and equipment batteries
Dielectric fluids	Anti-conductive insulation for electric components, such as wires

The Washington State Model Toxics Control Act (MTCA) dictates the handling and cleanup of these types of hazardous materials. Accidental releases would need to be contained, assessed, and remediated, with hazardous waste transported and disposed of in line with state and federal regulations.

Hazardous materials are present in vehicles, construction equipment, transformers, and other materials used in utility-scale project construction and site characterization. These include petroleum products, hydraulic fluids, batteries (including lead-acid batteries and nickel cadmium batteries), solvents, corrosion control coatings, and spent hazardous material containers. In rare instances of accidents, including equipment failure or damage to construction materials, spills of hazardous materials could be possible. MTCA regulates the handling and cleanup of these types of hazardous materials. Spills would need to be contained, assessed, and remediated, with hazardous waste transported and disposed of in line with state and federal regulations. Any waste generated from these hazardous materials would be in small quantities as construction and decommissioning would not require large quantities of hazardous materials. Hazardous waste would be disposed of in portable containers before being transported off site by a permitted hazardous waste transporter to a permitted hazardous waste treatment, storage, or disposal facility.

During decommissioning, restoration or remediation of the substation and electrical sites may be necessary due to the use of oils and other hazardous materials during energy facility operation. The precise quantities and content of solid waste would vary depending on the facility size, and the actions associated with decommissioning would depend on materials used and specific site restoration actions needed based on the local environment. Decommissioning would typically involve removal of all aboveground components of the solar facilities and would be likely to generate more solid waste than during the construction or operation phases. Decommissioning could also involve a higher risk of releasing hazardous materials compared to construction due to degradation of facility components or dismantling facility components.

Decommissioning would also include more recycling and disposal of solid and hazardous waste. A substantial portion of the materials that comprise solar energy facilities are recyclable, such as steel, aluminum, glass, copper, and plastic. As discussed in the *Public Services and Utilities Technical Resource Report*, the PV Module Stewardship and Takeback Program requirements in Chapter 70A.510 Revised Code of Washington (RCW) will require manufacturers and distributors of PV modules develop and implement a plan for managing disposal. Additionally, decommissioning efforts at a similar scale are typically contracted to companies with expertise in solid and hazardous waste management and the knowledge and capacity to manage waste. The scale of a utility-scale facility could result in long decommissioning processes but would be unlikely to result in risk of environmental contamination or an increase in threats to human health and safety.

Impacts from hazardous materials during construction and decommissioning of solar energy facilities are unlikely. Accidents or failures that could result in the release of hazardous materials are rare, and if they do occur, they are unlikely to happen at a scale that could result in risk of environmental contamination or an increase in threats to human health and safety.

Through compliance with laws and permits and with the implementation of measures to avoid and reduce impacts, construction and decommissioning activities would likely result in **less than significant impacts** related to hazardous materials.

3.4.1.2 Health and safety

Construction and decommissioning activities in the study area would present similar health and safety risks to workers as those that are present on other industrial construction sites. In general, health and safety risks could be increased by the scale of larger projects in comparison to smaller ones. Decommissioning could involve a higher risk of exposure to hazardous materials, electricity, or fire due to degraded or malfunctioning project components. Impacts on the public are unlikely. Public access to portions of the project would be restricted by fences, which would limit public exposure to potential hazards.

Occupational health and safety hazards associated with the construction, site characterization, and decommissioning activities could include but are not limited to the following:

- Falls from facility structures
- Collisions with construction vehicles
- Exposure to electricity
- Exposure to hazardous materials
- Exposure to the elements, including extreme conditions, and sunlight
- Explosions, fire, or high-temperature materials
- Exposure to high-volume construction noises
- Exposure to dangerous plants or animals

Developers would follow Occupational Safety and Health Administration (OSHA) regulations, which establish required safety protocol, risk reduction measures, and limitations on potential exposure to specific hazards. Occupational health and safety regulations relevant to the construction, operation, and decommissioning are detailed under the Occupational Safety and Health Act, including crane and hoist safety, electrical safety, fall prevention, lockout/tagout, heat/cold stress, and personal protective equipment. Additional health and safety requirements would be established during site-specific, project-level planning to address hazards specific to the project or site.

See Section 3.4.1.1 for IEA findings on human health exposure. This study found that for utility-scale system, exposure was several orders of magnitude below USEPA health screening values in soil, air, and groundwater (Sinha et al. 2019). These values account for chronic exposure to chemicals, protective of both cancer and noncancer endpoints.

Occupational health and safety risks during project construction and decommissioning could vary by geography across the study area and include exposure to the elements, falls in landscapes with steeper topography, or wildfire risk, as well as associated wildfire smoke exposure.

Impacts during construction and decommissioning relative to health and safety are unlikely. While accidents could occur, laws, regulations, and industry standards are in place to prevent health and safety hazards in the workplace, including regulations specific to solar energy facilities. These requirements would be supplemented by project- or site-specific health and safety plans.

Through compliance with laws and permits and with the implementation of measures to avoid and reduce impacts, construction and decommissioning activities would likely result in **less than significant impacts** related to health and safety.

3.4.1.3 Wildfire risk

Potential wildfire impacts associated with site characterization, construction, and decommissioning activities consist of those related to the risk factors described in Section 3.2.3, combined with activities such as the use of equipment on dry vegetated lands that could ignite and increase wildfire risk. In general, wildfire risks could be increased by the scale of larger projects in comparison to smaller ones.

Construction activities could generate ignition risks that require careful management, especially in areas of high fire risk. The study area is likely to experience additional climate change effects by the time of decommissioning, with a projected increase in the number of high fire danger days. An increased presence of vehicles and equipment with combustion engines and the use of flammable substances on site could increase risks of ignition during construction and decommissioning. The likelihood of a solar energy facility or related electrical equipment and gen-tie lines igniting a wildfire is low. Fires from PV solar panels are rare. Facilities could alter the behavior of fire due to structures, mowing, and land use changes. Equipment would need to meet state and international building and fire code standards. Where construction is proposed in wildland-urban interface or intermix areas, wildfires could spread to urban areas. Ignition risks may also include invasive plant species introduced by disturbance following initial site clearing during construction. However, clearing and maintaining access roads can also provide a constructed fire break and improve access for emergency responders. As described in the *Public Services and Utilities Technical Resource Report*, proactive planning with federal, state, and local wildfire and emergency response agencies and compliance with OSHA requirements would reduce construction-related risks that could otherwise threaten workers or spread to surrounding urban or wildland areas.

A Fire Prevention and Response Plan would include specific measures for coordinating and training response personnel, such as guidelines for first responders to safely shut down electrical systems in the event of fire, management requirements to reduce ignition risks throughout the sites, and site management fire safety and awareness protocols including tracking fire conditions in the surrounding region, among others.

Depending on the specific location, severity, and fire response capacity, there is the potential that construction and decommissioning activities would have **less than significant** to **potentially significant adverse impacts** of wildfire due to risk of ignition.

3.4.2 Impacts from operation

3.4.2.1 Hazardous materials

Hazardous materials potentially present during the operations would be similar to those present during construction and decommissioning, and therefore potential impacts in the event of accidental releases of hazardous materials would be similar. While accidental releases of hazardous materials from solar energy modules are rare, the risk of this occurring at larger utility-scale projects could be higher than the risk at smaller ones. However, the risk of environmental contamination or an increase in threats to human health and safety is still unlikely.

Operations and maintenance would require fewer on-site personnel and less-intensive labor than construction and decommissioning, which would result in a corresponding smaller amount of hazardous waste and fewer vehicles and equipment on site that could accidentally release hazardous materials.

Hazardous materials present in solar modules and other project infrastructure would be consistent with the volume and type of hazardous materials present in these structures during construction. Following construction, there would be a reduced potential for accidents from human error that could result in accidental releases of hazardous materials, but exposure to the elements and degradation of components over time could also increase the risk of damage or failure of infrastructure. A report on the types of cells and chemicals used in the manufacturing of PVs in 2001 to 2002, and their potential to impact health and the environment, stated the greatest risk of releases of gases (arsine and phosphine) or trace minerals (cadmium telluride and copper indium diselenide) would be from the manufacturing process (Ladwig and Hope 2003).

Impacts from hazardous materials during operation are unlikely. Accidents or failures that could result in the release of hazardous materials are rare, and if they do occur, they are unlikely to happen at a scale that could result in risk of environmental contamination or an increase in threats to human health and safety.

Through compliance with laws and permits and with the implementation of measures to avoid and reduce impacts, operation activities s would likely result in **less than significant impacts** related to hazardous materials.

3.4.2.2 Health and safety

The types of occupational health and safety hazards during operation are similar to those present during construction and decommissioning. While the types of hazards that people could be exposed to remain the same during operation, the risk of exposure would decrease in conjunction with a decrease in the scale and intensity of on-site labor compared to construction and decommissioning. In particular, the risk of falls from structures, vehicle collisions, and exposure to high-volume noises would be greatly reduced during typical operation and on-site maintenance. While accidents could occur, laws, regulations, and industry standards are in place to prevent health and safety hazards in the workplace, including regulations specific to solar energy facilities. These requirements would be supplemented by project- or site-specific health and safety plans.

Impacts on public health and safety from operation are unlikely. Public access to portions of the project would be limited by fencing, gates, and signage, which would limit public exposure to potential hazards. In the case of a wildfire that damages PV panels, exposure would likely be limited to on-site workers or emergency responders, though air releases may affect people nearby, depending on site-specific conditions.

The potential for glare from solar modules would be limited by the use of anti-reflective glass on the solar modules. Further consideration of impacts from glare on nearby land uses or vehicular travel is in the *Aesthetics/Visual Quality Technical Resource Report*.

Through compliance with laws and permits and with the implementation of measures to avoid and reduce impacts, operation activities would likely result in **less than significant impacts** related to health and safety.

3.4.2.3 Wildfire risk

The risk and extent of wildfires in Washington is growing because of climate change. Snow is melting earlier in the spring, leading to soil and forests that are drier and stay dry longer. This leads to wildfires that can burn hotter and spread faster. Climate change causes forest fuels (the trees and plants that burn and spread wildfire) to be drier and more ready to burn.

The potential for projects to contribute to wildfire risk considers ignition risk associated with operational activities, the scale of the project, along with the change in the landscape due to the presence of the project. There are two main types of fire risks during project operation: 1) those caused by operational activities; and 2) fires started outside project sites that have altered behavior (i.e., spread, movement, or ability to be suppressed) due to the presence of a solar energy project.

Fires from PV solar panels are very rare. The flammable parts (such as polymer outer layers, other plastic parts, and wiring insulation) are not known to support a substantial fire, and heat from a small flame is not sufficient to ignite a solar panel. However, incorrectly specified, sized, or faulty wiring or other equipment can cause a fire. Like other electrical installations, PV solar systems can be subject to electrical faults, such as arcing,[5] short circuits, and ground faults.[6] Faulty connections or cable insulation breakdowns also can cause issues. If such events occur, they can result in heat that could ignite flammable material nearby.

Most wildfires started by electrical power are caused by the contact of trees and surface fuels with power lines. This can be from downed lines caused by a falling tree or strong winds, or from overgrown trees reaching power lines. Power lines are strategically spaced apart to prevent them from coming into contact with one another. However, if they do come into contact from wind or other outside factors, there could be high-energy sparks.

All solar and electrical equipment would be required to conform to state and international building and fire code standards. Transformers and on-site generators would require grounding systems or other protective measures to reduce the potential fire effects of lightning. These design measures would reduce ignition risks. Moreover, these facilities would require testing and inspection for grid and system safety prior to commissioning, which would reduce operational fire risks. Activities involving regular maintenance of a solar energy project may include periodic electrical repair, welding, and equipment use and fueling. Such activities introduce risk for sparks or other ignition sources to an operational project. However, these

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[5] An arc, or arcing, occurs when electricity jumps from one connection to another.

[6] A ground fault is an inadvertent contact between an energized conductor and ground or a grounded equipment frame. The return path of the fault current is through the grounding system and any personnel or equipment that becomes part of that system. Ground faults can result from insulation breakdown.

risks can be reduced through appropriate implementation of an Operational Site Safety Management Plan.

Siting projects in rural or wildland areas may involve land use changes that contribute to fire risk. If, for example, irrigated agricultural operations are replaced projects, alterations in site contours, water use, and soil conditions could contribute to fire risk.

Operations and maintenance activities would include regular mowing and trimming of trees to control vegetation on the project sites and associated electrical corridors. The presence and maintenance of access roads and vegetative clearance in utility corridors can also reduce fuels and the associated ignition risks. While these activities reduce a fuel source, they also involve ignition risks that could generate sparks and cause wildfires, which could spread into the surrounding landscape. The presence and use of electrical equipment, including gen-tie lines, would have inherent operational ignition risks that require appropriate site management. This analysis assumes that projects, including associated access roads, would be regularly maintained and monitored to reduce these risks. Accidents and fires could still occur; however, there is a low likelihood of operations activities igniting a wildfire.

Depending on the specific location, severity, and fire response capacity, there is the potential that operation activities would have **less than significant** to **potentially significant adverse impacts** of wildfire due to risk of ignition.

3.4.3 Measures to avoid, reduce, and mitigate impacts

The PEIS identifies a variety of measures to avoid, reduce, and mitigate impacts. These measures are grouped into five categories:

- **General measures:** The general measures apply to all projects using the PEIS.
- **Recommended measures for siting and design:** These measures are recommended for siting and design in the pre-application phase of a project.
- **Required measures:** These measures must be implemented, as applicable, to use the PEIS. These include permits and approvals, plans, and other required measures.
- **Recommended measures for construction, operation, and decommissioning:** These measures are recommended for the construction, operation, and decommissioning phases of a project.
- **Mitigation measures for potential significant impacts:** These measures are provided only in sections for which potential significant impacts have been identified.

3.4.3.1 General measures

- **Laws, regulations, and permits:** Obtain required approvals and permits and ensure that a project adheres to relevant federal, state, and local laws and regulations.

  Rationale**:** Laws, regulations, and permits provide standards and requirements for the protection of resources. The PEIS impact analysis and significance findings assume that developers would comply with all relevant laws and regulations and obtain required approvals.

- **Coordination with agencies, Tribes, and communities:** Coordinate with agencies, Tribes, and communities prior to submitting an application and throughout the life of the project to discuss project siting and design, construction, operations, and decommissioning impacts, and measures to avoid, reduce, and mitigate impacts. Developers should also seek feedback from agencies, Tribes, and communities when developing and implementing the resource protection plans and mitigation plans identified in the PEIS.

  ***Rationale*:** Early coordination provides the opportunity to discuss potential project impacts and measures to avoid, reduce, and mitigate impacts. Continued coordination provides opportunities for adaptive management throughout the life of the project.

- **Land use:** Consider the following when siting and designing a project:
  - Existing land uses
  - Land ownership/land leases (e.g., grazing, farmland, forestry)
  - Local comprehensive plans and zoning
  - Designated flood zones, shorelines, natural resource lands, conservation lands, priority habitats, and other critical areas and lands prioritized for resource protection
  - Military testing, training, and operation areas

  ***Rationale*:** Considering these factors early in the siting and design process avoids and minimizes the potential for land use conflicts. Project-specific analysis is needed to determine land use consistency.

- **Choose a project site and a project layout to avoid and minimize disturbance:** Select the project location and design the facility to avoid potential impacts to resources. Examples include the following:
  - Minimizing the need for extensive grading and excavation and reducing soil disturbance, potential erosion, compaction, and waterlogging by considering soil characteristics
  - Minimizing facility footprint and land disturbances, including limiting clearing and alterations to natural topography and landforms and maintaining existing vegetation
  - Minimizing the number of structures required and co-locating structures to share pads, fences, access roads, lighting, etc.

  ***Rationale*:** Project sites and layouts may differ substantially in their potential for environmental impacts. Thoughtful selection of a project site and careful design of a facility layout can avoid and reduce environmental impacts.

- **Use existing infrastructure and disturbed lands and co-locate facilities:** During siting and design, avoid and minimize impacts by:

- Using existing infrastructure and disturbed lands, including roads, parking areas, staging areas, aggregate resources, and electrical and utility infrastructure
- Co-locating facilities within existing rights-of-way or easements
- Considering limitations of existing infrastructure, such as water and energy resources

***Rationale*:** Using existing infrastructure and disturbed lands and co-locating facilities reduces impacts to resources that would otherwise result from new ground disturbance and placement of facilities in previously undisturbed areas.

- **Conduct studies and surveys early:** Conduct studies and surveys early in the process and at the appropriate time of year to gather data to inform siting and design. Examples include the following:
  - Geotechnical study
  - Habitat and vegetation study
  - Cultural resource survey
  - Wetland delineation

  ***Rationale*:** Conducting studies and surveys early in the process and at the appropriate time of year provides data to inform siting and design choices that avoid and reduce impacts. This can reduce the overall timeline as well by providing information to agencies as part of a complete application for environmental reviews and permits.

- **Restoration and decommissioning:** Implement a Site Restoration Plan for interim reclamation following temporary construction and operations disturbance. Implement a Decommissioning Plan for site reclamation at the end of a project. Coordinate with state and local authorities, such as the Washington Department of Fish and Wildlife, county extension services, weed boards, or land management agencies on soil and revegetation measures, including approved seed mixes. Such plans address:
  - Documentation of pre-construction conditions and as-built construction drawings
  - Measures to salvage topsoil and revegetate disturbed areas with native and pollinator-supporting plants
  - Management of hazardous and solid wastes
  - Timelines for restoration and decommissioning actions
  - Monitoring of restoration actions
  - Adaptive management measures

  ***Rationale*:** Restoration and decommissioning actions return disturbed areas to pre-construction conditions, promote soil health and revegetation of native plants, remove project infrastructure from the landscape, and ensure that project components are disposed of or recycled in compliance with all applicable laws and regulations.

- **Cumulative impact assessment:** Assess cumulative impacts on resources based on reasonably foreseeable past, present, and future projects. Identify measures to avoid, reduce, and mitigate cumulative impacts. Consider local studies and plans, such as comprehensive plans.

***Rationale*:** Cumulative impacts can result from incremental, but collectively significant, actions that occur over time. The purpose of the cumulative impacts analysis is to make sure that decision-makers consider the full range of consequences under anticipated future conditions.

3.4.3.2 Recommended measures for siting and design

- Utilize wildland fire risk mapping to identify potential areas of risk. Use sources like DNR's wildland urban interface and the University of Washington's climate change prediction data to determine lower risk areas. In areas susceptible to wildfires, coordinate with local fire organizations early in the facility planning process to determine measures to incorporate into the design of the facility to achieve wildland fire resistance and prevent an increase in wildland fire frequency.
- In areas susceptible to wildfires, design facilities to reduce risk of ignitions from gen-tie lines or other project components, including potential setbacks. Determine appropriate setbacks in consultation with local, state, or federal land managers. Setback distances and right-of-way widths should consider factors such as proximity to residences, terrain, vegetation management clearance requirements for gen-tie lines, vegetation and natural communities on surrounding lands, and the need to maintain access for maintenance and emergency response.
- Consider underground gen-tie lines in areas with high-fire risk, unless underground lines are not feasible due to environmental conditions (e.g., topography, soil conductivity) or cultural or Tribal resource concerns.
- Design a minimum 20-foot, noncombustible, defensible space clearance around the project site fencing and around structures, particularly buildings, to serve as a fire break.
- Locate refueling areas on paved surfaces and away from surface water locations and drainages; add features to direct spilled materials to sumps or safe storage areas where they can be subsequently recovered.
- Align solar arrays to reduce or avoid glare impacts on off-site areas.

3.4.3.3 Required measures

This section lists permits and approvals, plans, and other required measures for use of the PEIS, as applicable. See Section 3.3 for more detailed information on potentially required permits and approvals:

- Clean Water Act Section 402 NPDES Construction Stormwater Permit (Ecology)
- Clean Water Act Section 402 NPDES Industrial Stormwater Permit (Ecology)
- Clean Water Act Section 402 NPDES Individual Permit (Ecology)
- Construction and development permits (e.g., road access, grading, building, mechanical, lights, signage) (local agency)
- Electrical permits (Washington State Department of Labor and Industries)

- Land use permits (e.g., comprehensive plan amendments, conditional use permit/special use permit, or zoning amendments) (local agency)
- Right-of-way or lease (federal, state, or local agency)
- State Waste Discharge Permit (Ecology)
- If the project has an aggregate storage capacity of oil greater than 1,320 gallons or is located where a discharge could reach a navigable water body, a Spill Prevention, Control, and Countermeasure (SPCC) Plan is required to prevent spills during construction and operation and to identify measures to expedite the response to a release if one were to occur.
- Implement an Emergency Response Plan to address worker health and safety and a Fire Prevention and Response Plan to address fire safety. Develop plans in coordination with local fire and emergency service providers. The plans must meet applicable laws/codes, such as the following:
    - Washington Administrative Code (WAC) 463-60-352(2) through 463-60-352(4), which address fire and explosion, hazardous materials release, and safety standards compliance
    - WAC 463-60-352(6), which describes emergency plans to ensure public safety and environmental protection
    - International Fire Code
- Implement a Hazardous Materials and Waste Management Plan to address the selection, transport, storage, and use of chemicals and hazardous materials during construction, operation, and decommissioning.
- Implement a Vegetation Management Plan to reduce wildfire fuel loads and prevent the establishment of non-native, invasive species on the facility site and along gen-tie line rights-of-way and roads.
- Implement a Health and Safety Plan to inform employees and others on site about what to do in case of emergencies, including rapid shutdown procedures, the locations of fire extinguishers and nearby hospitals, telephone numbers for emergency responders, first aid techniques, and readily accessible Material Safety Data Sheets for all on-site hazardous materials. Include other OSHA measures to address issues such as crane and hoist safety, electrical safety, fall prevention, lockout/tagout, heat/cold stress, and personal protective equipment.

3.4.3.4 Recommended measures for construction, operation, and decommissioning

- Coordinate with DNR and the U.S. Forest Service and monitor wildfire activity during project construction/decommissioning and operation. If necessary, modify or cease activities, change the schedule, or remove equipment.
- Minimize potential for ignition by:
    - Using diesel construction vehicles instead of gasoline vehicles to prevent potential ignition by catalytic converters
    - Prohibiting vehicles from idling in grassy areas
    - Restricting the use of high-temperature equipment in grassy areas

    - Equipping construction vehicles with fire extinguishers, spark arrestors, and heat shields, as appropriate
    - Restricting smoking to designated areas of the site as weather conditions permit
- Equip power transformers with an oil-level monitoring system. A decrease in oil level would be sensed by this system, and an alarm message would be sent to the central alert system.
- Implement lightning protection measures and grounding systems to protect facility equipment, as well as reduce the potential for wildfires.
- If blasting is conducted, clear vegetation from the evacuation zone and prepare water spray trucks and fire suppression equipment for use.
- Coordinate with the local fire marshal and applicable fire response agencies to ensure water is available during construction and operations for fire response. Water supply for firefighting may include water trucks, on-site wells, or other water storage, such as water cisterns.

3.4.3.5 Mitigation measures for potential significant impacts

- Use predictive digital monitoring and systems.

  ***Rationale*:** Predictive digital monitoring and systems can identify fault indicators and reduce risks of equipment failure and fires.

- Coordinate with the local fire marshal, or equivalent authority, and DNR wildfire management staff on training for employees in wildfire response.

  ***Rationale*:** Providing training for employees can improve fire response and reduce risk of fire spread.

3.4.4 Unavoidable significant adverse impacts

Construction, operation, and decommissioning of utility-scale solar projects may result in **potentially significant and unavoidable adverse impacts** related to wildfires if there are new ignition sources in remote locations with limited response capabilities. Determining if mitigation options would reduce or eliminate impacts below significance would be dependent on the specific project and site.

3.5 Solar facilities with battery energy storage systems

Projects with a BESS would include the same systems as those considered in Section 3.4, with the addition of one or two co-located BESSs each capable of storing up to 500 megawatts (MW) of energy. Most construction, operation, and decommissioning impacts of a project with co-located BESSs would be similar to projects without BESSs. Additional considerations for impacts that could occur associated with the BESSs—which contain hazardous materials, could cause fires, and present challenges for emergency responders—are discussed in sections below.

3.5.1 Impacts from construction and decommissioning

3.5.1.1 Hazardous materials

Hazardous materials for construction and decommissioning would be the same as those listed in Section 3.4.1.1 and Table 3, with the addition of the following:

- Battery electrolytes, typically used in vehicle, equipment batteries, and BESS
- Dielectric fluids, typically used in anti-conductive insulation for electric components, such as wires

Compared to construction, decommissioning could involve a higher risk of releasing hazardous materials due to the degradation or dismantling of project components.

Thermal runaway events, where lithium-ion batteries overheat due to damage or failure of battery management systems (BMSs), are very rare for BESSs. If properly installed and maintained, flow batteries and zinc-bromide batteries are generally not flammable. Lithium-ion or flow batteries would contain toxic chemicals that could be hazardous in the event of a system failure, which could result in the battery leaking. If the batteries overheat or are damaged, they could leak toxic gases, including hydrogen fluoride, hydrogen chloride, hydrogen cyanide, and carbon monoxide. Toxic chemical leaks from battery failures are rare and would be less likely during construction compared to operation because BESSs would not be storing energy generated on site, which would greatly reduce the likelihood of batteries failing due to overheating.

Attempts to extinguish battery fires with water, which manufacturers typically advise against, could increase exposure to toxic chemicals through smoke, vapor, or contaminated runoff (ACP 2023). Once a fire has self-extinguished, there may be releases of flammable or toxic gases, including hydrogen fluoride, hydrogen chloride, hydrogen cyanide, and carbon monoxide. Spraying water on smoke or vapor released from the battery, whether burning or not, may cause skin or lung irritation. This is one additional reason for allowing the battery to burn in a controlled manner. The site should be entered only by trained firefighters or emergency responders wearing full protective gear. For additional information pertaining to lithium-ion BESS incidents, including guidance for first responders, see Attachment 1 of the *Public Services and Utilities Technical Resource Report*.

NFPA 855 and state regulations require fire and spill containment measures for spills and fire for certain battery types with liquid electrolytes. Additionally, lithium-ion BESS that are not listed under UL 9540 require a hazard mitigation analysis which includes an evaluation of potential energy storage system failures and safety-related impacts. Spill response measures would be included in the project’s SWPPP, Emergency Response Plan, and the BESS operations and safety manual as required by NFPA 855. Secondary containment measures would consider the volume of water to be contained, and the methods and materials used for containment and treatment.

Lithium-ion, zinc hybrid, and flow batteries have lifespans that are shorter than a typical solar energy facility. Although most, if not all, materials that comprise lithium-ion batteries are recyclable, they are often disposed of as hazardous waste due to a lack of recycling service providers for batteries (Gignac 2020). Because of the growing use of lithium-ion batteries for energy storage and other purposes, USEPA has proposed rules to establish waste management regulations specific to the batteries and is undertaking efforts to advance industry capacity for battery recycling (USEPA 2023b). In 2023, Washington State adopted regulations under Chapter 70A.555 RCW, requiring battery manufacturers to collect and recycle small batteries, with a mandate that the Washington State Legislature assess and recommend options for collection and end-of-life management of large batteries, such as those used in BESSs (Ecology 2023). While the outcomes of these battery disposal regulations are uncertain, implementation of a statewide large battery collection and recycling system could greatly reduce impacts on local hazardous waste management capacity. Regardless of whether the batteries are recycled or disposed of as hazardous waste at their end of useful life, the batteries would be stored, handled, and transported in accordance with either hazardous waste regulations or battery-specific disposal standards, which would reduce the risk of releases of hazardous material.

Impacts from hazardous materials during construction and decommissioning are unlikely. Accidents or failures that could release hazardous materials are rare, and if they do occur, they are unlikely to happen at a scale that could result in risk of environmental contamination or an increase in threats to human health and safety.

Most impacts related to hazardous materials would be similar to findings for utility-scale solar projects without BESSs above. If a thermal runaway event due to damage or BMS failure were to occur, facilities with lithium-ion BESSs would have **potentially significant adverse impacts** due to hazardous air emission risks to emergency responders associated with the BESS.

3.5.1.2 Health and safety

Facilities with BESSs would largely include the same health and safety risks during construction and decommissioning as those described for utility-scale solar facilities without co-located BESSs. Decommissioning could involve a higher risk of exposure to hazardous materials, electricity, or fire due to degraded or malfunctioning project components.

Energy storage facilities can create hazards for firefighters and emergency responders, with the possibility of explosions, flammable gases, toxic fumes, water-reactive materials, electrical shock, corrosives, and chemical burns.

Additionally, batteries in the BESS could impact worker health and safety if there were a release of hazardous materials or fire. Exposure to toxic gases leaking from damaged batteries could cause irritation to the skin and lungs (ACP 2023). Battery failures that could produce these health and safety impacts are rare. Regular maintenance and emergency plans would help mitigate risks. The Washington State Patrol, Ecology, and representatives from industry and local fire protection districts produced a study of electric vehicle fires, which identified best practices for battery incident response risk reduction (WSP 2025). Best practice recommendations include establishing a program in the State Fire Marshalls Office (SFMO) for emerging technologies related to electrifying the state and the risks concerning fire and life safety for responders and communities. This new program would research emerging technologies, develop and implement training programs based on best practices (including those available through the National Fire Protection Association [NFPA] and industry associations), and contribute to the national and state codes and standards designed to keep responders and the public safe. Although the best practices recommendations were developed to specifically address electric vehicle battery fire response, the same or similar training carried out for first responders is also applicable to support safe and effective fire response for BESSs.

Impacts on health and safety would be similar to findings for utility-scale solar projects above, with additional risks to emergency responders associated with BESSs as noted in Section 3.5.1.1.

3.5.1.3 Wildfire risk

Facilities with BESSs would largely include the same wildfire risks during construction and decommissioning as those described in Section 3.4.1.3; however, the BESSs present additional fire risks.

Specialized advance planning and procedures for enhanced fire response training would be required for solar energy facilities and co-located BESSs. Proactive planning and compliance with requirements would reduce risks of wildfire ignition and spread.

In addition, as noted in Section 3.4.3, another consideration with decommissioning is the increased probability of high fire-danger days within the time frame of decommissioning. Proactive planning and compliance with requirements would reduce risks of wildfire ignition and spread.

Impacts related to wildfire risk would be similar to findings for utility-scale solar projects above.

3.5.2 Impacts from operation

3.5.2.1 Hazardous materials

Hazardous materials potentially present during operation would be similar to those present during construction, which would have similar impacts in the event of an accidental release as those described for projects without co-located BESSs. The additional risk of hazardous materials leaks from batteries in the BESS would increase during operation compared to construction. This is due to the increased potential for batteries to leak or ignite if damaged or for failed batteries to overheat when used for energy storage, whereas batteries are highly unlikely to overheat during construction or decommissioning, even if damaged, because they will not be used for energy storage during those phases. Hazardous materials present in BESSs would be consistent with the volume and type of hazardous materials present in these structures during construction.

Accidental releases of hazardous materials from solar energy modules or BESSs are rare, and if they do occur, the risk of environmental contamination or an increase in threats to human health and safety is still unlikely.

Impacts related to hazardous materials would be similar to findings for utility-scale solar projects above, with additional risks to emergency responders associated with BESS operation as noted in Section 3.5.1.1.

3.5.2.2 Health and safety

The types of health and safety hazards that people could be exposed to would largely be the same as those considered in Section 3.4.2.2. Additionally, operating risks could be higher due to the associated health and safety risks associated with BESSs.

Batteries in the BESS could impact worker health and safety through release of hazardous materials or fire. Battery storage may pose a risk of fire and explosion due to thermal runaway. Flammable electrolyte products can vaporize, vent from cells, and ignite on contact with an ignition source.

In addition, depending on the technology selected, batteries contain hazardous materials that pose potential risks for environmental release if not handled correctly and can introduce hazards for first responders (ACP 2023). See Section 3.5.1 for more information on exposure during fires.

For flow batteries, the stable voltage window of water is a relatively small 1.2 volts that shifts with pH. Outside of this window, hydrogen and oxygen can evolve along with toxic gases depending on the system chemistry. Because a system's power scales directly with increased nominal voltage, batteries typically operate at or just outside of the voltage window where gas can be generated. Hydrogen gas is flammable. The generated oxygen and hydrogen may be recombined into water to refill the battery or simply vented outside via an exhaust system (Energy 2024b). Toxic or corrosive gases, such as bromine, would be managed as a hazardous material (Trovò et al. 2023).

Exposure to toxic gases leaking from damaged batteries could cause irritation to the skin and lungs (ACP 2023). Battery failures that could produce these health and safety impacts are rare but would be more likely during operation due to the increased potential for batteries to leak or ignite in thermal runaway events. According to data published by the Electric Power Research Institute (EPRI), the BESS Failure Incident Database has recorded approximately 85 BESS failure events worldwide over the past decade, ranging from minor to major, with an average of 10 such failure events occurring annually even as global battery deployments have increased 20-fold (EPRI 2024). Additionally, past BESS installations were completed under previous regulations; current requirements include additional strategies to mitigate fire risk, such as those required by the current NFPA 855 standards.

Compliance with requirements, regular maintenance, and proactive emergency planning would help mitigate risks.

Impacts on health and safety would be similar to findings for utility-scale solar facilities above, with additional risks to emergency responders associated with BESS operation as noted in Section 3.5.1.1.

3.5.2.3 Wildfire risk

Facilities with BESSs would include similar types of wildfire risks during operations as those described in Section 3.7.2.3, depending on scale, and with additional impacts associated with the BESSs.

The BESS would result in the presence of additional hazardous materials on site, which could spill or require cleanup and remediation following an accident. Battery incidents can be difficult to extinguish, and some battery types can reignite above certain temperatures after being put out. WAC 51-54A-0322 requires lithium battery storage containers to include a fire protection system. An Emergency Response Plan would specify emergency response measures to be taken upon detection of a possible fire, and adherence to setback distances (in siting and design) would reduce risks of a fire spreading. Additionally, BESSs are typically installed in a graveled area where vegetation clearing and gravel surfacing would be required.

Thermal runaway events are very rare for lithium-ion BESSs, and, if properly installed and maintained, BESSs are generally not flammable. Battery unit installation or replacement should follow manufacturers' specifications for spacing and clearance distances. Further, BESSs generally come equipped with remote alarms for operations personnel and emergency response teams, including voltage, current, or temperature alarms from the BMS. Other protective measures include ventilation, overcurrent protection, battery controls to operate the batteries within designated parameters, temperature and humidity controls, smoke detection, and maintenance in accordance with manufacturers' guidelines. However, should a thermal runaway event occur, it can be serious. For additional information pertaining to lithium-ion BESS incidents including guidance for first responders, see the *Public Services and Utilities Technical Resource Report* Attachment 1.

Specialized advance planning and procedures for enhanced fire response training would be required to ensure that the solar energy facilities and co-located BESSs do not generate hazards for the public or emergency responders.

Impacts related to wildfire risk would be similar to findings for utility-scale solar facilities above.

3.5.3 Measures to avoid, reduce, and mitigate impacts

Measures would be the same as those in Section 3.4.3. Additional measures related to the BESS are detailed below.

3.5.3.1 Recommended measures for siting and design

- Design setback distances around each BESS to allow for maintenance, emergency access, and vegetation management. If there is a thermal runaway event, the required setback distances also prevent spread from one container to another.

3.5.3.2 Required measures

- Implement fire protection, prevention, and detection measures and design features in accordance with National Fire Protection Association (NFPA) 855, including requirements for providing redundant separate methods of BESS failure detection.
- Implement a detailed Emergency Response Plan specific to BESS operations to mitigate the consequences of potential damage or failure of battery management systems, and include protocols for containment, cleanup, and remediation in the event of soil contamination or environmental incidents.
- A hazard mitigation analysis may be required as part of NFPA 855 to evaluate any potential adverse interaction between the various energy systems and technologies.
- NFPA 855 requires an operations and maintenance manual be provided to both the BESS owner (or the authorized agent) and the system operator before the system is put into operation, and it specifies what is to be included in the manual. This includes requirements for system maintenance, training programs, and safety protocols for personnel involved in BESS operations and maintenance. Routine maintenance can help detect issues early, prevent failures, and minimize the risk of environmental contamination.

3.5.4 Unavoidable significant adverse impacts

Construction, operation, and decommissioning of utility-scale solar facilities with BESS may result in **potentially significant and unavoidable adverse impacts** related to wildfires if there are new ignition sources in remote locations with limited response capabilities. Determining if mitigation options would reduce or eliminate impacts below significance would be dependent on the specific project and site.

3.6 Solar facilities that include agricultural uses

For a facility that includes agricultural land uses, any existing agricultural lands would be maintained, or new agricultural use could be co-located with the utility-scale solar facility. Agrivoltaics may include raising or modifying site layouts to allow for agricultural use. The scale of solar energy facilities with co-located agricultural uses is assumed to be similar to facilities without agricultural use; therefore, most potential EHS impacts would be similar.

3.6.1 Impacts from construction and decommissioning

3.6.1.1 Hazardous materials

Hazardous materials for construction and decommissioning would be the same as those listed in Section 3.4.1.1 and Table 3 but would also include agricultural machinery and equipment that may require use of petroleum hydrocarbons and the use of fertilizers, herbicides, and pesticides, depending on the type of agricultural use. The risk of leaks or spills from this equipment is similar to that described for other construction equipment. Measures to protect land from spills are typically included in an SPCC Plan.

Impacts from hazardous materials during construction are unlikely. Accidents or failures that could result in the release of hazardous materials are rare, and if they do occur, they are unlikely to happen at a scale that could result in risk of environmental contamination or an increase in threats to human health and safety.

Impacts related to hazardous materials would be similar to findings for utility-scale solar facilities without agricultural uses described above.

3.6.1.2 Health and safety

Construction and decommissioning activities would present similar health and safety risks as those that could occur for projects without agricultural land use. Agricultural operations would not occur in active construction or decommissioning areas, but agricultural activities nearby could increase the presence or risk of exposure to certain occupational health and safety hazards, such as potential exposure to livestock, fertilizers, herbicides, pesticides, other chemicals associated with agriculture, or biohazards from livestock.

Similar to decommissioning facilities without agricultural land use, decommissioning could involve a higher risk of exposure to hazardous materials, electricity, or fire due to degraded or malfunctioning project components than the construction and operation phases.

Impacts related to health and safety would be similar to findings for utility-scale solar projects above.

3.6.1.3 Wildfire risk

Facilities with co-located agricultural uses could include maintenance of existing agricultural operations during construction. In these cases, active management of the vegetative landscape could result in a beneficial cooling effect to the land and reduced fire risk compared to facilities without agricultural use. Coordination to reduce potential ignition risks at the agrivoltaics sites would still be required. For other types of facilities with co-located agriculture to be added, construction would present similar risks as those that could occur for projects without agricultural land use. Emergency responders could also face access delays or obstacles due to the presence of agricultural gated areas or areas with livestock, which could exacerbate wildfire conditions.

Impacts related to wildfire risk would be similar to findings for utility-scale solar facilities above.

3.6.2 Impacts from operation

3.6.2.1 Hazardous materials

Hazardous materials potentially present during operation of a utility-scale solar energy facility with agricultural use would include those present during construction, which would have similar impacts in the event of accidental release as those described for projects without agricultural land use. Additional hazardous materials on site during operation that may not have been present during construction include fuel for farm vehicles, fertilizers, herbicides, pesticides, or biohazards from livestock. Operations and maintenance would include more workers than projects without agricultural land uses but would still require fewer on-site personnel and less-intensive labor than construction, which would result in a decrease in the generation of hazardous waste.

Farm vehicles or equipment uses on site could increase the risk of accidents and result in more potential hazardous material releases compared to the operation of facilities without agricultural uses.

The presence of agricultural operations would not substantially increase the risk of impacts. Accidents or failures that could result in the release of hazardous materials are rare, and if they do occur, the risk of environmental contamination or an increase in threats to human health and safety is still unlikely.

Impacts related to hazardous materials would be similar to findings for utility-scale solar facilities above.

3.6.2.2 Health and safety

The types of health and safety hazards that people could be exposed to would largely be the same as facilities without agricultural use. Agricultural activities on site could also increase the presence or risk of exposure to certain occupational health and safety hazards, such as potential exposure to fertilizers, pesticides, herbicides, livestock, biohazards associated with livestock, or other hazards associated with agricultural operations. The risk of exposure to occupational hazards that were present during construction would decrease during operation in conjunction with a decrease in the scale and intensity of on-site labor compared to construction. Other health and safety hazards include damage to facilities and potential injuries due to conflicts between workers and farmers or livestock. Coordination and planning with the agricultural operators would minimize risks of health and safety hazards during operations.

Impacts related to health and safety would be similar to findings for utility-scale solar facilities above.

3.6.2.3 Wildfire risk

Facilities with agricultural use would entail a different shared land use regime to accommodate grazing or other agricultural activities along with the operations and maintenance of solar energy facilities. Because there would be active management of the vegetative landscape (e.g., grazing, crop production, pollinator habitat), ignition risks would decrease while at the same time the presence of solar facilities would provide shade resulting in a beneficial cooling effect to the land, and it is assumed that wildfire risk for the agrivoltaics sites would generally be reduced.

Because of the shared land uses, coordination to reduce potential ignition risks at the agrivoltaics sites would still be required. Emergency responders could face access delays or obstacles due to the presence of agricultural livestock, fencing, or other project operations, which could exacerbate wildfire conditions.

Impacts related to wildfire risk would be similar to findings for utility-scale solar facilities above.

3.6.3 Measures to avoid, reduce, and mitigate impacts

Measures would be the same as those in Section 3.4.3. Additional measures related to the co-located agricultural land use are detailed below.

3.6.3.1 Recommended measures for construction, operation, and decommissioning

- Coordinate with agricultural operators to establish acceptable agricultural practices on the facility site during construction, operations, and decommissioning to protect the health and safety of employees. Review and incorporate applicable measures for agricultural practices developed by OSHA and the National Association of State Public Health Veterinarians.

3.6.4 Unavoidable significant adverse impacts

Construction, operation, and decommissioning of solar facilities that include agricultural uses may result in **potentially significant and unavoidable adverse impacts** related to wildfires if there are new ignition sources in remote locations with limited response capabilities. Determining if mitigation options would reduce or eliminate impacts below significance would be dependent on the specific project and site.

3.7 No Action Alternative

Under the No Action Alternative, agencies would continue to conduct environmental review and permitting for utility-scale solar facilities on a project-by-project basis. The potential impacts would be similar to the impacts for the types of facilities described above for construction, operation, and decommissioning, depending on project size and design, and would likely range from **less than significant** to **potentially significant adverse impacts**.

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