Appendix M: Transportation Resource Report

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

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Acronyms and Abbreviations List

AGL	above ground level
BESS	battery energy storage systems
BMP	best management practice
BNSF	Burlington Northern-Santa Fe
CFR	*Code of Federal Regulations*
DoD	U.S. Department of Defense
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
I-	Interstate
MW	megawatt
NOAA	National Oceanic and Atmospheric Administration
NPIAS	National Plan of Integrated Airport Systems
PEIS	Programmatic Environmental Impact Statement
RCW	Revised Code of Washington
ROC	Radar Operations Center
STIP	State Transportation Improvement Program
UP	Union Pacific
USACE	U.S. Army Corps of Engineers
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

Executive Summary

This resource report describes the transportation conditions in the study area. It also describes the regulatory context, outlines methods for assessing potential transportation impacts of types of facilities evaluated (alternatives), presents current transportation conditions in the study area, and assesses the potential impacts and actions that could avoid or reduce impacts.

Several different modes of transportation serve communities in the study area. Three major interstate highways are located centrally within the study area and are therefore accessible by truck or rail from many different locations in the study area. Four additional National Highway System highways serve the study area, along with 58 state highways. Burlington Northern-Santa Fe (BNSF) and Union Pacific (UP) operate railways in the study area and transport high-tonnage, oversize, and high-value cargo. Two Class I railways (BNSF and UP), 27 Class III railways, and 11 intermodal or transload facilities that serve rail exist in the study area. The study area also contains 10 major cargo service airports. The Pacific Ocean, Puget Sound, the Salish Sea, and marine highway M-84 provide water transport in the study area and connections to several ports, transload facilities, and intermodal facilities. These transport modes are vital to farming and other agricultural operations, workers, and residents in the study area.

Impacts to transportation could occur from traffic related to worker commutes and materials transport and road development. There would be a temporary increase in traffic on roads during construction and decommission of utility-scale wind energy facilities, and operations would result in a small increase in vehicle trips caused by maintenance employees periodically traveling to the facility site. No long-term road closures or interruptions to traffic patterns or volumes are expected. No substantial damage to roadways or related infrastructure (e.g., culverts or bridges) or transit, rail, air, or water transportation would occur. General aviation impacts could also occur due to the height of the wind turbines; however Federal Aviation Administration authorization is required for any structure over 200 feet tall.

Through compliance with laws and permits and with implementation of actions that could avoid and reduce impacts, the construction, operation, and decommissioning of facilities would likely result in **less than significant** impacts on transportation.

No significant and unavoidable adverse impacts related to transportation resources would occur.

Crosswalk with Transportation Resource Report for Utility-Scale Solar 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 transportation resource reports for each PEIS.

Utility-Scale Solar Energy PEIS	Utility-Scale Onshore Wind Energy PEIS (this document)
• Differences in construction impacts from transportation of facility components • Some differences in actions to avoid and reduce impacts	• Differences in construction impacts from transportation of facility components • Some differences in actions to avoid and reduce impacts

1 Introduction

This resource report describes transportation within the study area and assesses probable impacts associated with types of facilities (alternatives), including 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 transportation evaluated in this technical memorandum and lists relevant regulations that contribute to the evaluation of potential impacts.

1.1 Resource description

This resource report analyzes the following transportation topics: transportation systems (roads, air travel, radar and airport facilities, and waterway freight corridors), traffic (transit, water, and rail), parking, and movement/circulation of people and goods.

Transportation issues related to utility-scale wind energy facilities relate primarily to transporting equipment, supplies, materials, and workers to and from the study area. This resource report evaluates impacts of four types of utility-scale wind facilities. No transportation or traffic modeling was completed for this programmatic-level review. Transportation impacts for future utility-scale wind facilities would be based in part on the size of the facility site, number of turbines, specific location and access details, and other aspects of each proposed facility.

1.2 Regulatory context

Table 1 lists laws, plans, and policies relevant to evaluating potential impacts on transportation. For local regulations, Table 1 lists categories of laws, plans, and policies that could apply depending on the local jurisdiction in which a facility is proposed.

Table 1. Applicable laws, plans, and policies

Regulation, Statute, Guideline	Description
Federal	
49 *Code of Federal Regulations* (CFR) 77, Federal Aviation Administration (FAA) Obstruction to Navigation Federal Regulation	Requires FAA approval of any facility higher than 200 feet (61 meters) in height.
49 *United States Code* 5101 et seq., Hazardous Materials Transportation Act	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." Title 49 regulations pertain to all forms of surface transportation and transportation security, including pipelines, railroads (passenger and freight), waterways, cars, etc. Hazardous material or hazardous waste handlers, shippers, carriers, or freight forwarders must comply with Title 49 regulations, which cover requirements for markings, labels, placards, shipping papers, training, emergency response, and performance-oriented packaging standards.
Fixing America's Surface Transportation Act	Established a new National Highway Freight Network, which requires states to improve the safety, security, efficiency, and resiliency of freight transportation in rural and urban areas.
Metropolitan Transportation Planning and Programming, 23 CFR 450.306	Requires metropolitan planning processes including projects, strategies, and services to address productivity, safety, security, mobility, resiliency, and other environmental and mobility goals.
Federal Highway Administration (FHWA) Office of Infrastructure Interstate System Access Informational Guide (FHWA 2010)	Provides background on how the Washington State Department of Transportation (WSDOT) assesses requests for new or modified access to the Interstate System. Provides information and methods for analyzing access requests by considering the needs of the system on a national, state, and local levels.
FHWA Final Rule to 23 CFR 625, Design Standards for Highways	Modifies regulations governing new construction, reconstruction, resurfacing, restoration, and rehabilitation projects on the National Highway System (including the Interstate System).
14 CFR 77 Safe, Efficient Use, and Preservation of the Navigable Airspace	Establishes: 1) requirements to provide notice to FAA of certain proposed construction or alteration of structures; 2) standards used to determine obstructions to air navigation, and navigational and communication facilities; 3) the process for aeronautical studies of obstructions to air navigation or navigational facilities; and 4) the process to petition FAA for discretionary review of determinations, revisions, and extensions of determinations.
Federal Land Policy and Management Act of 1976, As Amended (FLPMA), Title VI Rights-of-Way	Authorizes the granting of rights-of-way for facilities on federally managed lands, such as systems for generation, transmission, and distribution of electric energy, and roads and highways. Requires the entity applying for right-of-way access to submit a plan of construction, operation, and rehabilitation for such right-of-way in compliance with the applicable federal agency's regulations.
Federal agency road design manuals and handbooks	Describes steps, guidelines, and requirements for designing roads on federally managed lands. Each agency maintains its own guidelines and standards.
Federal-Aid Highway Act of 1944	Created the Interstate System.

Regulation, Statute, Guideline	Description
Federal-Aid Highway Act of 1956	Established the program for funding and building the Interstate System.
State	
Chapter 47.06 Revised Code of Washington (RCW), Washington State System Plans: Highway, Freight, Aviation, Marine, and Public Transportation	Ensures that the transportation system in Washington supports and enhances the movement of people and goods; addresses federal and state policies and meet federal and state planning requirements (WSDOT 2016, 2017a, 2017b, 2022a). Includes RCW 47.06.050 related to state-owned facilities and RCW 47.06.040, the statewide multimodal transportation plan.
WSDOT Draft 2024 Highway System Plan (WSDOT 2024a)	Implements RCW 47.06.040 and ensures that the highway system in Washington supports and enhances the movement of people and goods; addresses federal and state policies and meets federal and state planning requirements.
Washington Statewide Transportation Improvement Program (STIP; WSDOT 2024b)	The STIP is a 4-year prioritized multimodal transportation program including state, local, Tribal, and public transportation projects involving highways, streets, roads, rail, transit-hubs, park and rides, bridges, sidewalks, bike lanes, trails, and safety. It is developed annually, submitted to FHWA and the Federal Transit Administration in December, and approved in January.
Forest Practices Act, Chapter 76.09 RCW, and Forest Practices Rules, Title 222 Washington Administrative Code (WAC)	The Washington Department of Natural Resources administers rules that govern forest practices activities on non-federal and non-Tribal forestland in Washington state.
Guidelines for Forest Roads, Section 3 (DNR 2013)	Provides guidance related to forest practices and Forest Roads.
Transportation System Policy Goals, RCW 47.04.280	Contains six transportation system policy goals, including the maintenance, preservation, and extension of the life and utility of prior investments in transportation systems and services and the predictable movement of goods and people throughout Washington state, including congestion relief and improved freight mobility.
Water Quality Standards for Surface Water (Chapter 173-201A WAC)	Establishes water quality standards for surface waters, implementing Title 90 RCW (Chapter 90.48 RCW, Water Pollution Control Act). Freshwater designated uses and associated criteria are specifically identified in WAC 173-201A-200. Applicable to proposed new or improved roads and associated runoff.
Guide for Planning, Evaluating, and Designing Part-Time Shoulder Use as a Traffic Management Strategy (FHWA 2016)	Describes planning, design, implementation, and day-to-day operation of shoulder use. Part-time shoulder use is the conversion of shoulders to travel lanes during some hours of day as a congestion relief strategy.
Written notice to U.S. Department of Defense (DoD) for renewable energy projects (RCW 35.63.270, 35A.63.290, and 36.01.320; WAC 365-16-475)	Requires local governments to provide DoD with written notice for alternative-energy permit applications.

Regulation, Statute, Guideline	Description
Regional	
Regional transportation and transit agency plans	Set forth goals, policies, and future plans related to transportation, traffic, and transit within regions.
Regional airport plans	Set forth goals, policies, and future plans related to regional airports.
Water port plans	Set forth goals, policies, and future plans related to water ports.
Local	
Local governments' transportation plans or comprehensive plan transportation elements	Set forth goals, policies, and future plans related to transportation and traffic.
Local governments' zoning and municipal codes regarding stormwater management	Provide requirements for including adequate stormwater quantity and quality controls for construction and development activities, including new or improved roads, and outline associated local government review and permitting procedures.

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 transportation is the geographic extent of analysis of transportation impacts associated with the construction, operation and maintenance, and decommissioning of the types of facilities analyzed in this PEIS. The study area includes transportation routes (e.g., roads, intersections, railroad mainlines, air travel paths, and waterway freight corridors) and parking or staging areas used by vehicles or displaced by equipment for the types of facilities analyzed in this PEIS.

Figure 1 shows the roads and railroads and Figures 2a and 2b show ports, major air cargo airports, and navigable waters. Figure 3 shows all Federal Aviation Administration (FAA)-designated airports.

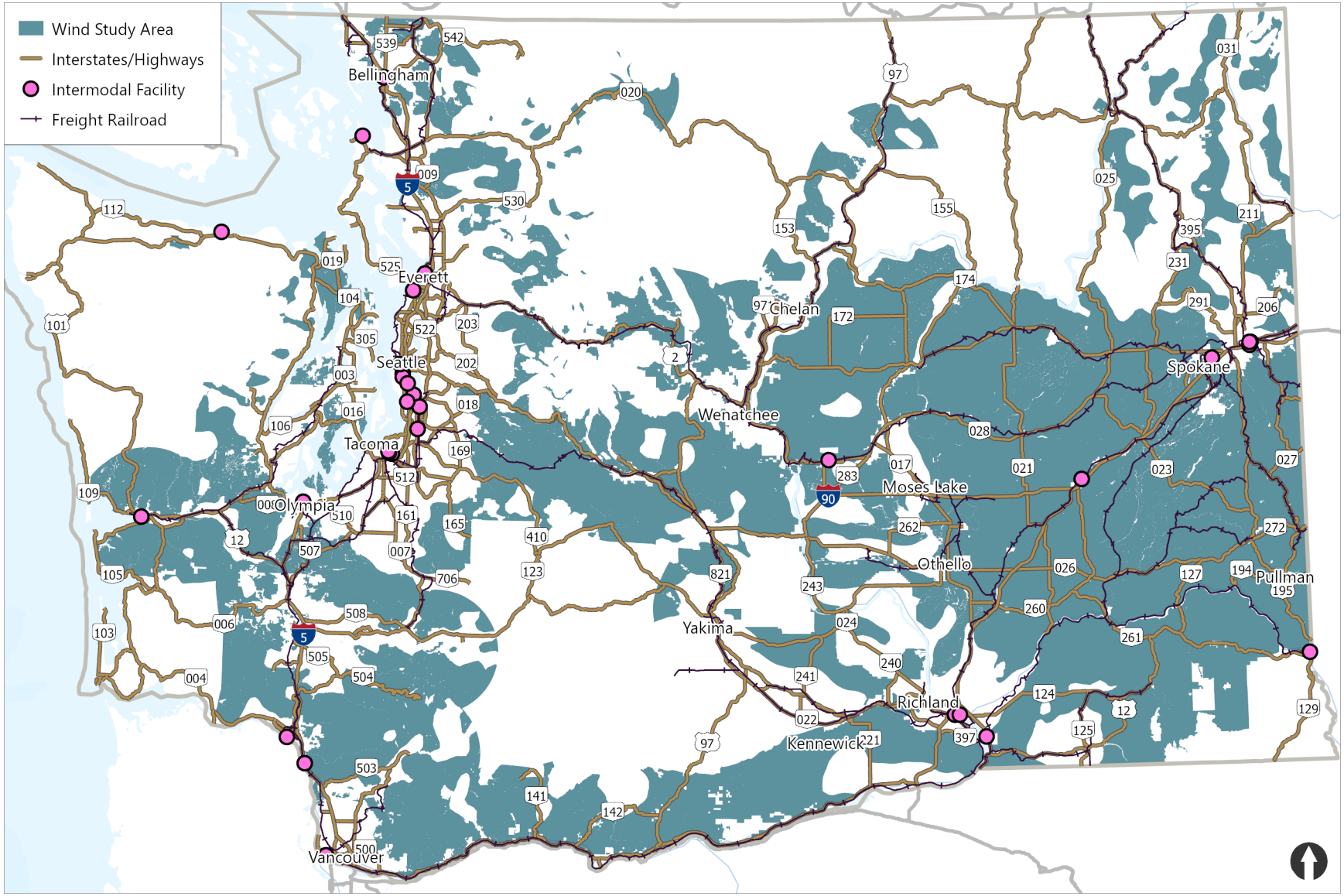

Figure 1. Roads and railroads

Data sources: WSDOT 2024c, 2024d, 2024e

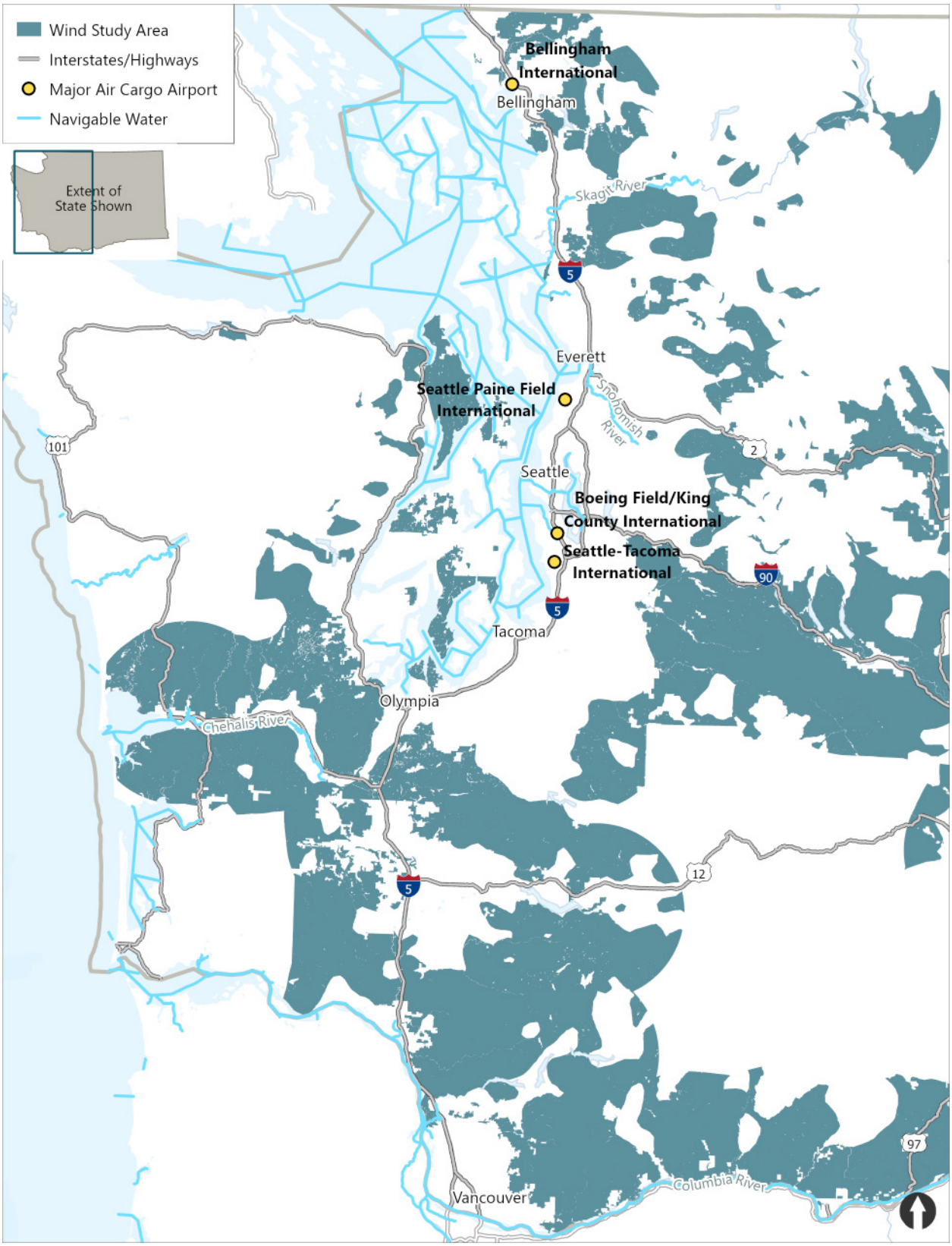

Figure 2a. Major cargo airports and navigable waters, western Washington

Data sources: FAA 2024a; USDOT 2024

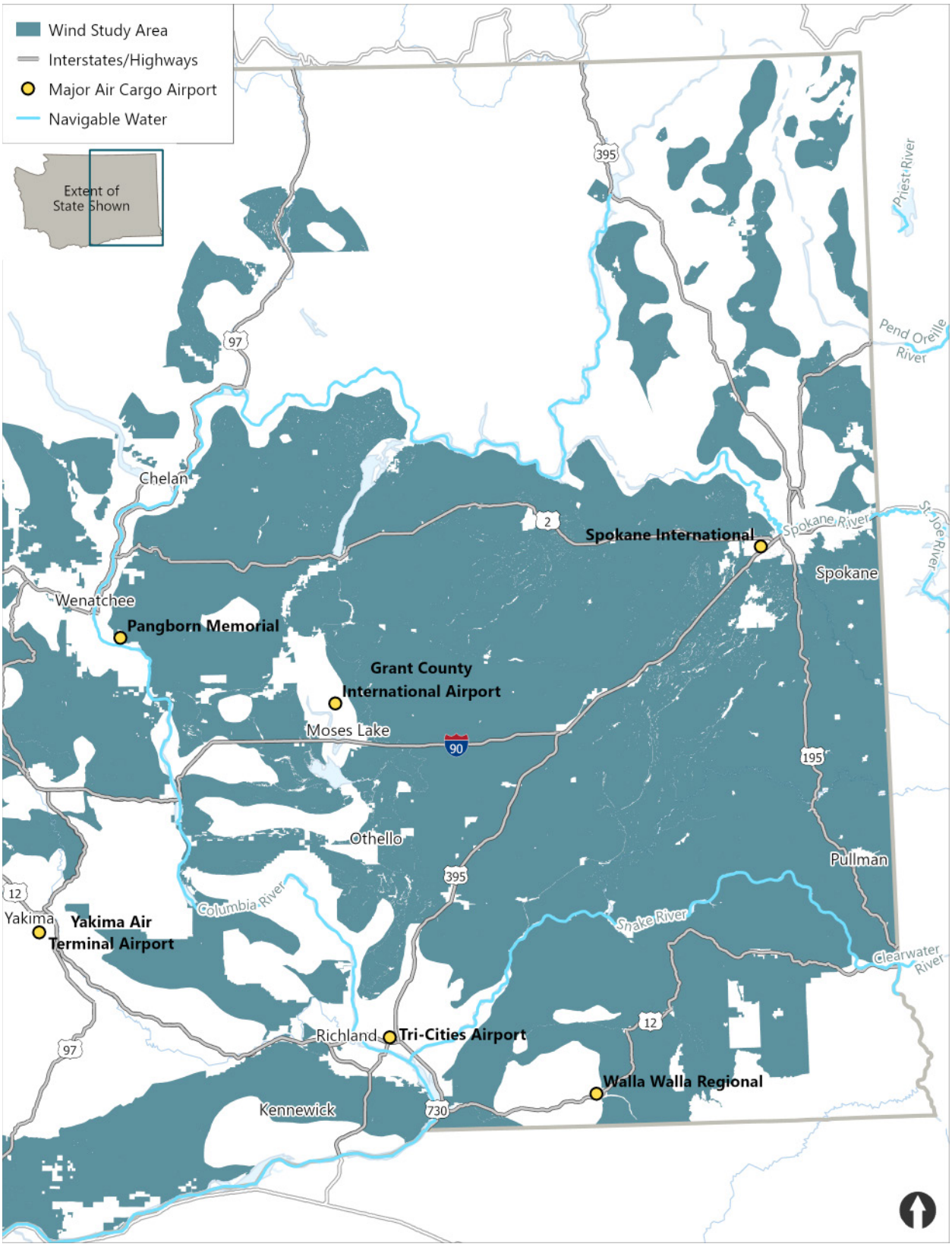

Figure 2b. Major cargo airports and navigable waters, eastern Washington

Data sources: FAA 2024a; USDOT 2024

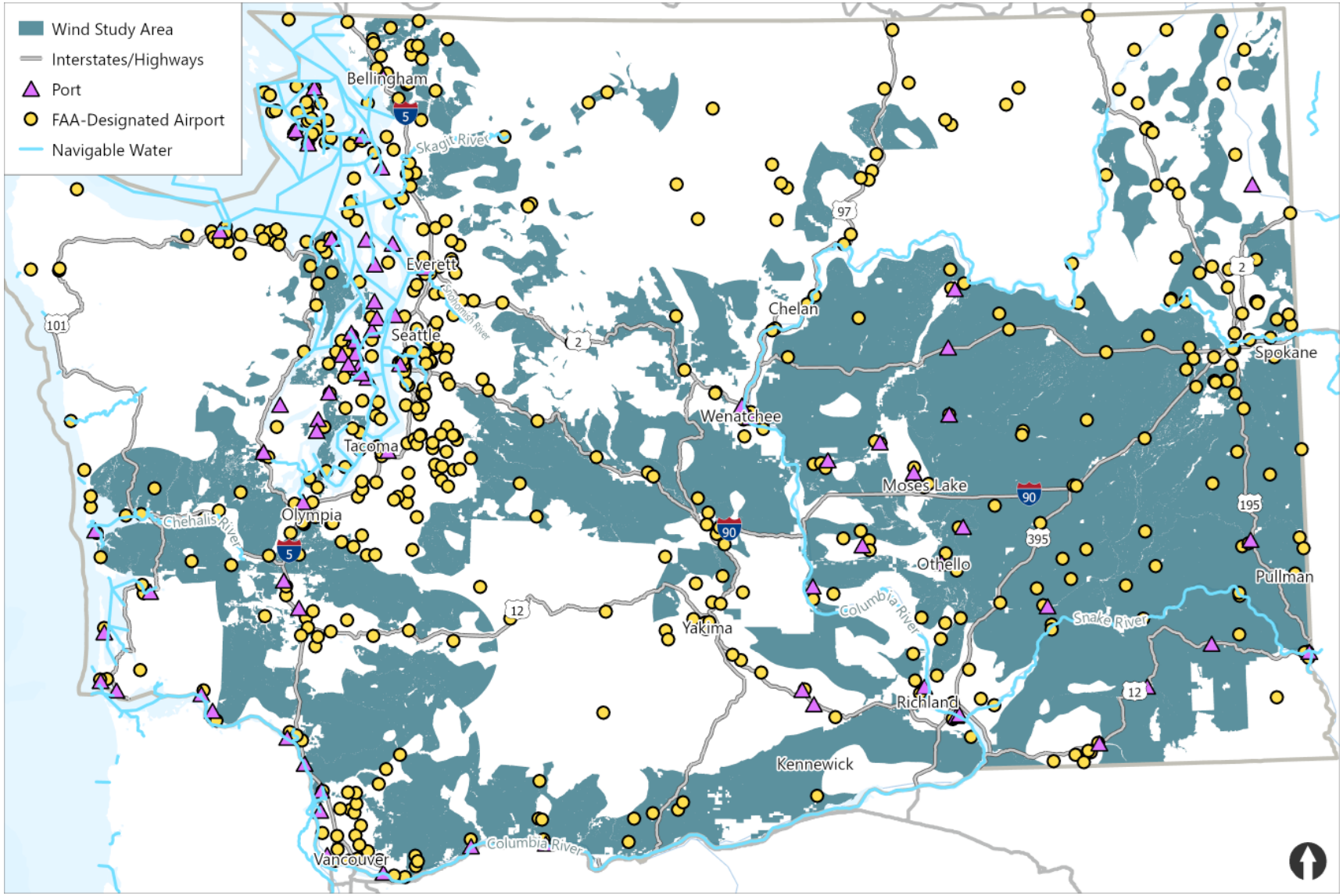

Figure 3. FAA-designated airports

Data sources: FAA 2024a; USDOT 2024; WPPA 2024

2.2 Technical approach

The approach for this resource report involved gathering existing information about transportation in the study area, including roadways, railways, air travel, and navigable waterways. This resource report also presents information about existing travel and commuting patterns and movements of goods and services. Information gathered is from existing sources; no new information or data were collected.

Utility-scale wind energy facilities would have specific needs due to the size and characteristics of the turbines and support equipment. Project-level evaluations for each future proposed facility would need to include the types, numbers, and trips of truck, rail, or barge delivery of equipment; specifics of equipment needed (e.g., cranes, bulldozers, graders, compactors, semi-truck/trailers, flatbed trucks); and the types, volumes, and origins of construction materials, such as gravel, sand, and water. The size and weight of the heavier components (e.g., turbines, towers, nacelles, rotors, substation equipment) would dictate the specifications for site access roads for required right-of-way, maximum grade, turning radii, and fortified bridges. Facility operations would generally require smaller and fewer vehicles than during construction or decommissioning, with a possibility of large component transport when replacement equipment or equipment removal is necessary. Project-level evaluations for each future proposed facility would need to include information such as the size of the workforce, worker commutes, length of construction period, expected road detours or closures, and quantities and off-site sources of construction materials and disposal locations.

For the programmatic analysis of impacts in this resource report, ranges for facility construction, operation, and decommissioning activities were estimated. The analysis of impacts did not include traffic modeling or engineering, level of service analysis, vehicle-miles traveled analysis, or other new modeling. Impacts on the transportation system were qualitatively assessed and based on an evaluation of existing, non-site-specific information consistent with a programmatic level of analysis. The resource report evaluates the following aspects of transportation:

- Traffic volumes and distances for construction and operation of facilities
- Potential waterborne, rail, and air traffic
- Potential new or improved access roads or parking/staging areas that proponents could propose for construction, operation, and maintenance activities

2.3 Impact assessment

To analyze impacts, the resource report qualitatively describes potential increases in traffic and transportation, the demand for freight transport service, and potential traffic hazards related to wide or heavy loads or slower vehicles. The analysis discusses relevant regulations, including those related to access limitations, and the process for obtaining necessary approvals.

Proponents would likely consult with FAA to construct or alter certain objects of a certain height within navigable airspace. FAA may require lighting or marking the objects. Washington state has 140 public airports, as well as private airports and military facilities that use aircraft.

This analysis evaluates impacts relative to the effects of construction, operation, and decommissioning of types of facilities analyzed in this PEIS and from the No Action Alternative. Significant impacts would occur if a wind energy facility would result in the following:

- Permanent, significant impacts on traffic patterns, volumes, hazards, or risks to other users, including commercial and military aircraft
- Long-term road closures or interruptions to traffic patterns or volumes, causing the movement of people and goods to be impacted in the long term
- Substantial damage to roadways or related infrastructure (e.g., culverts or bridges) that could not be safely used without major repairs or replacement to return to pre-impact conditions
- Substantial damage or change to transit, rail, air, or water transportation that could not be safely used without major repairs or replacement to return to pre-impact conditions

3 Technical Analysis and Results

3.1 Overview

This section provides an analysis of potential impacts on transportation that might occur for the utility-scale onshore wind energy facility types analyzed in the PEIS. This section also evaluates actions that could avoid, minimize, or reduce the identified impacts and potential unavoidable significant adverse impacts.

3.2 Affected environment

The affected environment represents the conditions before any construction begins. This section presents information about existing transportation in the study area, including roadways, railways, air travel, and navigable waterways, existing travel and commuting patterns, and movement of goods and services. Wind turbines, towers, rotors, and nacelles are currently transported in the study area by rail, truck, or barge. Many freight transport and transportation options exist within the study area.

3.2.1 Roadways and travel patterns

Washington's road network spans more than 80,000 miles, with 764 interstate miles and 1,602 miles of U.S. highways connected by state routes, county roads, city streets, and other roadways (WSDOT 2022b).

Major roads in the study area including the following (see Figure 1):

- Interstate highways or other U.S. highways 2, 5, 12, 82, 90, 97, and 195
- State highways 3, 4, 6, 8, 9, 11, 14, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 31, 101, 104, 105, 124, 125, 127, 165, 172, 174, 194, 206, 211, 221, 231, 240, 241, 243, 260, 261, 262, 272, 283, 290, 291, 302, 395, 397, 410, 504, 505, 507, 508, 530, 539, 542, 548, 821, and 971

The Interstate System serves interstate, regional, and intrastate traffic (FHWA 2024a). Interstate highways within the study area include Interstate 5 (I-5), I-90, and I--82 (see Figure 1). I-5 is the major north-south route through the state in western Washington. I-90 is the major east-west route and primary transportation corridor through Washington state. I-82 begins at I-90 near Ellensburg and extends south/southeast to Oregon. These corridors are principal freight arterials, moving regional and international cargo, and commute and recreation routes, providing access to nearby cities and outdoor recreational areas.

Both I-5 and I-90 are crucial to local, regional, national, and international trade. I-5 is the main north-south interstate highway on the west coast of the United States and extends 1,381 miles from Mexico to Canada. The portion of I-5 within the study area is 277 miles long, connecting

the cities of Vancouver, Longview/Kelso, Olympia, Tacoma, Seattle, Everett, Bellingham, Blaine, and other areas.

The portion of I-90 within the study area extends through the Washington cities of Ellensburg, Moses Lake, Ritzville, Sprague, and Spokane (FHWA 2024b). I-82 serves Washington (132 miles) and Oregon (11 miles), extending from Ellensburg through the Washington cities of Grandview, Kennewick, Sunnyside, and Yakima and through the Oregon city of Hermiston (FHWA 2024a). The Washington State Department of Transportation (WSDOT) is improving 15 miles of I-90 between Hyak and Easton, within the study area, as part of the I-90 Snoqualmie Pass East Project. The project is projected to be completed in 2029 (WSDOT 2024f). In addition, WSDOT has plans for capacity, paving, interchange, bridge, and other improvements to maintain I-90. No planned projects are currently identified for I-82.

Throughout the study area, I-5, I-90, I-82, state routes, county roads, and smaller roads serve residents and businesses. These roads are commercial, commuter, and recreation routes, providing access to nearby cities, employment centers, rural towns, and outdoor recreational areas. Communities rely on the ability to travel to obtain goods and services, healthcare, and access employment. The study area contains a few larger cities and several small towns and communities, and the road system is vital to these communities and their economies. Eighty percent of communities in Washington rely solely on trucks for their goods (WTA 2024).

Transportation of agricultural products within and through the study area is crucial to local and regional economies (NASS 2017). The road network handles the largest share of freight compared to other modes of transportation (i.e., rail or barge), with trucks moving more than half of all goods in Washington. Roads shown in Figure 1 support domestic and international trade movements and connect Washington's truck freight to other states, cities, and countries (WSDOT 2022b).

Roads that cross public lands throughout the study area may be used for recreation and to transport natural resources, such as timber, and agricultural products. Some forest road segments in the study area have existing authorized public access, whereas other segments include trust lands surrounded by privately owned lands; therefore, access to public parcels can require easements (DNR 2024).

Federally managed roads in the study area include those crossing national forests and scenic areas. Some federally managed roads are open for public access, while others are for administrative use only. Federal land management agencies such as the U.S. Fish and Wildlife Service, U.S. Forest Service, Bureau of Land Management, U.S. Army Corps of Engineers (USACE), and Bureau of Reclamation each have planning and guidance documents for road use and design.

3.2.2 Railways

Wind energy facilities could utilize rail transport both in and outside of the study area. Wind turbines are most often transported via rail due to their substantial size and weight. To ship the

wind energy equipment (typically oversize loads), railroads often hire logistics companies to ship wind components, such as turbines, directly from the manufacturer and then transport the components by rail to the nearest intermodal facility. At the intermodal facility, wind energy components can be transported by truck over a shorter distance to the installation site (UP 2021). Turbines are transported by rail on more than 3,200 miles of freight railroad tracks in Washington state, two of which are Class I railroads operated by Burlington Northern-Santa Fe (BNSF) and Union Pacific (UP) and 27 of which are Class III railroads (short lines). Class III railroads may not have the capacity to transport wind turbines; however, BNSF and UP have the capacity to transport oversize loads.

Rail freight is typically used to transport high-tonnage, oversize, and high-value cargo, such as turbines. Rail transport can be up to four times more fuel-efficient than truck transport; trains can transport 1 ton of cargo approximately 470 miles on 1 gallon of diesel (FRA 2020). Trucks are still typically used to cover the first and last mile between cargo loading and delivery to the destination (WSDOT 2022b).

Rail transport is relatively energy efficient; effective for shipping raw goods and oversize and heavy loads; and ideal for long-distance transport. However, railroad transportation requires facilities to transfer loads to and from trucks and can be delayed by high demand or lack of capacity at terminals (WSDOT 2022a). In general, longer trains can create delays on state and local roads at at-grade signalized and unsignalized crossings. The study area contains many rural communities, which are more likely to have unsignalized rail crossings compared to urban areas.

Two Class I railroads (BNSF and UP) and 11 Class III railroads currently operate in the study area (WSTC 2006; WSDOT 2022b). The Class I railway corridors connect Washington with the rest of the North American rail network, while Class III railroads offer collection and distribution services and access to key industries (WSTC 2006). The remaining 16 Class III railroads in Washington (WSDOT 2022b) could also serve certain facilities, depending on location.

There are 39 intermodal facilities in Washington allowing for the transfer of cargo between rail and other methods of transport (Figure 1). Transload of cargo between rail and trucks or semitrailers takes place at 22 facilities statewide operated by BNSF, UP, Cascade and Columbia River Railroad, and Tacoma Municipal Belt Railway. In addition, cargo is transferred between ships and rail at seven facilities statewide (WSDOT 2022b). Ten intermodal facilities exist within the study area: the ports of Quincy, Pasco, Ritzville, Clarkston, Vancouver, Bellingham, Longview, and Kennewick; Spokane Intermodal Terminal; and Spokane International Airport. Within the study area, transload of cargo between rail and trucks or semitrailers takes place at the Port of Quincy and at both Spokane intermodal facilities. Cargo is transferred between ships and rail at eight facilities within the study area and several more nearby (WP 2024).

BNSF has been transporting wind turbines in Washington state since 2000 and operates a transload facility in Pasco to transfer wind energy components from rail to trucks for shipment to wind facilities (BNSF 2015).

3.2.3 Air travel

Currently, air transport is not commonly used to transport components of a wind energy facility, but it may be used for smaller components. FAA has regulatory authority over aviation safety. The 2023–2027 National Plan of Integrated Airport Systems (NPIAS) lists 548 airports in Washington, including 415 airports for private use that are closed to the public and 133 airports for public use (FAA 2022a) (see Figures 2a and 2b and Table 2). The wind study area includes 89 FAA-designated general aviation airports. These airports vary in size and uses but are primarily small airports serving local uses, including private aviation and commercial agricultural operations.

Air cargo in Washington state is primarily generated by activity at Seattle-Tacoma International Airport, King County International Airport – Boeing Field, and Spokane International Airport. Non-hub and small commercial passenger airports within the state account for only 4% of the total air cargo volumes moved in 2016 (JTC 2018) (Table 2). Seattle-Tacoma International Airport, as an international air cargo hub, is a primary gateway for air freight from Asia and is currently studying options for expanding its cargo facilities. Spokane International Airport is the primary cargo airport for eastern Washington. The Grant County Airport in Moses Lake has wide runways, large aviation facilities, and more available land compared to many other public airports in Washington (JTC 2018).

Table 2. Major air cargo airports that could be used for onshore wind facility component transport

Airport Name	Location	NPIAS Classification	Number of Air Cargo Operators
Seattle-Tacoma International Airport	SeaTac	Large Hub	34
King County International Airport – Boeing Field	Seattle	Non-hub	7
Spokane International Airport	Spokane	Small Hub	5
Snohomish County Airport/Paine Field	Everett and Mukilteo	Reliever	4
Bellingham International Airport	Bellingham	Small Hub	3
Yakima Air Terminal/McAllister Field	Yakima	Non-hub	3
Pangborn Memorial Airport	East Wenatchee	Non-hub	3
Tri-Cities Airport	Pasco	Non-hub	2
Walla Walla Regional Airport	Walla Walla	Non-hub	2

Airport Name	Location	NPIAS Classification	Number of Air Cargo Operators
Grant County International Airport	Moses Lake	General Aviation Airport	2

Notes:
Sources: WSDOT 2017c, 2019, 2024a; JTC 2018.

a. Sponsor determined using WSDOT (2017c, 2024a).
b. Airport Classification and Washington Aviation System Plan State Classification determined using WSDOT (2019).
c. Airport Classification Key: Airports are classified based on ownership and number of passenger boardings per year. Primary airports are commercial service airports with more than 10,000 annual enplanements; Reliever airports are designated by the Secretary of Transportation to relieve congestion at a commercial service airport and to provide more general aviation access to the overall community. General Aviation airports are public-use airports that do not have scheduled service or have scheduled service with fewer than 2,500 passenger boardings each year (FAA 2022b).

Washington also hosts several military bases, many of which have patterns of airspace use for logistics, training, testing, and transit. Figure 4 depicts military training routes near the study area, from the Compatible Energy Siting Assessment prototype map tool (Commerce 2024).

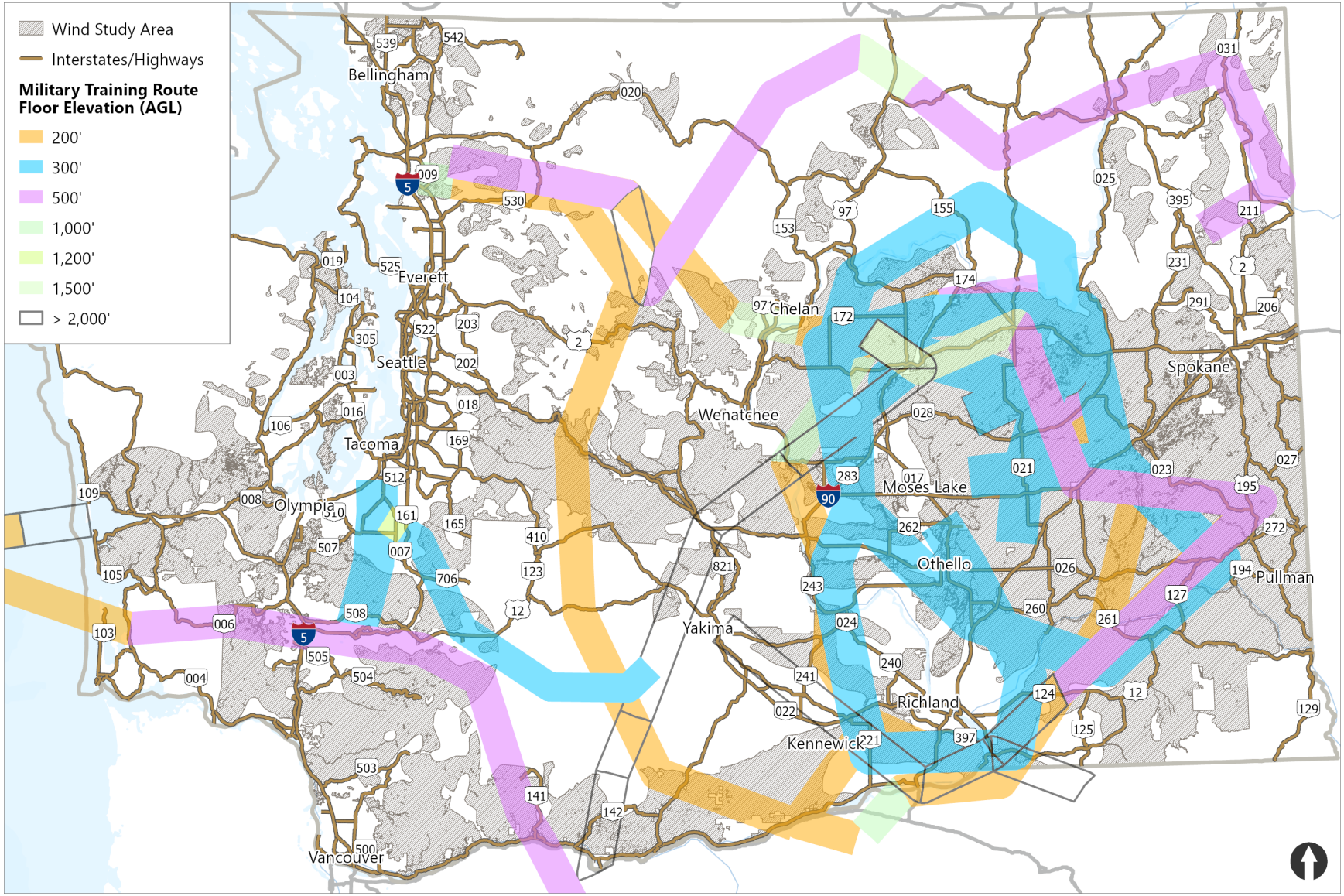

Figure 4. Military training routes in Washington state

Data source: Commerce 2024

3.2.4 Navigable waterways

Navigable waterways and ports both within and outside of the study area could be used to transport wind facility components to facilities in the study area. Waterways are currently used to transport wind facility components, such as turbine towers, rotors, and nacelles. The ports of Vancouver and Longview have received components for wind turbines and either shipped them by barge farther along the Columbia-Snake River System or transferred them to rail or truck (POV 2020; POL 2020). Navigable waterways, for the purpose of this memorandum, are defined as waterways by which freight transportation occurs by barge. 33 *Code of Federal Regulations* (CFR) 329.4 defines Navigable Waters of the United States as:

> Waters that are subject to the ebb and flow of tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate of foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity.

USACE plans, constructs, operates, and maintains navigation channels, locks, and dams to maintain authorized channel depths in harbors and inland waterways.

USACE provides navigation along the Columbia River that follows the Oregon-Washington border and extends 106.5 miles from the mouth of the Columbia River to Vancouver, Washington, as well as along the lower 11.6 miles of the Willamette River. Columbia River navigation accommodates the current fleet of international bulk cargo and container ships as part of the Columbia and Lower Willamette Federal Navigation Channel, which in 2017 was used to transport 47.5 million tons of cargo (USACE 2024).

According to WSDOT's *Freight System Plan* (WSDOT 2022a), Washington's maritime freight transport network includes the Salish Sea, the Columbia-Snake River System, and the U.S. Pacific Coast.

The U.S. Department of Transportation has designated two marine highways that serve Washington State. Marine highway M-5 includes the Pacific Ocean coastal waters and connects commercial navigation channels, ports, and harbors from San Diego to the U.S.-Canada border. Marine highway M-84 spans Oregon, Washington, and Idaho from Astoria, Oregon, to Lewiston, Idaho (MARAD 2023, 2024), and includes the Columbia, Willamette, and Snake rivers. The Columbia-Snake River System portion of marine highway M-84 transports 2.5 to 10 million tons of product per year.

Washington ranks fifth in the United States in terms of overall maritime volumes. There are 18 public ports, 158 marine terminals, 11 deepwater marine ports, and 57 inland ports in Washington. Roughly 27 million tons of freight is moved per year, primarily serving agricultural, energy, and manufacturing industries (WSDOT 2022b). Seventeen ports are located within the study area, with another 35 ports nearby (see Figures 2a and 2b). While travel times by barge take longer than rail or truck, it provides a lower-cost option that is very efficient (WSDOT 2022b).

According to the Pacific Northwest Waterways Association, one tow (a towboat plus four barges) can move the same amount of freight as one freight train and 538 trucks (PNWA 2022).

3.3 Potentially required permits

The following permits related to transportation could be required for construction, operation, or decommissioning of typical wind energy facilities and activities:

- **Determination of No Hazard to Air Navigation Approval (FAA)** could be required if the facility could affect navigable airspace. The proponent would need to file a Notice of Proposed Construction or Alteration (FAA Form 7460-1) at least 45 days prior to construction if FAA has requested one or if the proposed structure has the potential to do the following:
    - Exceed 200 feet above ground level (AGL)
    - Be located near an airport and exceed the slope ratio
    - Involve construction of a traverseway (e.g., highway, railroad, waterway) and, once adjusted upward with the appropriate vertical distance, would exceed a certain standard
    - Emit frequencies
    - Be in an instrument approach area
    - Be near a navigation facility and impact the assurance of navigation signal reception
    - Be on an airport or heliport

  Proponents can use FAA's Notice Criteria Tool (FAA 2024b) to determine whether the proposed facility requires an FAA Form 7460-1. FAA may also request a Form 7460-1 filing. Advisory Circular 70/7460-1M, Obstruction Marking and Lighting, describes standards for marking and lighting structures such as buildings and supporting structures of overhead wires (FAA 2020).
- **U.S. Department of Defense (DoD) Clearance for Radar Interference.** Wind turbines can cause interference with radar systems because towers and blades reflect electromagnetic radiation. As part of FAA's No Hazard to Air Navigation Approval, FAA notifies other federal agencies with radar assets near the facility, such as DoD, Department of Homeland Security, and the National Oceanic and Atmospheric Administration (NOAA). DoD assesses potential impacts on DoD missions and may issue a preliminary determination to inform the proponent prior to the FAA Form 7460-1 submittal. DoD may work with the proponent to mitigate the issues. Tools available to assist proponents include the DoD Preliminary Screening Tool and the NOAA NEXRAD Screening Toolbase (EERE 2024).
- **NOAA Radar Operations Center (ROC) Approval.** The ROC learns of proposed wind facilities either through the Department of Commerce's National Telecommunications and Information Administration, which acts as a clearinghouse for proponents to voluntarily submit wind facility proposals for review by several federal agencies, including NOAA, or informally, directly from proponents. The ROC tries to proactively contact the developers if a third party notifies the ROC of a wind facility that has the potential to

significantly impact a nearby weather surveillance and warning system. The ROC analyzes the proposal and communicates its findings to the proponent (NOAA 2024).

- **Overweight/Oversize Permits (WSDOT)** would be required for oversize and overweight loads.
- **Special Motor Vehicle Permit Regulations and Conditions (WSDOT)** would be required when special permit conditions, curfew hours, escort requirements, or nighttime movements are necessary.
- **Access Connection Permit (WSDOT)** would be needed to allow vehicular access, and connection points of ingress to and egress from, the state highway system within unincorporated managed access areas that are under the jurisdiction of WSDOT. This requirement is based on Chapter 468-51 Washington Administrative Code (WAC), Chapter 468-52 WAC, and Chapter 47.50 Revised Code of Washington.
- **Forest Practices Permit/Notification (Washington Department of Natural Resources)** would be required for construction on forestlands, including constructing or abandoning forest roads.
- **National Pollutant Discharge Elimination System Construction Stormwater General Permit (Washington State Department of Ecology)** would be required for proposed road construction or improvement resulting in ground disturbance and stormwater discharges to surface waters.
- **Environmental Permits (e.g., Critical Area, or Tree Removal Permit) (Local Agency or County)** would be required if tree removal or impacts on critical areas are proposed as part of road construction or improvement or to remove overhead obstructions.
- **Land Use Permits (e.g., Comprehensive Plan Amendments, Conditional Use Permit, or Zoning Amendments) (Local Agency or County)** would be required if changes to a comprehensive plan or zoning designation, Conditional Use Permit, or variance is required as part of proposed road construction or improvement.
- **Construction Permits (right-of-way permits, access permits, clear/grade permits, building, mechanical, and electrical) (Local Agency or County)** would be required if proposed new or improved roads or moving/replacing/placing utility poles or installing safety equipment (lights, signage) is proposed.
- **Federal Right-of-Way Grant or Special Use Authorization** allows specific use of federal lands for certain types of projects, including roads, highways, energy facilities, and transmission lines.

3.4 Small to medium utility-scale facilities of 10 MW to 250 MW (Alternative 1)

This section describes potential impacts on transportation due to the construction, operation, and decommissioning of small to medium utility-scale wind energy facilities.

3.4.1 Impacts from construction

The location of an onshore wind energy facility could have impacts on the local road network. Construction would require transporting resources and workers to a facility site, potentially utilizing road, rail, air, or water (barge) transport. A temporary increase in demand for shipping services and a temporary increase in traffic on roads would therefore occur during construction. A small amount of worker traffic is also expected during the site characterization phase. This PEIS assumes that construction would last between 6 and 24 months.

Worker traffic

Workers would likely drive to a site using existing local roads during site characterization and construction. The construction workforce may be 100 to 400 workers for a 150-megawatt (MW) energy facility, depending on the timing and schedule for construction. The number of workers on site daily would vary. The proximity of the site to major roads, the phasing of construction activities, the size of the facility, and the size of the construction workforce would determine the magnitude and extent of temporary disruptions to local traffic occur due to construction worker commuters.

Workers could travel from larger cities in and near the study area, such as Ellensburg, Yakima, Wenatchee, the Tri-Cities, Spokane, cities along the I-5 corridor between approximately Everett and Vancouver, and cities near the coast, such as Aberdeen. The farther a facility site is from urbanized areas with large construction labor forces, the longer the worker trips may be and the higher the likelihood that workers could choose to temporarily relocate near the facility during the construction period. Using the size of the study area and the location of labor markets within the study area, construction worker trips are assumed to range from 5 to 150 miles each way. The proximity of the site to major roads may determine whether traffic congestion occurs related to construction worker traffic. Major roads in general accommodate more traffic than local roads; therefore, a site closer to major roads may generate less congestion during construction.

Traffic related to components and materials transport

Wind turbine tower components (turbine sections and blades) would require oversize or overweight shipments, which would affect local traffic in the short term. The number of daily truck trips would vary throughout the construction period depending on the activity. These large loads would be expected to cause temporary disruptions on primary and secondary roads used to access a facility site.

Some heavy equipment and materials needed for site access (road improvement), site characterization, site preparation, and turbine foundation construction are typical of other road construction projects and would not pose unique transportation considerations. Shipments of materials, such as gravel, concrete, and water, would not be likely to affect local primary and secondary road networks. Most of the anticipated construction equipment (e.g., heavy earthmoving equipment, cranes) would remain at a facility site for the duration of construction

activities. Such construction equipment is routinely moved on U.S. roads, and there will be a limited number of one-time shipments.

Components of wind facilities are also often transported by water or rail. Smaller wind facility components could be shipped by air. The choice of transportation method for large wind components (e.g., turbine blades) would depend on the quantity of turbine towers, the manufacturer's location, and the final destination. If rail is used, equipment could be transported on a flatbed or container. Careful planning is required due to the size of the wind turbine components. Longer turbine blades may require specially designed railcars, and heights after blades are loaded may be too high for overpasses or tunnels. Rail loads of greater size or weight differ from typical rail shipments in that they move as non-scheduled, special trains. Teams analyze the dimensions and specifications of each shipment and identify the safest route from origin to destination (UP 2021). If trucks are used for transport between an intermodal facility and the site, flatbed trucks may be suitable for transporting large components such as turbine towers, rotors, and nacelles. A project-specific route between an intermodal station and a wind energy facility site may travel through small towns on roads with tighter turning radii, which may require road improvement, as discussed below (Veritread 2022).

One turbine blade can require a multi-axle trailer to accommodate the length and bulk of the blade. Seven flatbed trucks may be required to deliver one commercial wind turbine, which is typically broken down into three tower sections, a nacelle that holds the turbine's generator, a gearbox and electrical components (rotor), and three long wind turbine blades (Veritread 2022). Based on this estimated seven trucks per turbine (Veritread 2022), construction of 7 to 167 wind turbines under Alternative 1 would require 49 to 1,169 truckloads.

The oversize loads and carefully planned routes that would occur for a small-to medium-sized facility could result in temporary impacts on traffic patterns or hazards experienced by other road users such as drivers, bicyclists, and pedestrians (due to temporary delays and construction hazards). Use of transportation modes for shipping components, supplies, and materials would be temporary.

Road improvements

Facility construction may include fortifying local road bridges, reconstructing turning radii, adding acceleration or deceleration lanes on highways, or removal of obstructions to move the shipments. This would be determined on a site-specific basis. Depending on the number and complexity of required road improvements or new roads at a particular site, construction can be temporary but potentially disruptive to communities.

Although most conditions modified for construction (e.g., a temporary access road, widened turning radii, or a new acceleration lane) would be returned to existing conditions after construction, some may remain. The remaining modified conditions would represent a permanent impact to the transportation and traffic system but are not likely to result in significant adverse impacts to users. Policies, permitting requirements, and local design guidelines would be followed. Local transportation management plans and municipal code

regulations would address additional temporary traffic volume increases, temporary detours, signage, and construction timing. Construction would not result in long-term road closures or interruptions to traffic patterns or volumes.

Jurisdictions having authority, such as WSDOT or the local county or city, would regulate construction activities and issue permits at their discretion for road construction or improvement, such as right-of-way permits, construction permits, and permits related to stormwater or utilities, if applicable. Local jurisdictions would also regulate signage and hours of construction.

Facility developers may propose locating wind facilities in remote or higher altitude areas, which could require the construction or improvement of forest roads. If roads are built during the construction period to gain access to a site, these new roads could also be required for operations, maintenance, and decommissioning of the facility. Wind facilities and any related road construction or improvements proposed on state or federally managed lands would be regulated by state and federal policies, including requirements for environmental reviews, permits, and road design standards.

Facility proponents would be required to transport equipment and supplies in compliance with transportation regulations and permits, which are designed to minimize substantial damage or change to transit, rail, air (including military flights), water transportation, and roadways or related infrastructure (e.g., culverts or bridges). Therefore, substantial damage to transportation modes and related infrastructure requiring major repairs or replacement to return to safe usage and pre-impact conditions would not be expected.

Through compliance with laws and permits and with implementation of actions that could avoid and reduce impacts, construction activities would likely result in **less than significant impacts** on transportation.

3.4.2 Impacts from operation

Operation of small to medium facilities would include a small increase in vehicle trips due to maintenance employees periodically traveling to the facility site. When equipment requires replacement over the life of a facility, that equipment may utilize road, rail, water (ship or barge), or air shipping. No employees would be permanently stationed at most facilities on a daily basis, and no equipment, supplies, or materials would be expected to be shipped to or from a facility on a regular basis. Deliveries of materials during operations could include water or fuel for backup generators or maintenance vehicles. Fuels are routinely shipped for other applications and pose no unusual hazards.

On-site operations would likely include travel within the facility footprint for repairs and maintenance. Maintenance activities could include water use for dust suppression on roads and cleaning operations. If water is not available on-site during operations, water would need to be transported to the facility.

The electrical interference of control systems with aircraft operations is not likely but should be evaluated for any new installation. The potential for interference is highly dependent on facility design and location relative to aviation resources. Interactions with low-altitude aircraft avionics or communications could occur if corona discharges from the generation-tie transmission lines are not minimized and if specific electric frequencies are not avoided.

Wind turbines are anticipated to be 750 feet or taller with blades extended. Given the height of the structures, wind energy facilities could introduce obstacles affecting air navigation for aerial firefighting capabilities and emergency response. Additional discussion on these hazards is discussed in the *Public Services and Utilities Resource Report* (ESA 2024).

Authorization from FAA is needed for any structure over 200 feet in height. FAA advisory guidelines for obstruction lighting and marking would apply to wind turbine siting and design. In addition, FAA has requirements to provide notice to FAA of the following: 1) certain proposed construction or alteration of structures; 2) standards used to determine obstructions to air navigation and navigational and communication facilities; 3) a process for aeronautical studies of obstructions to air navigation or navigational facilities; and 4) the process to petition FAA for discretionary review of determinations, revisions, and extensions of determinations.

No permanent changes to traffic patterns, volumes, hazards, or risks to other users are expected to occur from wind energy facility operations in compliance with regulations. Air and marine transport are not expected to be needed during operations, except if bigger components require replacement. No long-term road closures or interruptions to traffic patterns or volumes are expected. No damage to roadways or related infrastructure (e.g., culverts or bridges) or transit, rail, air (including military flights), or water transportation would occur that would require major repairs or replacement to return to use and pre-impact conditions.

Through compliance with laws and permits and with implementation of actions that could avoid and reduce impacts, the operation of facilities would likely result in **less than significant impacts** on transportation.

3.4.3 Impacts from decommissioning

Decommissioning actions include dismantling and removing the turbines and other aboveground components, such as the collector substation, buildings, and overhead lines. Service roads may be removed or remain depending on agreements with the new or existing landowners. When a wind energy facility reaches the end of its design life, repowering may also be an option instead of decommissioning. Repowering consists of replacing (partially or totally) the old wind turbines with more powerful and more efficient models using the latest technologies.

Impacts associated with decommissioning or repowering would be temporary and similar to impacts of construction because the same routes would likely be used. The number of truck or

rail trips may be similar to construction, and for repowering, would depend on the amount and type of new equipment brought in and taken out.

Developers would be required to transport equipment and supplies in compliance with transportation regulations and permits, which are designed to minimize substantial damage or change to transit, rail, air (including military flight training), water transportation, and roadways or related infrastructure (e.g., culverts or bridges). Therefore, substantial damage to transportation modes and related infrastructure requiring major repairs or replacement to return to safe usage and pre-impact conditions is not expected.

Through compliance with laws and permits and with implementation of actions that could avoid and reduce impacts, decommissioning activities would likely result in less than significant impacts on transportation.

3.4.4 Actions to avoid and reduce impacts

Potential measures to reduce adverse impacts may include siting and design considerations, regulatory and permit requirements, and other mitigation measures. Site-specific mitigation actions would be developed during project-specific reviews and permitting for facilities proposed in the future.

3.4.4.1 Siting and design considerations

Siting and design considerations are actions that could be taken by a proponent in developing a facility design or considering specific sites. These are intended to avoid, minimize, and/or mitigate potential resource impacts and include the following:

- Consider traffic routes and peak hour traffic volumes when designating and designing access roads to a facility site.
- Consider use of existing roads, parking and staging areas, and utility corridors to the maximum extent feasible and if safe and structurally sound.
- Design and construct any new access roads to the appropriate standard no higher than necessary for the intended function.
- Light and paint turbines in accordance with FAA rules and advisory circulars. Lighting systems would be placed on the nacelle to warn pilots at night of the presence of the turbines.
- Assess the potential for transportation impacts associated with the proposed facility in coordination with appropriate state and local agencies, consulting land use plans, transportation plans, and local plans to the maximum extent practicable.
- Coordinate with interested agencies, Tribes, and interested parties (WSDOT 2024g) if facility design proposes or requires a change in interstate access or a new interstate access. Proposed access changes should be considered in the context of statewide and local transportation and land use planning because they can affect local and regional traffic circulation.

- Design the facility to comply with applicable FAA regulations, including height and frequency requirements, to avoid or minimize potential safety issues associated with proximity to airports, military bases or training areas, or landing strips.
- Coordinate with FAA early to identify and minimize impacts on civilian airport and airspace use. For any temporary or permanent structure that exceeds any obstruction standard contained in 14 CFR 77 or an overall height of 200 feet (60.96 meters) AGL, ensure the structure is marked or lighted. FAA could recommend marking or lighting a structure not exceeding 200 feet (61 meters) AGL or not within the distances from airports or heliports mentioned previously because of its location (FAA 2020).
- If the proposed project is located under military utilized airspace with a floor of 500 feet AGL, coordinating with the local military representative to conduct a Glint/Glare Analysis to identify whether there are potential impacts is recommended.
- Contact DoD early in the process on siting of a wind facility and transmission facilities near or within military training routes, military bases, or training areas in order to identify and mitigate potential impacts on military operations. Site design must consider military installations and air space needs. Use the Compatible Energy Siting Assessment mapping tool to determine whether wind facilities are under military utilized airspace. If so, submit plans to DoD for review.

3.4.4.2 Permits, plans, and best management practices

This section lists actions associated with potential permits, plans, or best management practices (BMPs). BMPs are activities, maintenance procedures, managerial practices, or structural features that prevent or reduce adverse impacts. These may be required in permits or plans by a regulatory agency and include the following:

- Develop a Transportation Management Plan for oversize or overweight components specific to wind energy development that considers component sizes, weights, origin, destination, and unique handling requirements. The Transportation Management Plan should also evaluate various transportation modes, including rail or waterway freight. The Transportation Management Plan should include the following:
  - Evaluation of the routes for bridges, grade crossings, and potential overhead obstructions
  - Review of local traffic patterns
  - Provisions to maintain emergency vehicle routes
  - The dimensional diagram of the load
  - Why alternate transportation is not available
  - Completing a practice run of the route
  - Escort vehicles (private and/or police escorts)
  - State and local travel schedules
  - Seasonal considerations: ice and snow, spring thaw, etc.
- Develop a Traffic Control Plan and Haul Route Agreement in coordination with WSDOT and the local jurisdiction for traffic management during construction and for construction of access approaches from county rights-of-way. The plan should address the following:

    - Routes and haul schedules
    - Road design, construction, and management standards
    - Coordination and consultation with local planning authorities regarding general traffic, public transit routes and stops, and school bus routes and stops
    - The transport of turbine components, main assembly cranes, and other large pieces of equipment
    - The use of pilot cars and certified flaggers
    - Specific object sizes, weights, origin, destination, and unique handling requirements
    - Alternative transportation approaches
    - Compliance with federal, state, and local permitting requirements for weight, clearance, load size, and oversize and overweight vehicles
    - Minimizing hazards and congestion
    - Ensuring post-construction road restoration to conditions as good or better than preconstruction
    - Using appropriate vehicle and roadside signing and warning devices when slow or oversize loads are being hauled
- Evaluate transportation impacts as part of the environmental review for the facility and, to the maximum extent practicable, consider options to avoid, minimize, and/or mitigate such risk in coordination with the agencies having jurisdiction.
- To the maximum extent practicable, include local road improvements, provide multiple site access locations and routes, stagger work schedules for different work functions (e.g., site preparation, turbine assembly, and electrical connections), shift work hours to facilitate off-peak commuting times to minimize impact on local commuters, or implement a ride-sharing or shuttle program. These actions would mitigate impacts related to the daily commutes of construction workers.
- Incorporate environmental inspection and monitoring measures into facility planning to monitor and respond to transportation impacts during construction, operations, and decommissioning.
- To the maximum extent practicable, implement traffic control measures, such as intersection realignment coupled with speed limit reduction; the installation of traffic lights and/or other signage; and the addition of acceleration, deceleration, and turn lanes on routes with site entrances. These actions would reduce hazards for incoming and outgoing traffic, as well as expedite traffic flow.
- To the extent practicable, avoid impacts to existing and planned public roadway corridors to maintain proper traffic flows and retain more direct routing for the local population.
- Restore vegetation and contour to roads abandoned after construction.
- Ensure that fill brought to a facility site would be suitable for its intended use and delivered in accordance with BMPs and an approved local transportation plan.
- Construct all road improvements in conjunction with and in compliance with local public works department standards.

- Coordinate with the local jurisdiction to identify a qualified third-party engineer who would document road conditions prior to construction and again within 30 days after construction is complete or as weather permits.
- Provide advance notice to adjacent landowners and residents of construction to reduce access disruptions.
- All construction vehicles should yield to school buses and lower their speed when approaching a school bus or bus stop.
- Place advanced warning and proper roadway signage on major state, county, and local roads to warn motorists of detours, road closures, and potential facility-related vehicles entering and exiting the roadway. Implement traffic control measures to reduce hazards for incoming and outgoing traffic and streamline traffic flow, such as intersection realignment and speed limit reductions; install traffic lights and/or other signage; and add acceleration, deceleration, and turn lanes on routes with site entrances.
- Use temporary barriers and traffic control measures where possible during construction. Flaggers should be employed.
- Provide advance notification to emergency providers and hospitals when public roads may be partially or completely closed.
- Give emergency vehicles the right-of-way.
- Obtain a Right-of-Way Access Permit or Work in Right-of-Way Permit from the local jurisdiction.
- If any changes to National Highway System roads are proposed, the comply with the Federal Highway Administration Final Rule to 23 CFR 625, which modifies regulations governing new construction, reconstruction, resurfacing (except for maintenance resurfacing), restoration, and rehabilitation projects on the National Highway System (including the Interstate System). These design standards and standard specifications were established by the American Association of State Highway and Transportation Officials (WSDOT 2024h).

3.4.5 Unavoidable significant adverse impacts

Through compliance with laws and permits and with implementation of actions to avoid and mitigate significant impacts, small to medium utility-scale wind facilities would have **no significant and unavoidable adverse impacts** on transportation from construction, operation, or decommissioning.

3.5 Large utility-scale facilities of 251 MW to 1,500 MW (Alternative 2)

3.5.1 Impacts from construction, operation, and decommissioning

This section describes potential impacts on transportation due to the construction, operation, and decommissioning/repowering of large utility-scale wind energy facilities.

Impacts from construction would be similar to those described for small to medium facilities, except that some impacts would be greater in magnitude and extent. For large facilities, 168 to 1,000 wind turbines with capacity to generate 1.5 MW of electricity or 42 to 250 wind turbines with 6.0 MW capacity would be constructed. The tower height with blades would be the same as for small to medium facilities. Up to 2,000 construction workers could be employed for the project. The number of workers on site daily would vary.

Construction worker travel times would likely be similar, but larger facilities may require more workers or a longer construction period than small to medium facilities.

The demand for freight transport would increase proportionate to the larger site size and greater number of turbines. Assuming seven trucks per turbine, similar to small to medium facilities, approximately 1,180 to 7,000 truck trips would be required for large facilities. A shift from trucks to rail due to larger shipments would not substantially affect rail transportation due to the existing, established rail infrastructure and the capacity for rail freight transport throughout the study area. Due to the choices and availability of intermodal transportation within the study area, the highway, air, rail, and water transportation system in the study area could likely accommodate the additional demand associated with large facilities.

Impacts due to operation and decommissioning/repowering would be similar to small to medium facilities, except proportionally greater in magnitude due to larger facility sizes. No employees would be permanently stationed at most facilities on a daily basis, and no equipment, supplies, or materials would be expected to be shipped to or from a facility on a regular basis. Available actions to avoid and reduce impacts during operation and decommissioning would be the same as those identified for small to medium facilities.

Through compliance with laws and permits and with implementation of actions that could avoid and reduce impacts, construction, operations, and decommissioning activities would likely result in **less than significant impacts** on transportation. Available actions to avoid and reduce temporary impacts from construction would be the same as those identified for small to medium facilities described in Section 3.4.4.

3.5.2 Actions to avoid and reduce impacts

Potential measures to reduce adverse impacts would be the same as those included for small to medium facilities in Section 3.4.4.

3.5.3 Unavoidable significant adverse impacts

Through compliance with laws and permits and with implementation of actions to avoid and mitigate significant impacts, large utility-scale wind facilities would have **no significant and unavoidable adverse impacts** on transportation from construction, operation, or decommissioning.

3.6 Wind energy facility and co-located battery energy storage systems (Alternative 3)

3.6.1 Impacts from construction, operation, and decommissioning

This section describes potential impacts on transportation due to the construction, operation, and decommissioning/repowering of utility-scale wind energy facilities with battery energy storage systems (BESSs). Impacts would be similar to facilities described in Sections 3.4 and 3.5, except that more truck trips (assumed 10 or fewer additional trips for the BESS construction, beyond truck trips required based on facility size) would be required to transport the battery systems during construction and decommissioning. Some of the additional trips can be expected to be oversize or overweight loads. BESSs are typically constructed in gravel areas, meaning that additional gravel may need to be transported to a facility with co-located BESSs.

During facility operation, maintenance and operation of the BESS would contribute very few trips to overall facility impacts. Impacts due to operation and decommissioning would be similar to facilities without a BESS.

Through compliance with laws and permits and with implementation of actions that could avoid and reduce impacts, construction, operations, and decommissioning activities would likely result in **less than significant impacts** on transportation.

3.6.2 Actions to avoid and reduce impacts

Potential measures to reduce adverse impacts would be the same as those included in Section 3.4.4.

3.6.3 Unavoidable significant adverse impacts

Through compliance with laws and permits and with implementation of actions to avoid and mitigate significant impacts, utility-scale wind facilities with co-located BESS would have **no significant and unavoidable adverse impacts** on transportation from construction, operation, or decommissioning.

3.7 Onshore wind energy facility combined with agricultural land use (Alternative 4)

3.7.1 Impacts from construction, operation, and decommissioning

This section discusses potential impacts on transportation due to the construction, operation, and decommissioning of wind energy facilities that include agricultural uses. Impacts during construction and decommissioning would be similar to facilities described in Sections 3.4 and 3.5. Construction and decommissioning schedules, including truck trips and deliveries, may need to be coordinated with seasonal agricultural activities, such as grazing, planting, or harvesting. Other available actions to avoid and reduce temporary impacts from construction would be the same as those identified for facilities without agricultural land use.

Impacts due to operation would be similar to facilities without agricultural land use, although the agricultural uses of these facilities would require more operations and maintenance-related truck trips. Maintenance activities may need to be coordinated with seasonal agricultural activities. The number of trips would vary by facility and specific type of agricultural uses.

Through compliance with laws and permits and with implementation of actions that could avoid and reduce impacts, construction, operations, and decommissioning activities would likely result in **less than significant impacts** on transportation

3.7.2 Actions to avoid and reduce impacts

Available actions to avoid and reduce impacts would be the same as those identified for facilities without agricultural land use. Potential measures to reduce adverse impacts would be the same as those identified in Section 3.4.4.

3.7.3 Unavoidable significant adverse impacts

Through compliance with laws and permits and with implementation of actions to avoid and mitigate significant impacts, utility-scale wind facilities with agricultural use would have **no significant and unavoidable adverse impacts** on transportation from construction, operation, or decommissioning.

3.8 No Action Alternative

Under the No Action Alternative, a PEIS would not be completed. Counties and state agencies would continue to conduct environmental review and permitting for utility-scale wind energy development under existing state and local laws on a facility-by-facility basis. The potential impacts from facilities developed under the No Action Alternative would be similar to the impacts for the types of facilities described above for construction, operations, and decommissioning, depending on facility size and design, and would be **less than significant**.

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