

MILITARY INSTALLATION RESILIENCE REVIEW

SUMMARY DOCUMENT



Joint Base Lewis-McChord

SEPTEMBER 2024



SOUTH SOUND MILITARY &
COMMUNITIES PARTNERSHIP



ACKNOWLEDGMENTS

Acknowledgments

The South Sound Military and Communities Partnership (SSMCP) would like to thank the development team that played an active role in the publication of this Military Installation Resilience Review. Special thanks to our contacts from Joint Base Lewis-McChord and the array of community representatives for their support and technical expertise.

About SSMCP

SSMCP is a partnership of more than 50 members including cities, counties, tribes, nonprofits, corporations, organizations, and Joint Base Lewis-McChord. SSMCP seeks to bridge military and civilian communities through innovative and flexible partnerships and perform mutually beneficial work in the South Sound. It aims to foster communication and mutual benefit through coordination among their partners on complex issues affecting the military and civilian communities.

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Department of Defense Installation Resilience Program

The Department of Defense (DoD) Office of Local Defense Community Cooperation (OLDCC) furthers the priorities of the National Defense Strategy through technical and financial assistance to state and local governments to strengthen critical relationships with military installations in support of readiness and resilience. OLDCC's Installation Resilience program provides the opportunity for defense communities to partner with their local installation as "one community" to identify natural threats across the community that are likely to impair the continued operational utility of the installation. Community responses may include organizing, planning and implementation of necessary actions that involve protection, restoration, and maintenance of critical infrastructure, services, and natural features through collaborative federal, state, local, and private efforts. The SSMCP is serving as the study sponsor for the Joint Base Lewis-McChord Military Installation Resilience Review (MIRR) with technical and financial support from OLDCC through their Installation Resilience program. This program is designed to support local and state government initiatives to identify, analyze, and implement actions necessary to foster, protect, and enhance military installation sustainability that promotes both community and installation resilience and compatible community development. The overarching goal is to increase the military value of the installation by preserving the military mission and promoting continued community growth, resilience, and economic development. When done successfully, communities may increase the overall value of the installation by preserving its role in the U.S. National Security Strategy.

ACKNOWLEDGMENTS



SOUTH SOUND MILITARY & COMMUNITIES PARTNERSHIP

Executive Leadership Team



Steering Committee





A Partnership of more than **50 member** cities, counties, the Nisqually Indian Tribe, Joint Base Lewis McChord, State, regional, corporate, and non-profit organizations dedicated to fostering outcomes that are mutually beneficial to the South Sound.

Working Group Chairs



SSMCP focuses on the intersection of issues between local governments and the military community



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ACRONYMS/ABBREVIATIONS

Acronyms and Abbreviations

ACUB	Army Compatible Use Buffer
AEP	Annual Exceedance Probability
BACM	Best Available Control Measures
BRAC	Base Realignment and Closure Commission
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DHA	Defense Health Agency
DoD	Department of Defense
DMCC	Disaster Medical Coordination Center
e.g.	“Exempli gratia” or “for example”
EOC	Emergency Operations Center
ESA	Endangered Species Act
Etc.	“Et cetera” or “and so forth”
FEMA	Federal Emergency Management Agency
GIS	Geographical Information Systems
I-	Interstate
JBLM	Joint Base Lewis-McChord
JLUS	Joint Land Use Study
MIRR	Military Installation Resilience Review
NWHRN	Northwest Healthcare Response Network
OLDCC	Office of Local Defense Community Cooperation
PFAS	Per- and Polyfluoroalkyl Substances
RAP	Resilience Action Plan
REIA	Regional Economic Impact Analysis
SME	Subject Matter Expert
SMVF	Service Members, Veterans, and Families
SR-	State Route
SSMCP	South Sound Military and Communities Partnership
SS911	South Sound 911
TCOMM911	Thurston 911 Communications
VA	Veterans Affairs

FORWARD

Forward

Natural disasters and changes in climate and extreme weather events in recent years have amplified vulnerabilities and risks for communities across the United States. Local defense communities are deserving of specific attention because they are essential to supporting military installations that maintain our national security. Defense communities provide essential operations, services, and infrastructure necessary for military installations to maintain mission assurance and mission-critical functions. This infrastructure must not only protect and preserve military readiness and defense capabilities, but also provide safe places for service members and their families to live, work and play.

In 2023, SSMCP received a grant from the DoD OLDCC to undertake a Military Installation Resilience Review (MIRR). The focus of the MIRR is to understand and support the interconnectedness and interdependencies of the critical infrastructure assets and systems that link Joint Base Lewis-McChord (JBLM) and the surrounding local defense communities and to establish a strategy to enhance their resilience. SSMCP sponsored the MIRR as a community-led, cooperative strategic planning process among the South Sound communities and JBLM to analyze and implement actions necessary to foster, protect, and enhance both community and military installation sustainability.



Figure 1: Stryker vehicle by Mount Rainier.

FORWARD

What is military installation resilience?

Military installation resilience is defined under 10 U.S.C. Section §101(e)(8) as:

“The capability of a military installation to avoid, prepare for, minimize the effort of, adapt to, and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions that do, or have the potential to, adversely affect the military installation or essential transportation, logistical, or other necessary resources outside of the military installation that are necessary in order to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions.”

As local defense communities improve their own resilience, they effectively support the broader picture of military operations and national security. The success of these communities and military installations are interdependent—together they must plan, design, and finance to successfully shape a resilient future. These significant endeavors are best done through strong partnerships formed with shared, cohesive visions and understandings of vulnerabilities and risks, prioritization of resilience projects, and innovative financing tools.

Why perform a Military Installation Resilience Review?

JBLM is a major economic engine for the South Sound Region. Therefore, the surrounding local governments, represented through the SSMCP, have a vested interest in supporting development and maintenance of infrastructure beyond installation boundaries to support military mission assurance and continued operations. These linkages require an understanding of where vulnerabilities are shared and how the

SSMCP communities and JBLM can work together to help address identified regional challenges.

How do I use this document?

The MIRR is composed of the documents listed below. The documents work in tandem to establish the context for the installation, list the various hazards that threaten the region, and detail projects that mitigate these hazards.

- 1. Technical Report** includes shared hazards, vulnerabilities, and risks affecting both the South Sound communities and JBLM with special attention given to the unique resilience requirements necessary to support the long-term sustainability and operability of the installation.
- 2. Resilience Action Plan** includes recommended actions and investments beyond the installation boundaries that can address the identified vulnerabilities and risks. The Resilience Action Plan Summary below provides an overview of the Priority Critical Assets identified during the resilience assessment process, recommended resilience actions and projects, and potential funding sources. Additional details and information are presented in the Resilience Action Plan (see Chapter 6).

FORWARD

Project Name	Project Description	Project Lead
Defense Community Transportation Corridor Study	Conduct a Regional Transportation Corridor Study to identify corridors critical to installation access, conduct a risk and resilience assessment of each corridor, and establish adaption recommendations for each corridor with assigned agency responsibility and appropriate funding sources.	SSMCP Transportation Working Group
Defense Community Communication Interoperability Plan	Develop an interagency plan to seek improved interoperability of communications among JBLM and key regional partners with identification of governance models, strategic plans, infrastructure and procedural enhancements, and training opportunities.	TCOMM911 SS911 Pierce County Communications Department
Defense Community Energy Grid Resilience	Conduct an Energy Grid Resilience Study to identify and prioritize power generation, transmission, and storage technologies that are of shared benefit to the community and JBLM.	Tacoma Public Utilities
Basic Needs Resource Support for Service Members, Veterans, and Families (SMVFs)	Develop a website resource landing page connected with a smartphone application specifically for use among SMVFs that includes listings for housing support, financial support, mental health and peer support, substance use disorder, and food insecurity.	SSMCP United Way of Pierce County
Regional Mass Sheltering Cooperative	Establish a cooperative framework among JBLM and key regional partners to focus on the procurement of shared mass care and shelter resources, joint training and exercises, and planning initiatives associated with mass sheltering during largescale regional emergencies.	Local emergency management agencies
Enhanced Health and Medical Communications and Data Sharing	Establish a program framework among Madigan Army Medical Center and key regional healthcare partners to enhance communications and data sharing capabilities.	Thurston County Public Health Department Tacoma -Pierce County Health Department
Medical Surge and Alternate Care Coordination Strategy	Develop a guide to assist relevant agencies with the identification, prioritization, and establishment of alternate local disaster medical coordination centers across the region.	Northwest Healthcare Response Network Washington Department of Health

FORWARD

Emergency Water Supply Framework for Healthcare Facilities	Conduct an Emergency Water Supply Assessment for local healthcare facilities that also provides recommendations for capital improvements and alternate water delivery options.	Local public utility districts, public works departments, and healthcare facilities
Water System Emergency Interconnection	Identify alternatives to establish emergency interties between the JBLM water system and other defense community public water systems.	JBLM Directorate of Public Works

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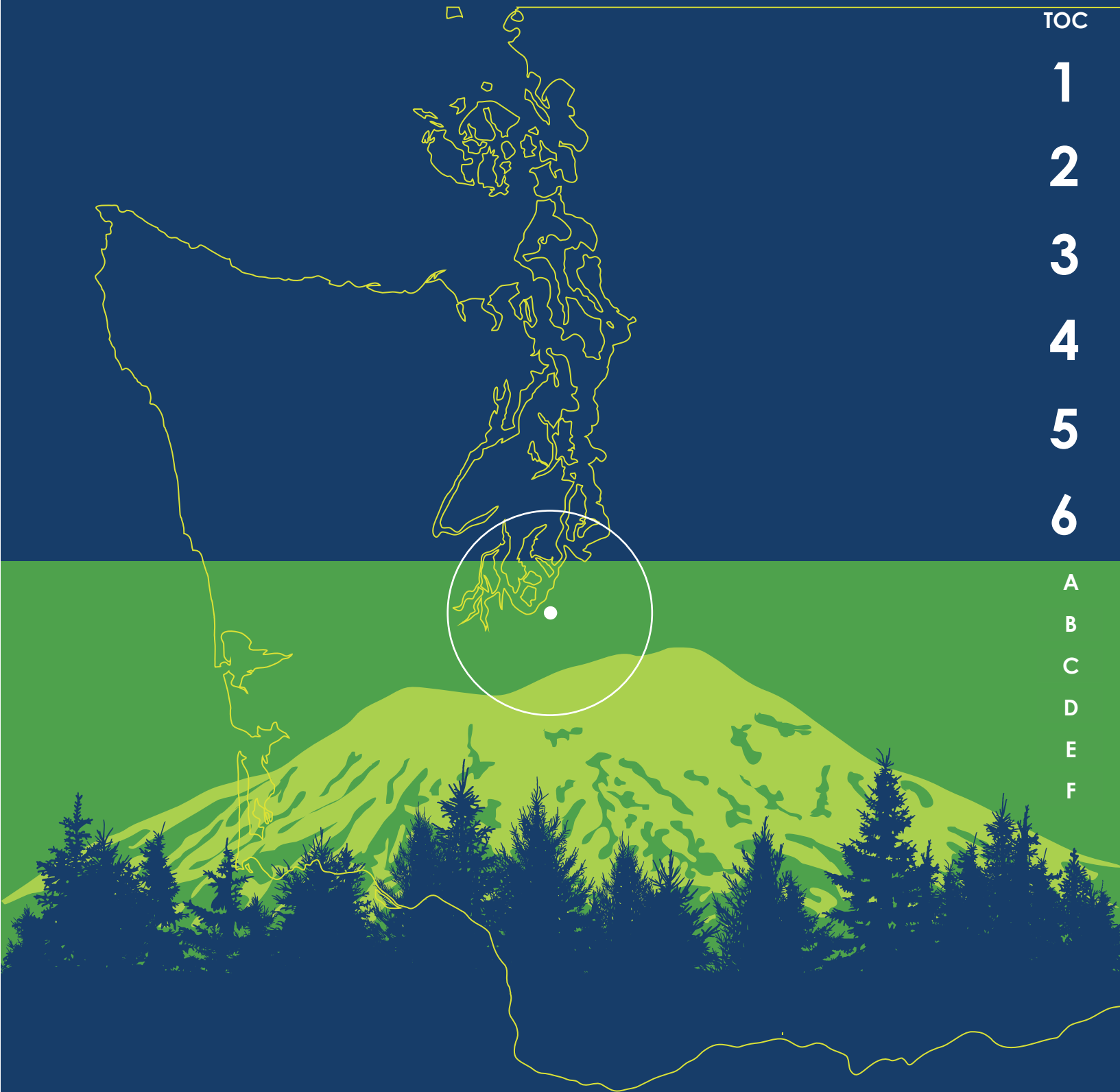
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Increases in extreme weather events related to climate change and a global pandemic have shed light on risks and vulnerabilities within our communities. Across the United States, we are facing devastating effects from natural disasters and the realities of resilience shortfalls that communities must respond to in real-time as we see a rise in billion-dollar disasters.

Annually, natural hazards take the lives of hundreds and cost taxpayers billions of dollars to help communities, organizations, businesses, and individuals recover. In 2023, 28 separate billion-dollar weather and climate disasters occurred across the United States costing the nation \$92.9 billion, which does not include the costs of the December 2023 East Coast storm and flooding event.¹

Climate-related extreme weather events affect military readiness, alter the operational environment, and drain resources. Wildfires have forced evacuations at installations in the western United States while hurricanes on the East Coast and flooding in the Midwest have inflicted billions of dollars of damage on facilities that are home to key warfighting capabilities².

1.1 Purpose

As defense communities improve their own resilience, they effectively support the broader picture of military operations and national security. This MIRR plays a critical role to protect both the military and the greater region to ensure support of the U.S. National Security Strategy; continued community growth and economic development; and adequate and resilient shared critical infrastructure such as water, stormwater, wastewater, installation energy, transportation, installation access, and communications.

The South Sound Region communities and JBLM are exposed to a range of natural hazards including earthquakes, extreme heat, extreme winter weather, wildfire, volcanic activity, and floods. Climate change has exacerbated the frequency, magnitude, and impact of these hazards (with the exception of earthquakes and volcanic activity), amplifying the necessity to increase and invest in the resilience of the local defense community and the installation.

Recognizing that JBLM serves as a significant economic engine for the South Sound Region, all parties have a vested interest in supporting the development and maintenance of infrastructure beyond installation boundaries to support military mission assurance and continued military operations.

These linkages require an understanding of where vulnerabilities are shared and how working together can help with shared visions and understandings of risks, prioritization of resilience projects, and innovative financing tools. Together, all parties benefit from jointly defining success and the metrics to evaluate success.

Defining Resilience For Defense Communities

Community resilience is widely accepted in the planning industry as the sustained ability of a community to respond to, withstand, and recover from adverse situations. Resilient communities can respond to and adapt quickly to system shocks while

¹ U.S. struck with historic number of billion-dollar disasters in 2023. National Oceanic and Atmospheric Administrations. Accessed August 1, 2024. [U.S. struck with historic number of billion-dollar disasters in 2023 | National Oceanic and Atmospheric Administration \(noaa.gov\)](#)

² Department of Defense, Office of the Undersecretary of Defense (Acquisition and Sustainment). 2021. Department of Defense Draft Climate Adaptation Plan. Report Submitted to National Climate Task Force and Federal Chief Sustainability Officer. 1 September 2021.

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maintaining their economic, environmental, and social functionality. The more recent emphasis by Congress and the Department of Defense on supporting military installation resilience presents significant opportunities for defense communities to improve their own resilience while effectively supporting the broader requirements of military operations and national security. Defense communities are deserving of specific attention because they are essential to supporting the military installations, which in turn maintain our national security. Defense communities are part of a larger network of essential operations, services, and infrastructure necessary for the military installation to sustain continued military operations and readiness.

A resilient defense community is a community, in partnership with its respective military installation, that understands its vulnerabilities, is prepared to respond to a shock, and proactively mitigate risks associated with a broad array of current and future hazards; a community that when it does experience a shock or disruption, is able to absorb the hit, rebound forward and recover rapidly. The community needs to understand and support the interconnectedness and interdependencies of the critical infrastructure assets and systems that link the community, military installation, and greater region.

1.2 Resilience Planning

The concept of resilience is linked to a wide variety of planning approaches, methodologies, and design concepts aimed at reducing risk to or lessening the impacts of shocks and stressors. Communities can enhance resilience through hazard mitigation planning, climate change adaptation, smart technology, redundancy, sustainability efforts, or a combination of these approaches. But all approaches seek

10 U.S.C §101(e)(8) defines military installation resilience as “The capability of a military installation to avoid, prepare for, minimize the effort of, adapt to, and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions that do, or have the potential to, adversely affect the military installation or essential transportation, logistical, or other necessary resources outside of the military installation that are necessary in order to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions.”

to protect communities from the loss of life and damages to infrastructure and property, while simultaneously seeking to expedite the recovery process that improves the quality of life for community members. To ensure a comprehensive approach to resilience planning, it is important to understand key planning concepts when executing a resilience strategy.

- **Hazard Mitigation** – Hazard mitigation is any action taken to reduce risk before, during, or after a hazard event. As a planning concept, it looks to reduce harmful impacts from natural hazards, such as flooding, wildfires, earthquakes, and severe weather. Hazard mitigation planning can incorporate climate adaptation by assessing and seeking to reduce future risks.
- **Climate Adaptation** – Climate adaptation is the international practice of assessing and implementing strategies to respond to local variability in climate-related elements such

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as temperature, precipitation, wind, storm events, and sea-level rise. It is important for communities to assess how increased variability in climate trends might affect the daily lives of the people, processes, and systems within them. Adaptation can take many forms and can be tailored to the specific needs of a community or region.

- **Smart Community** – The smart community movement encompasses the broad concept of creating interconnected communities that leverage technologies and data to improve day-to-day problems people experience and to benefit community activities³. Smart technology and informed approaches to problems can be integrated into resilience projects, often amplifying the effects of larger capital improvements.
- **Redundancy** – The concept of redundancy within resilience focuses on achieving safeguards against the failure of a system. Redundancy aims to increase reliability and predictability by providing alternatives when a primary system or process fails.
- **Sustainability** – Sustainability emphasizes the importance of economic efficacy, environmental stewardship, and equity or social vitality through what is often referred to as the “triple bottom line” concept⁴. Sustainability recognizes that these three pillars are essential in maintaining and improving long-term functionality and quality of life within communities. Defense communities face the added complexity of considering their relationship with the local military installation when striving to balance these goals during the decision-making process.

DoD and installation resources can support and inform a defense community’s resilience planning efforts and advance military installation resilience by funding and implementing identified solutions. In addition, the defense community perspective is needed to ensure that mission-essential facilities, infrastructure, and services beyond the installation boundaries are identified, understood, and preserved. Resilience planning is not meant to be a linear process but rather a cyclical one to support SSMCP in the development of an overall resilience program, with the goal of continuous improvement in resilience, quality of life, public safety, and the overarching tenet of national security. In the long term, defense communities can continue to evaluate and build upon their resilience strategy and implementation. As the South Sound Region becomes more resilient, it expands such preparedness to a broader scale, strengthening regional and national defense resilience strategies as well.

1.3 Approach

This MIRR was developed using the Defense Community Resilience Planning Framework and identified in the joint Association of Defense Communities and Stantec publication *Advancing Resilience for Defense Communities: A Planning Framework*. Its focus is on the interdependencies of JBLM and its local defense community, referred to herein as the JBLM Defense Community. This resilience planning framework is intended

³ Nam, Taewoo and Theresa Pardo (2011). *Conceptualizing Smart City with Dimensions of Technology, People, and Institutions*. Center for Technology in Government, University at Albany, SUNY. Retrieved from https://inta-aivn.org/images/cc/Urbanism/background%20documents/dgo_2011_smartcity.pdf.

⁴ Goodland, Robert. *The Concept of Environmental Sustainability*. *Annual Review of Ecology and Systematics* (1995), 26: 1-24. Retrieved from <https://www.jstor.org/stable/2097196>.

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to support the SSMCP’s efforts to assess, plan, prioritize, and implement resilience strategies and infrastructure projects in support of maintaining military mission assurance and mission-essential functions, as well as continued community growth and economic development.

The Defense Community Resilience Planning Framework provides a method to assess vulnerabilities and risks within defense community jurisdictional boundaries, in coordination with threats to installation resilience. It provides a risk-informed, phased approach to identify and prioritize investments for resilience projects and includes opportunities to foster partnerships. The process is broken into the following eight (8) phases (see Figure 1.1):

- **Establish Project Governance Structures and Engagement Approach** – The project team developed an Engagement Plan that detailed each community engagement event to hold at strategic points in the MIRR planning process. Using feedback from the Kickoff Meeting, a governance structure was developed to include representatives from key local organizations. Refer to Section 2 for more information.
- **Define Scope of Study** – A study area was developed for this project as a means to focus research and outreach efforts. The delineation of and adherence to this study area was critical in capturing key assets that both JBLM and the JBLM Defense Community depend upon.
- **Collect and Review Existing Data and Documentation** – Past studies conducted for JBLM such as the 2015 Joint Land Use Study, local hazard



Figure 1.1: MIRR Process Graphic.

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mitigation plans, and other regional planning documents including climate adaptation plans were reviewed to establish a planning area baseline. Additionally, geospatial data was obtained from Thurston and Pierce Counties data bases to form a preliminary list of regional assets.

- **Identify Hazards** – Local hazard mitigation plans were reviewed to understand which hazards are present in the region, specifically in the MIRR Study Area, to generate an initial comprehensive list of hazards.
- **Prioritize Hazards and Critical Assets** – Community engagement events with regional stakeholders such as surveys and workshops were used to refine and prioritize the initial list of hazards and assets. The resulting list of prioritized assets and hazards was further narrowed down based on feedback from SSMCP and JBLM.
- **Assess Risk** – A risk assessment was conducted for each prioritized asset in which its exposure to each of the prioritized hazards across three time frames (baseline, mid-century, and end-of-century) was examined. The determination of an asset’s exposure to a hazard then led to an estimate of the impacts/damage it would experience based on the severity of the hazard.

The results allowed the project team to determine which assets were the most at-risk and should be prioritized for resilience enhancing projects.

- **Identify Priority Projects** – Resilience actions and projects were developed throughout the MIRR in response to issues identified during the community engagement process and following the risk assessment to address the most at-risk assets. Once organized into a list, SSMCP and JBLM representatives ranked these projects that were then provided to regional stakeholders for validation and refinement during a community engagement event. The resulting list of projects was then validated again with SSMCP and JBLM representatives.
- **Plan for Implementation** – The projects that made it through the prioritization process were then further developed with assistance from Stantec subject matter experts (SMEs). Once these projects were developed into more detailed descriptions, the project team met with regional asset owners and SMEs to validate the contents of each description as well as generate awareness and buy-in from regional stakeholders for each project. The results of this effort are represented in the Resilience Action Plan.

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Project Schedule



Figure 1.2: JBLM MIRR Key Milestones

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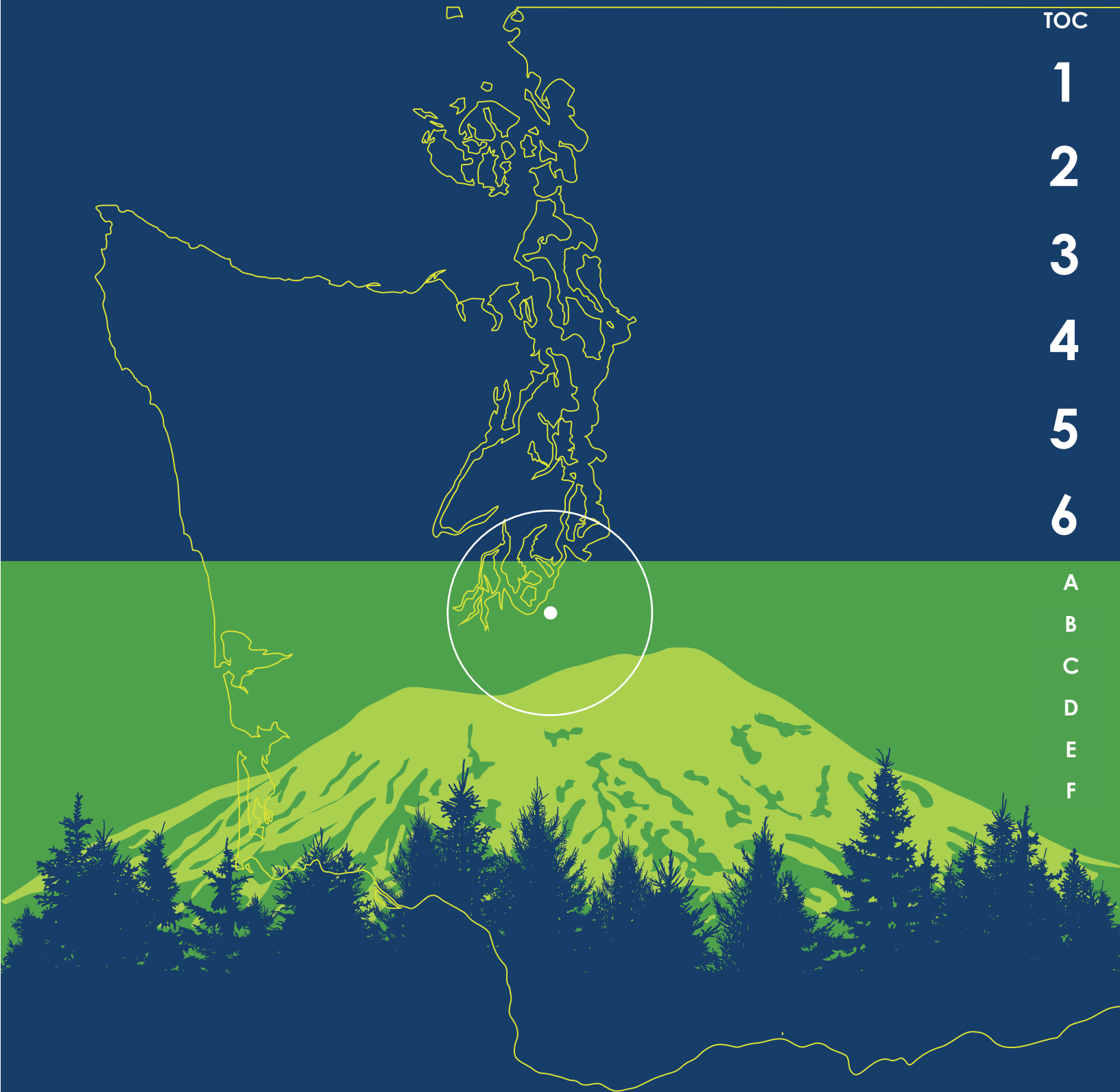
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The composition of an area plays a major role in understanding the obstacles and opportunities in achieving resilience. Study areas must be clearly defined when assessing geographically dependent concepts such as natural hazards and critical assets; the set of hazards that plague one area can be vastly different for another area just 100 miles away. Furthermore, contextual information such as the annual economic impact of an installation on the communities around it can be used to understand how an installation and the surrounding defense community interact.

2.1 Study Area

The MIRR Study Area was defined early in the planning process to focus conversations and analyses on critical assets that JBLM and the adjacent communities jointly rely on. The MIRR area consists of two components:

- **Primary Study Area** – Defined as within five miles of JBLM's perimeter that is the same radius used for the *2020 Evaluation of Location Transportation Impacts in the Vicinity of JBLM Report*. It was assumed that this scale would capture the majority of shared critical assets due to the nature of proximity, system service delivery, and interdependencies (e.g., flooding or traffic at gate entry/exit, drinking water).
- **Regional Study Area** – Defined as within 15 miles of JBLM's perimeter to capture critical infrastructure assets and encompassing all SSMCP member communities. Due to the nature of some assets, a greater geographic area was needed to review and determine shared criticality (e.g., a hospital that also serves JBLM).

The Primary and Regional Study Area boundaries resulted in the inclusion of 23 incorporated and unincorporated municipalities across Pierce and Thurston Counties, the Nisqually Nation, and the entirety of JBLM, excluding the Yakima Training Center in eastern Washington.

2.2 JBLM Defense Community Profile

The South Sound Region, for the purpose of this study, includes municipalities contained within Pierce and Thurston Counties as well as the Nisqually Nation. JBLM is entirely contained within Pierce County but sits on its southern boundary with Thurston County.

Population

The MIRR Study Area consists of 23 incorporated and unincorporated communities across Pierce and Thurston Counties, as well as the Nisqually Nation. Figure 2.2 includes the population of each municipality within the MIRR Study Area and its status as an SSMCP member.

Disadvantaged Communities in the Study Area

The socioeconomic status of communities within a project's study area can influence its ability to qualify and be prioritized for federal funding opportunities. The Justice40 Initiative, as part of Executive Order 14008, is the federal government's goal that 40% of the overall benefits of certain federal investments flow to disadvantaged communities that are marginalized, underserved, and overburdened by pollution. Communities that are considered disadvantaged by the initiative meet or exceed a range of criteria and combinations of criteria that can be found [here](#).

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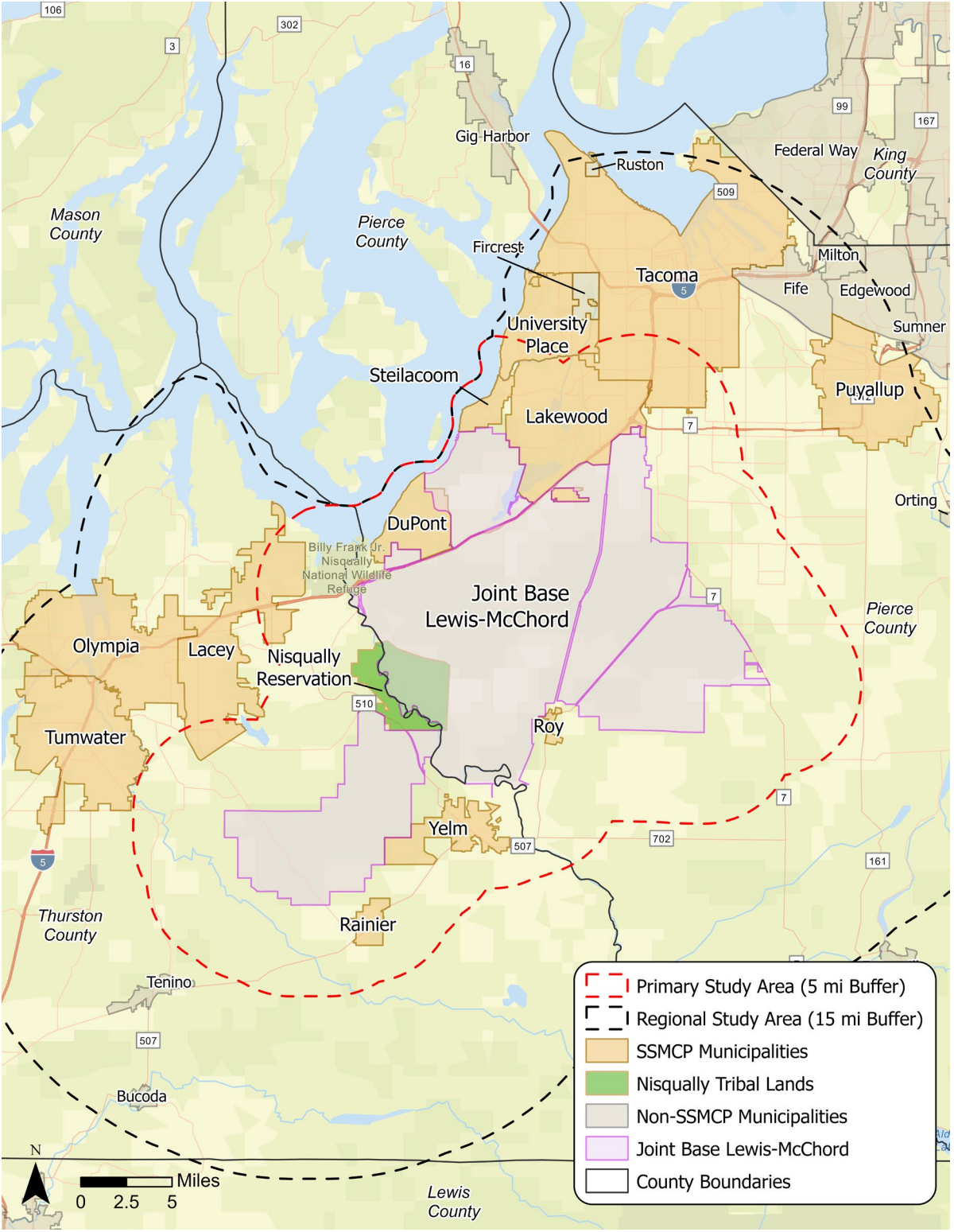


Figure 2.1: MIRR Study Area

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Municipality	Population (V2022 ⁵)	Municipality	Population (V2022 ⁵)	Municipality	Population (V2022 ⁵)
Bucoda	557 ⁶	<i>Nisqually Reservation</i>	639 ⁷	<i>Tacoma</i>	221,776
<i>DuPont</i>	9,884	<i>Olympia</i>	55,669	Tenino	1,854 ⁶
Edgewood	12,896	Orting	8,954	<i>Tumwater</i>	26,369
Federal Way	97,863	<i>Puyallup</i>	42,452	<i>University Place</i>	34,634
Fife	10,809	<i>Rainier</i>	2,772 ⁶	<i>Yelm</i>	10,668
Fircrest	6,998	<i>Roy</i>	910 ⁶	Total	706,568
Gig Harbor	12,484	Ruston	1,238 ⁶	<i>Thurston County</i>	298,758*
<i>Lacey</i>	58,552	<i>Steilacoom</i>	6,655	<i>Pierce County</i>	927,380*
<i>Lakewood</i>	62,572	Sumner	10,595		
Milton	8,768				

Orange Italicization indicates that the municipality is an SSMCP member. Population footnotes at bottom of following page.
* This population was not included in the total count because large portions of the county are outside the study area

Figure 2.2: Populations of each municipality within the MIRR Study Area and its status as an SSMCP member.

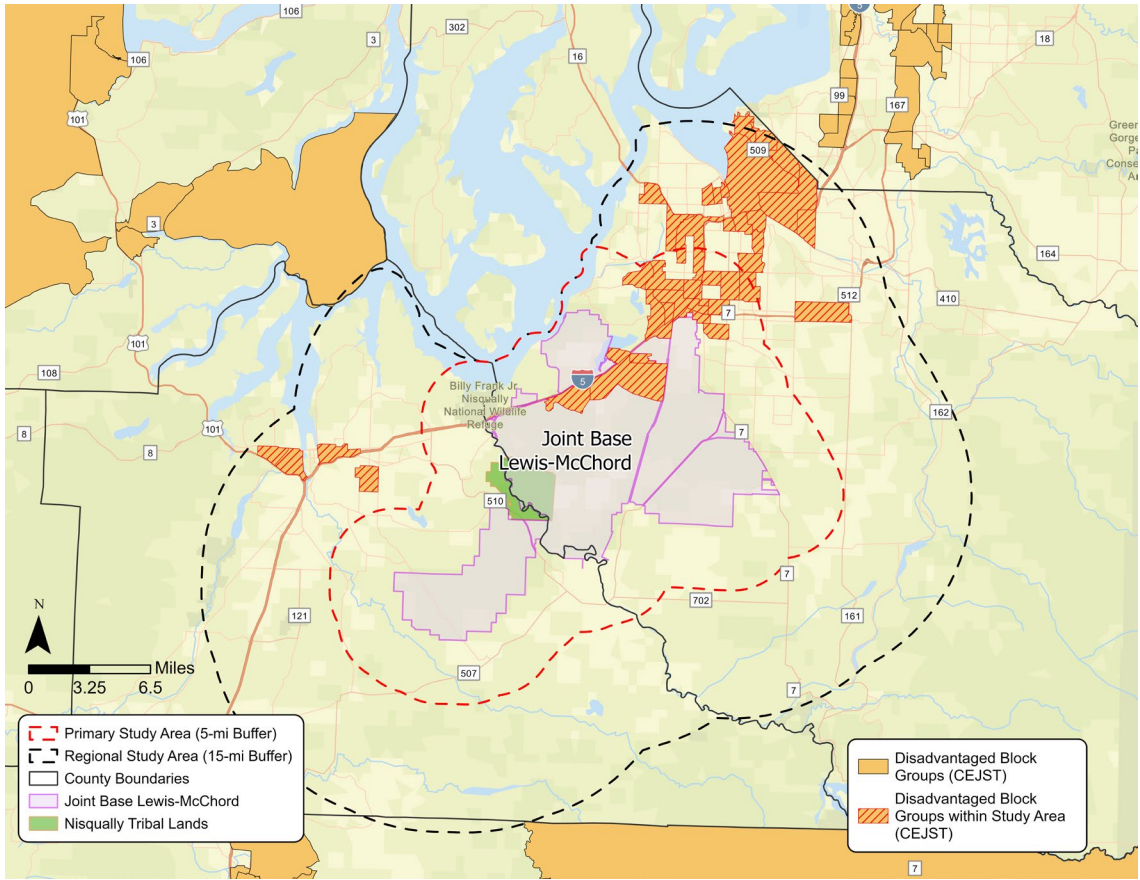


Figure 2.3: Disadvantaged Communities in the Study Area

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Using the Council on Environmental Quality's Environmental and Economic Justice Screening Tool, the project team identified 41 census tracts within the MIRR Study Area that qualify as disadvantaged communities. The presence of one or more of these communities within a resilience action project's scope can be leveraged to receive additional funding through the Justice40 Initiative. Figure 2.3 displays the spatial distribution of these disadvantaged census tracts within the MIRR Study Area. Refer to Appendix E.2 for the list of these 41 communities.

2.3 Installation Overview

JBLM is a military installation in Western Washington located in Pierce County, approximately 9.1 miles southwest of Tacoma. JBLM became one of 12 joint bases across the DoD in 2010 when Fort Lewis and McChord Air Force Base merged as an outcome of a 2005 Base Realignment and Closure Commission (BRAC) action. With an Army Joint Base Commander and an Air Force Deputy Joint Base Commander, JBLM is the home to I Corps and 62nd Airlift Wing, serves as a training and mobilization center for all services, and has much of the 2nd Infantry Division in residence, along with the Headquarters, 7th Infantry Division, 593rd Expeditionary Sustainment Command, and 1st Special Forces Group. As the Army's only power projection platform in the Western U.S., JBLM is crucial to the military's deployment of resources into the Pacific. Its location provides rapid access to the deepwater ports of Tacoma, Olympia, and Seattle for deploying equipment. Units can be deployed from McChord Field and use nearby Sea-Tac Airport. JBLM's strategic location

provides Air Force units with the ability to conduct combat and humanitarian airlift with the C-17 Globemaster III.

JBLM consists of four geographical areas – Lewis Main, Lewis North, McChord Field, and Yakima Training Center, which is not included in this MIRR study. JBLM Lewis Main, Lewis North and McChord Field include abundant high-quality, close-in training areas, including 115 live-fire ranges. Additional training space is available at Yakima Training Center in eastern Washington, including maneuver areas and additional live-fire ranges.

Prior to the 2005 BRAC merger, Fort Lewis and McChord Air Force Base were established in 1917 and 1938, respectively, with both serving crucial roles in World War II. Since then both bases have supported almost every major U.S. military engagement through the training and deployment of U.S. military resources. Additionally, the two bases served as a launching pad for countless humanitarian and peacekeeping efforts such as relief during the 1992 Typhoons and Hurricane Katrina.

JBLM serves as a vital hub of activity representing a cornerstone of military readiness and community engagement. JBLM remains committed to supporting its service members and their families through various programs and services aimed at enhancing quality of life. From providing comprehensive healthcare services to offering educational and recreational opportunities, JBLM maintains a steadfast dedication to the well-being of its community.

Geography

Consisting of 90,283 acres in the South Sound Region of Western Washington, JBLM includes an airfield, barracks, command housing, the Madigan Army Medical Center,

⁵ Vintage 2022 Estimates from U.S. Census Bureau QuickFacts, U.S. Census Bureau QuickFacts: United States
⁶ ACS 2021 5-Year Estimate
⁷ Nisqually Reservation 2022 Statistical Profile, Tacoma Regional Planning Commission: Nisqually (trpc.org)

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and other key assets critical to maintaining mission readiness. JBLM possesses a small portion of waterfront along the Puget Sound and is situated between two major rivers of the region: the Nisqually to its south and the Puyallup to its north.

Military Mission/Operations

JBLM's mission is to provide state-of-the-art training and infrastructure, responsive quality of life programs, and fully capable mobilization and deployment for Army, Navy, Air Force, and Marines. As the only power projection platform located on the West Coast, JBLM is a critical asset to the nation's military. Currently, JBLM is actively engaged in ongoing training exercises to ensure the readiness of its personnel across all branches of the military. Furthermore, the base continues to play a crucial role in national defense strategies, participating in joint operations and collaborations to uphold security both at home and abroad.

Military Operations Issues

The ability of the Army and Air Force to support testing and training missions in the South Sound Region depends on the continued cooperation of its friends and neighbors in the surrounding communities. Although most current land uses around JBLM do not have adverse impacts on military capabilities, some types of incompatible development can threaten JBLM's ability to effectively make use of its ideal testing and training location. The 2015 Joint Base Lewis-McChord Joint Land Use Study Land Use Compatibility Analysis (JLUS) included identification of the following primary concerns that could adversely impact continued military operations at JBLM:

- Additional Urban Growth in McChord Field North Clear Zone and the Thurston Highlands Master Planned Community
- Incompatible Land Use in Aircraft Safety Zones
- Incompatible Land Use in High Noise Zones
- Habit loss of Listed Endangered and Threatened Species (See Figure 6)
- Need for transportation solutions for local road networks, including I-5 Corridor
- Management of trespass and unauthorized access to JBLM range and training lands
- Communication and coordination among JLUS partners

As incompatible community development increases, pressure builds for the Army and Air Force to alter operations or otherwise reduce mission effectiveness, ultimately jeopardizing the viability of the JBLM mission. See the 2015 Joint Base Lewis-McChord Joint Land Use Study Land Use Compatibility Analysis for more information.

Economic Impact

In 2022, five graduate students and an economics professor assisted SSMCP's effort to produce a JBLM Regional Economic Impact Analysis (REIA)⁸ to understand the contributions of JBLM to the economies of Thurston and Pierce Counties. This study found that JBLM represents the third largest employer in the State of Washington providing 85,000 total jobs and generates a total economic impact of \$15 billion for the South Sound Region when factoring in all direct, indirect, induced impacts, and tax revenues.

Figure 2.5 presents the concentrations of

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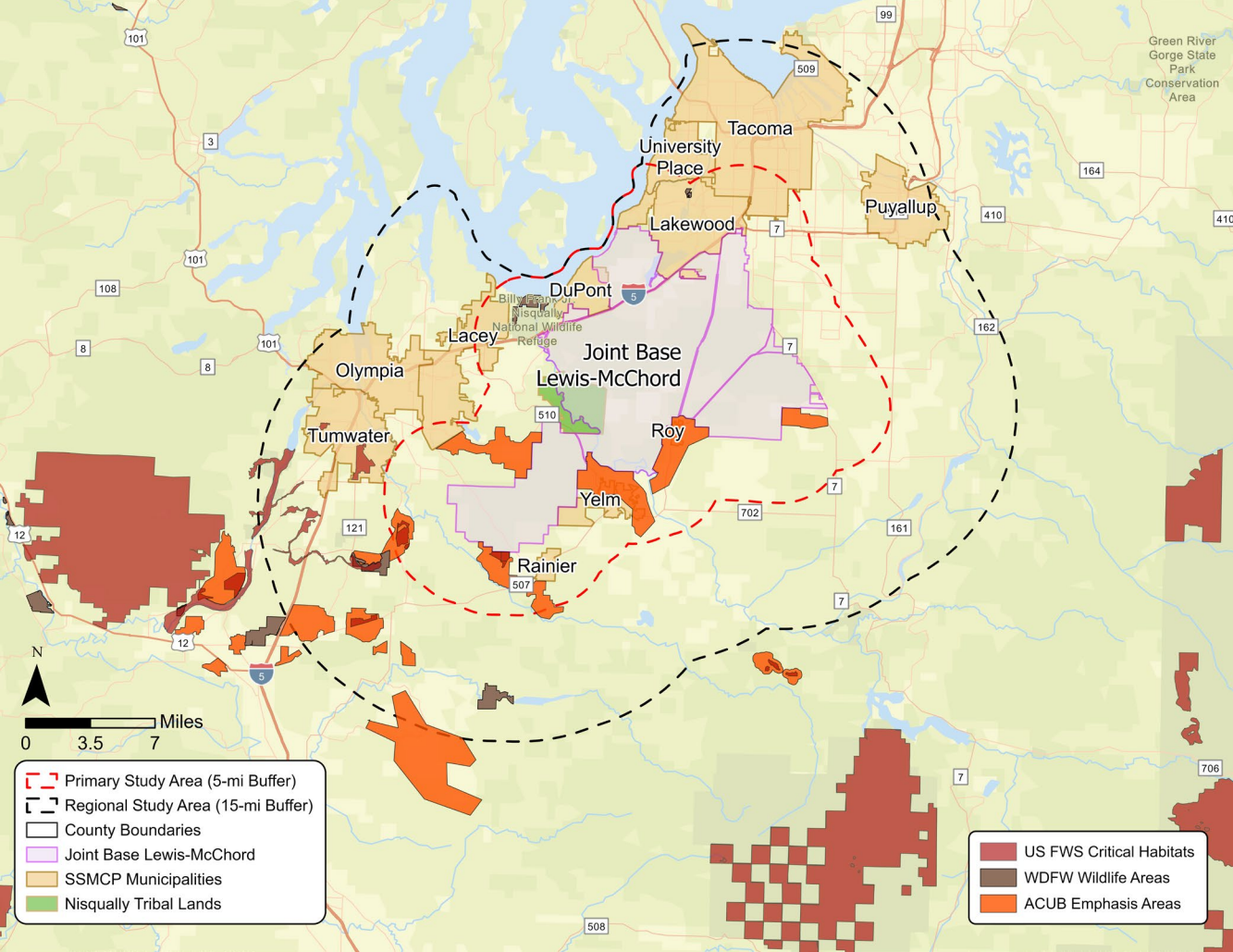


Figure 2.4: Map of Priority Habitats for ESA Listed Species near the base

where the installation's workforce lives in the JBLM Defense Community.

⁸ Anderson et al. "Regional Economic Impact Analysis Joint Base Lewis-McChord 2022." University of Washington: Tacoma.

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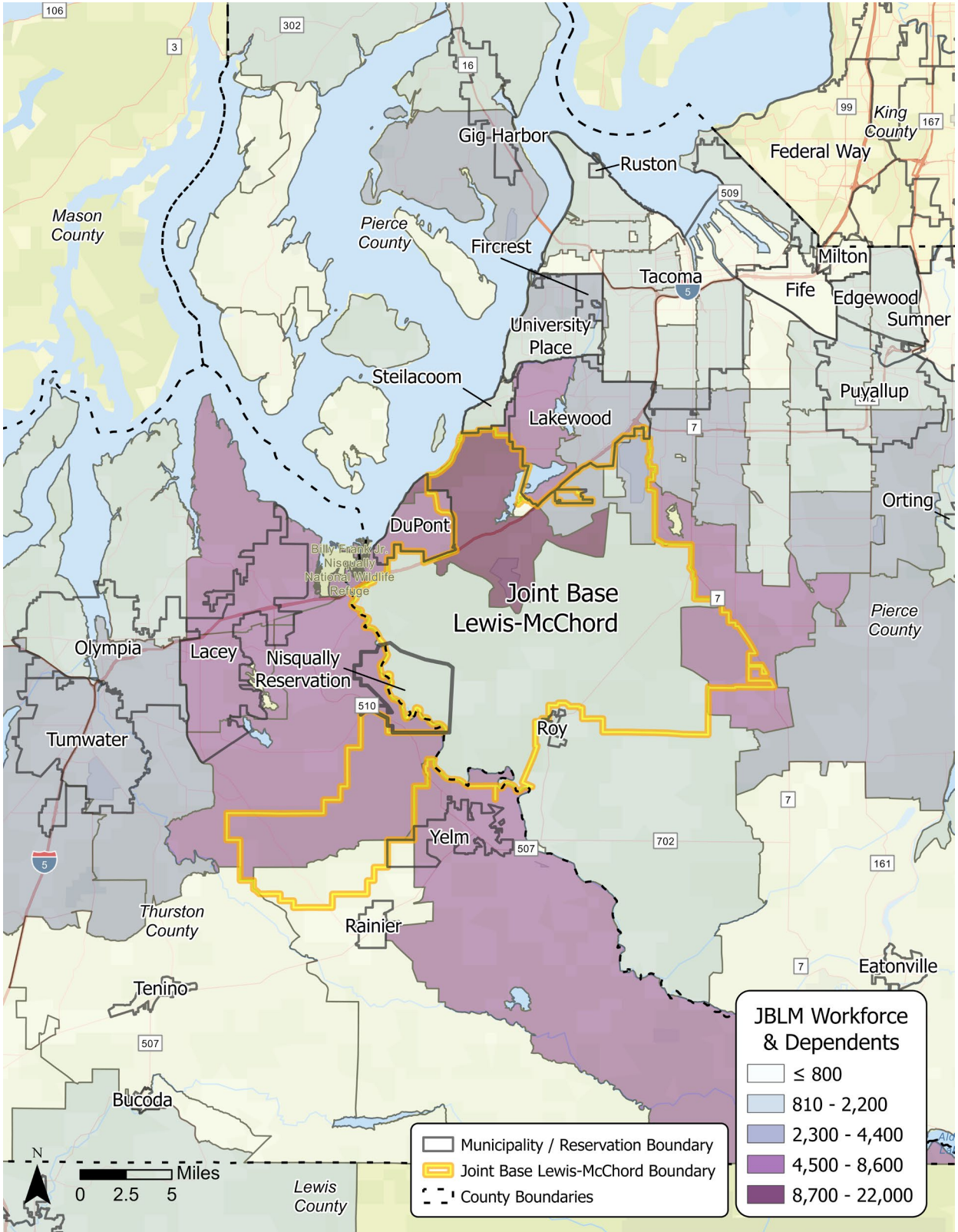


Figure 2.5: JBLM Workforce Map

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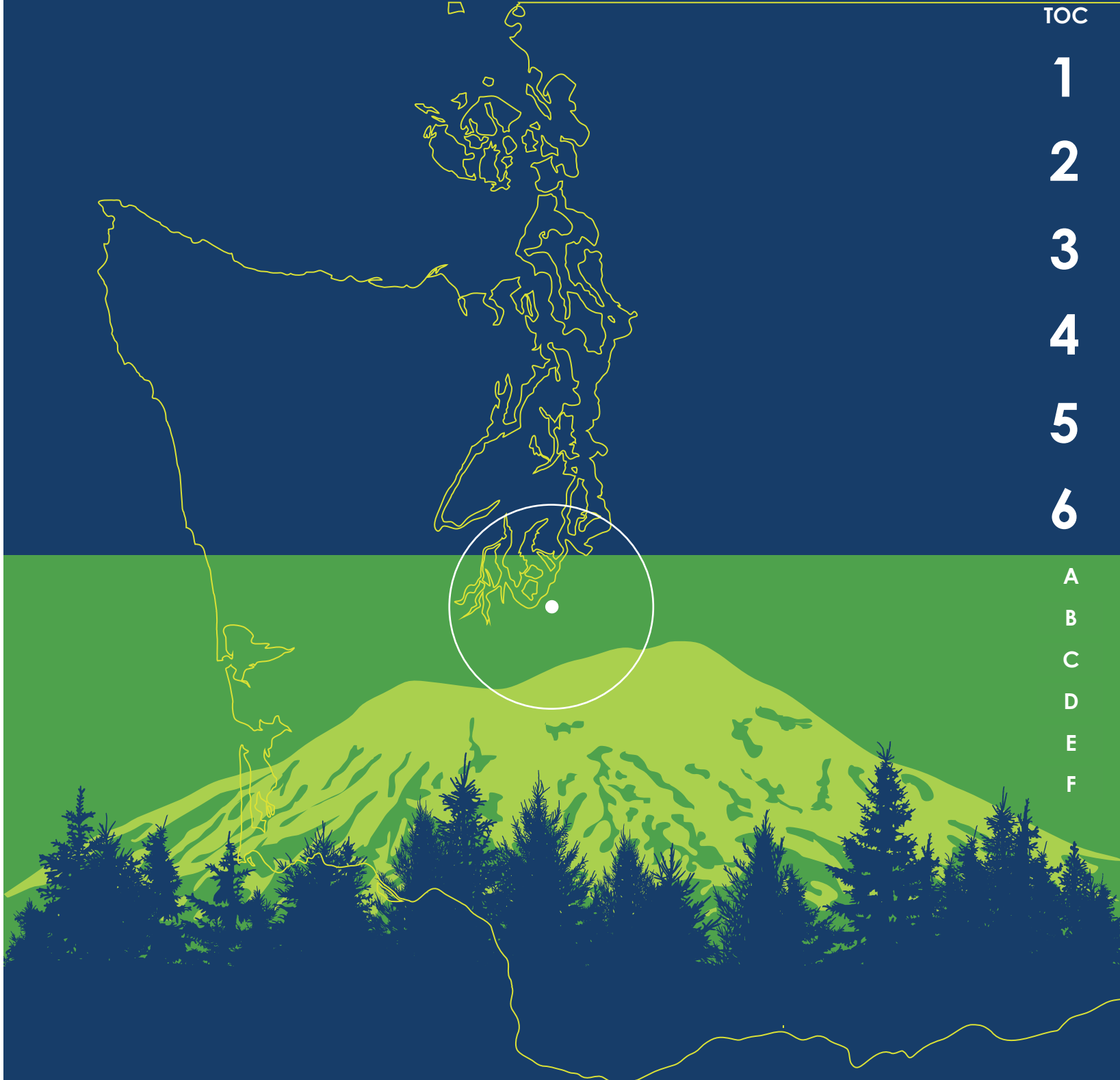
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Establishing an appropriate network in the South Sound Region to support resilience planning efforts is key to the development of impactful resilience actions. Convening the right people, organizations, and resources is essential to identify strategies and projects that are effective and enhance both community and military installation resilience, quality of life, and public safety.

The purpose of stakeholder engagement is to broaden the understanding of the complex issues facing South Sound communities, while also ensuring that various critical perspectives are incorporated during the project execution. The objective of the stakeholder engagement for the MIRR was twofold: (1) ensure the accurate capture of relevant community infrastructure information including asset data, and (2) evaluate and assess interim deliverables, providing direction and focus to the project execution.

3.1 Project Governance

MIRRs typically employ a governance structure comprised of individuals and organizations that work together to gather resources and data, contribute expertise, and help develop the path forward for the community through the representation of a broad range of interests. The governance structure for this MIRR includes a Policy Committee, which serves as the executive steering committee, and the Resilience Task Force, which represents a broader stakeholder group tasked with reviewing the vulnerabilities, risks, and resilience actions. Additionally, Military Installation Representatives (MIRs), individuals currently serving the installation, and Subject Matter Experts, personnel knowledgeable of certain aspects and/or hazards, were utilized for refining the scope and gathering in-depth information.

Refer to Appendix B for comprehensive summaries of each group within the project's governance structure.

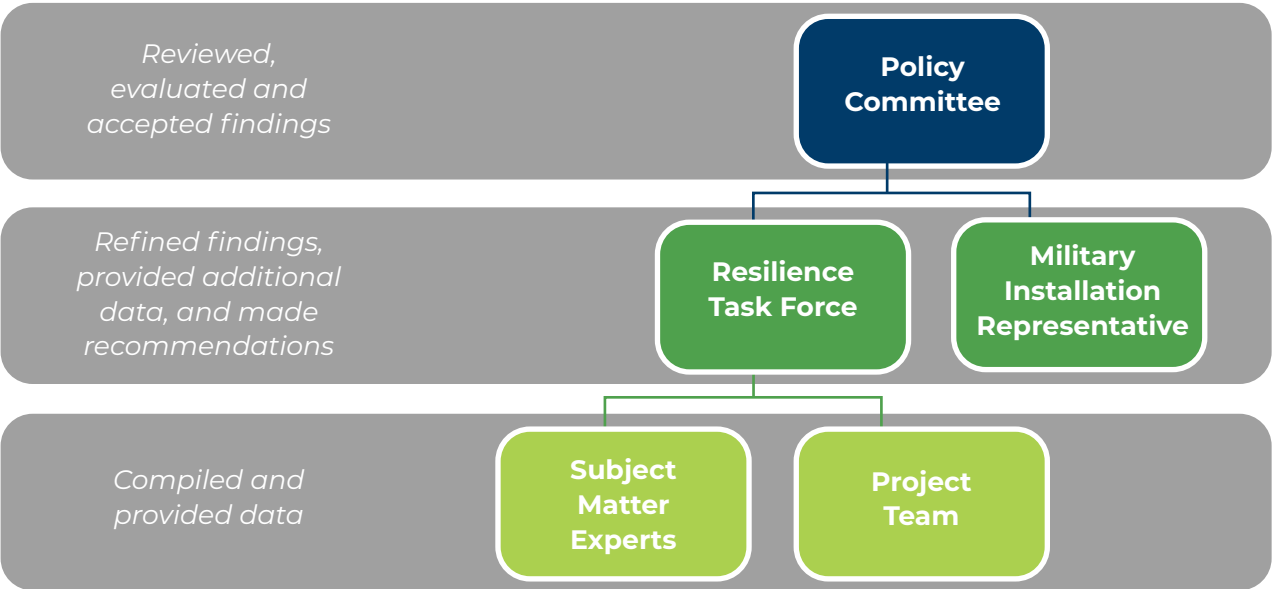


Figure 3.1: Project Governance Organization Chart

3.2 Engagement Strategy

From March 2023 to July 2024, in-person and virtual engagements were conducted with regional stakeholders to develop the MIRR and meet the study objectives. As described in Table 3.2, these engagement efforts can be broadly assigned to three categories: workshops, interviews, and surveys. Figure 3.3 provides a chronological timeline of the overall engagement effort and Figure 3.4 summarizes the major engagement events.

For summaries of every individual engagement event conducted for the MIRR, refer to Appendix B.

Engagement	Attendance	Structure
Workshops	Generally open invite that focused on members of the governance structure as well as representatives of jurisdictions and lifelines in the South Sound. Attendance at each event typically consisted of around 15 to 25 individuals.	Typically conducted in a hybrid-attendance format with a focus on in-person attendance. Structured to present current project findings, then hold discussions to improve and validate project data.
Interviews	Targeted invite that focused on the information needs of the project at that time. Typically consisted of around one to five individuals.	Typically conducted in a virtual attendance format. Structured to ask participants specific questions and record responses.
Surveys	Open invite that focused on members of the entire governance structure. The number of individuals participating varied greatly.	Digital questionnaires and/or maps that were distributed to stakeholders with the intent of capturing their responses to specific questions.

Figure 3.2: Engagement Event Categories

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GOVERNANCE AND ENGAGEMENT STRATEGY

GOVERNANCE AND ENGAGEMENT STRATEGY

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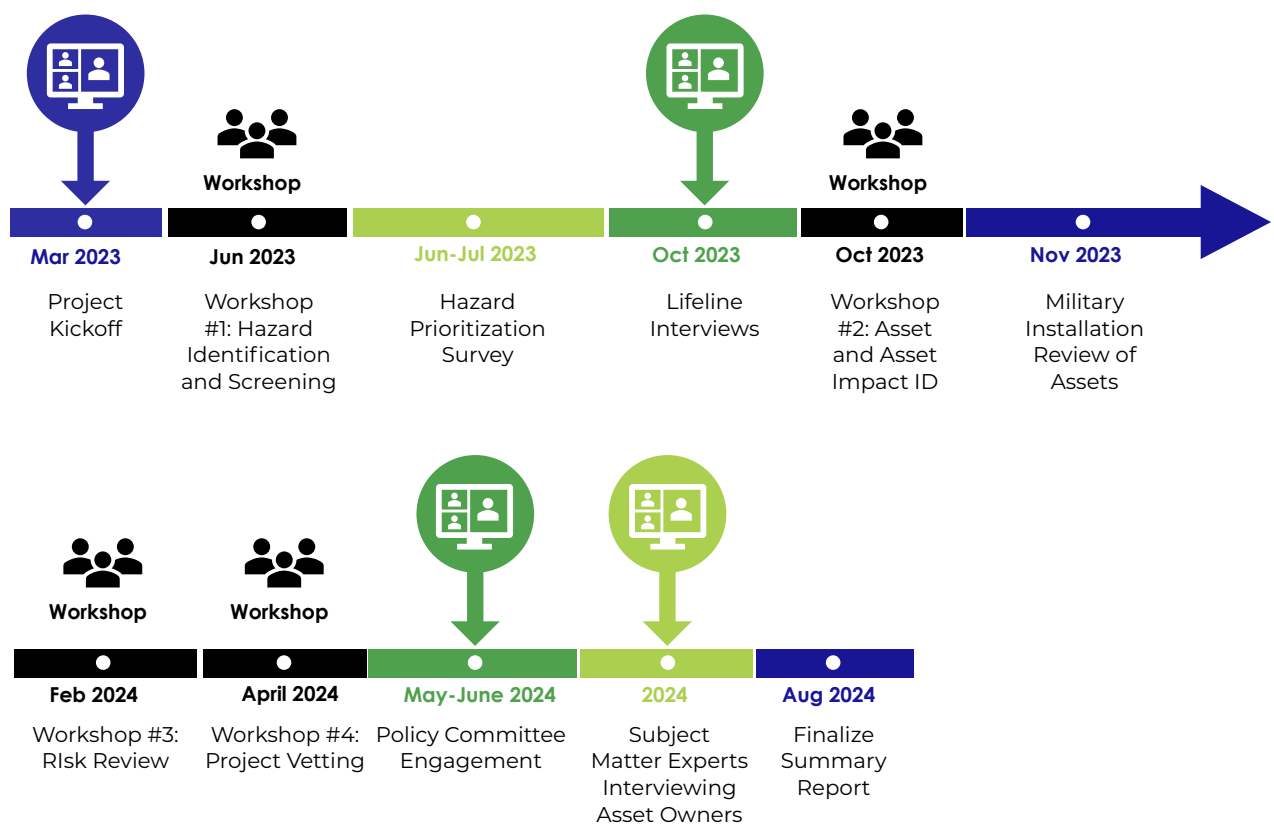


Figure 3.3: Timeline of Project Engagement

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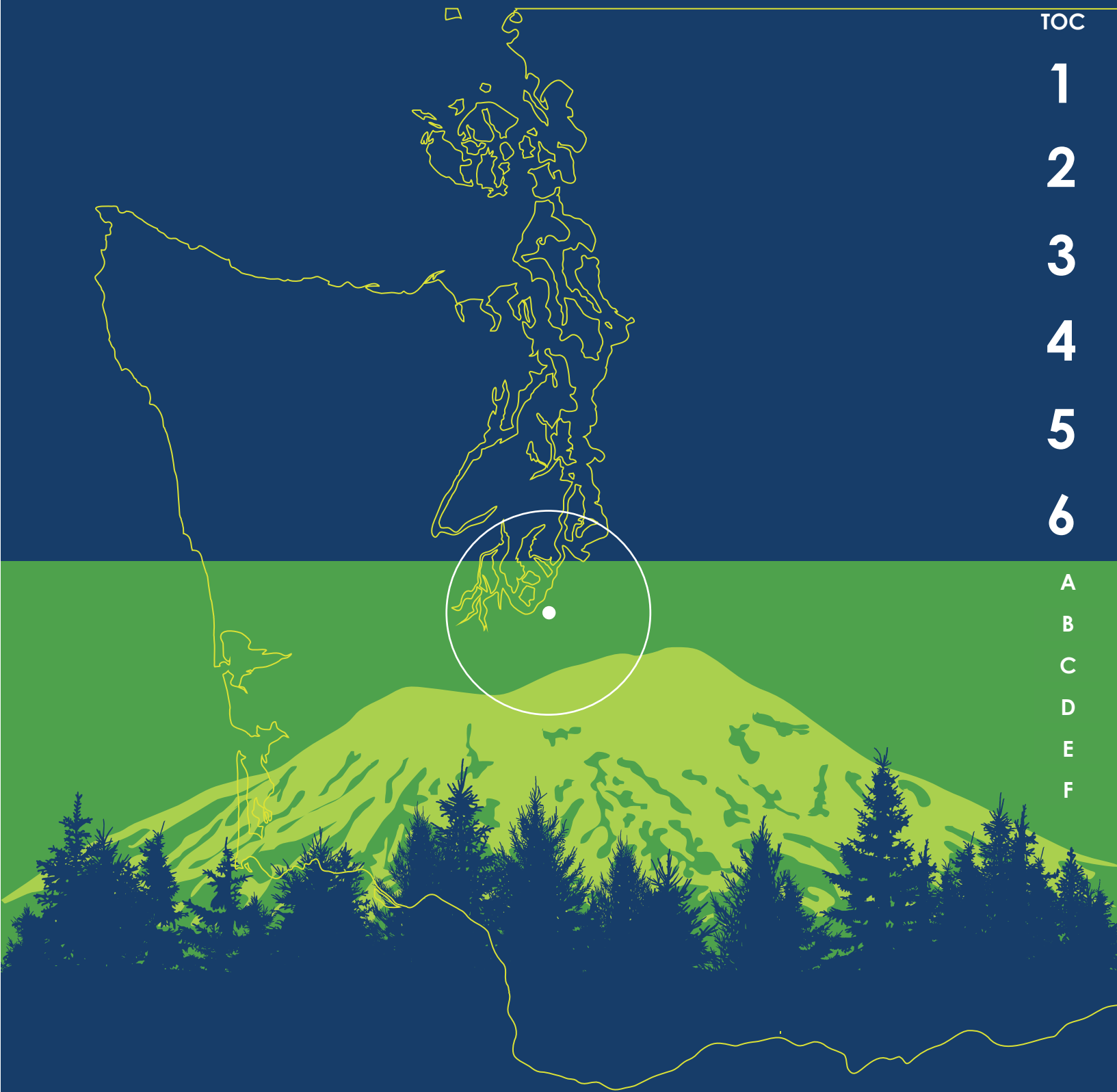
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Date	Location	Attendance	Objectives
Project Kickoff March 15, 2023	Lakewood City Hall, Lakewood, WA	22 in-person	<ul style="list-style-type: none">Introduce the project team and ensure workshop attendees understand the purpose and proposed approach for the project.Using FEMA's community lifelines, establish an approach for organizing the Resilience Task Force who will inform project deliverables and future resilience actions.Confirm the status of existing, in progress, and ongoing resilience planning efforts at JBLM and identify any information security requirements.
Workshop #1: Hazard ID and Screening June 8, 2023	Lakewood City Hall, Lakewood, WA	Hybrid: 21 in-person 5 virtual	<ul style="list-style-type: none">Build and strengthen relationships between partners.Support understanding of the JBLM MIRR project and its expected outcomes.Review the approach to defining the project study area and critical assets.Review the initial list of proposed priority hazards and threats for the project.Work collaboratively, in breakout sessions, to identify areas of concern and critical assets specific to each community lifeline.
Workshop #2: Asset & Asset Impact ID October 31, 2023	Lakewood City Hall, Lakewood, WA	Hybrid: 17 in-person 15 virtual	<ul style="list-style-type: none">Review community lifeline key takeaways learned from engagement efforts to date.Review asset criticality, bridge knowledge gaps, and discuss barriers to resilience and project ideas.
Workshop #3: Risk Review February 15, 2024	Virtual	34 virtual	<ul style="list-style-type: none">Display and validate the findings of the risk assessment to various South Sound stakeholders.Elicit preliminary asset-driven resilience project ideas from participants.
Workshop #4: Project Vetting April 20, 2024	Lakewood City Hall, Lakewood, WA	Hybrid: 12 in-person 4 virtual	<ul style="list-style-type: none">Present the resilience projects created to date.Refine the resilience projects and brainstorm additional resilience solutions.Review and validate JBLM and SSMCP's separate prioritization of these projects.Narrow the top-priority projects down to a list that will comprise the Resilience Action Plan.

Figure 3.4: Workshop Summaries



COMMUNITY LIFELINES AND CRITICAL ASSETS

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The Federal Emergency Management Agency (FEMA) has identified eight primary community lifelines representing the fundamental services in a community that, when stabilized, enable all other aspects of society to function. For the purposes of the JBLM MIRR, Natural Resources was created as an additional lifeline to account for the unique environmental considerations of the MIRR Study Area, such as critical habitat areas for endangered species and their impact on JBLM's training mission. Each lifeline is comprised of assets, services, and capabilities that serve the communities. These lifelines function as an integrated network that supports the needs of the community and enables all other aspects of society to function.

4.1 Community Lifelines

FEMA's eight primary lifelines and the additional Natural Resources lifeline are described in the following sections. Each lifeline contains multiple components that help define the general scope of services for that lifeline. The components are further divided into relevant subcomponents that provide a granular level of enabling functions for the delivery of services to a community.

Water Systems:
Groundwater, Water/
Wastewater Treatment Plants,
Distribution systems

Safety and Security:
Fire and Police Stations

Health and Medical:
Hospitals, Ambulatory
Services, Triage Locations

Hazardous Materials:
Railroads, Superfund Sites,
Landfills

Energy:
Hydroelectric Facilities,
Substations

Communications:
Dispatch Centers, Cellular
Towers

Transportation:
Evacuation Routes,
Installation Access

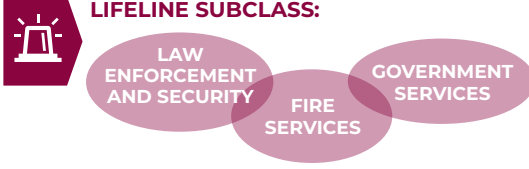
Food, Hydration and Shelter:
Community Housing,
Warming/Cooling Shelters,
Food Pantries



Natural Resources:
Critical Ecosystems (i.e., ESA-
listed species habitats)
Ecosystem Services (e.g.,
natural floodwater storage),
Tribal 'Usual and Accustomed'
Hunting and Fishing Areas,
Wildlife Refuges and
Nature Reserves, Parks
and Recreational Areas,
Agricultural Lands

For example, the Safety and Security Lifeline is further broken down into asset subcomponents such as police precincts, fire stations, emergency operations centers (EOCs), etc.

Safety and Security



The Safety and Security Lifeline involves responder and survivor safety as well as the continuity of government, including government functions, firefighting, and law enforcement, among others.

In the MIRR Study Area. The tribal nations, municipalities (e.g., cities and counties) and special districts that serve the communities of the South Sound Region primarily provide the general government services, including public safety and security services in the MIRR study area. The Thurston and

COMMUNITY LIFELINES AND CRITICAL ASSETS

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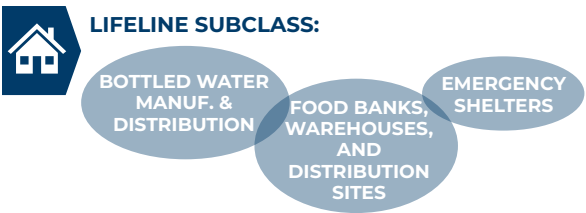
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Pierce County Sheriff's Offices and a range of city police departments provide local law enforcement services in the MIRR study area. Washington State Patrol (WSP) provides law enforcement support on I-5 and other state-owned roadways. Seven (7) fire districts provide fire services in the MIRR Study Area: Tacoma Fire Department, West Pierce Fire and Rescue (University Place, Lakewood), DuPont Fire Department, Steilacoom Public Safety, South Pierce Fire and Rescue (unincorporated Pierce County), Graham Fire and Rescue, and Central Pierce Fire and Rescue (Puyallup, Spanaway/Frederickson).

On the installation. The Fire and Emergency Services Division (FES) housed within the Directorate of Emergency Services (DES) is responsible for the fire emergency response program on the installation. The Provost Marshall (PM) apart of the DES performs law enforcement operations and is generally the first responder to emergencies on the installation. The 3rd Ordinance Battalion (EOD) is responsible for coordinating and conducting the response to known or potential explosive hazards on the installation.

Food, Hydration and Shelter



The Food, Hydration and Shelter Lifeline assesses traditional feeding and hydration services that are routinely paired with sheltering, as well as the agricultural infrastructure required to meet those needs. Drinking water systems, such as water supply, treatment, and distribution, are addressed under the Water Systems Lifeline.

In the MIRR Study Area. Access to food in the MIRR Study Srea is provided through a range of services including local grocery stores and markets and area restaurants. A key resource in the MIRR Study Area is the Emergency Food Network that serves as Pierce County's central storage and distribution center for emergency food programs. The American Red Cross provides emergency sheltering operations and support to both Pierce and Thurston Counties through its South Sound and Olympics Chapter; this chapter also oversees six additional counties. For the purposes of this study, the hydration facet of the lifeline will consist of plans, facilities, organizations, and vehicles necessary for delivering emergency water rations (bottled water) to communities.

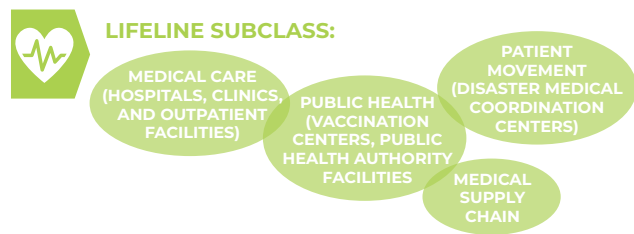
On the Installation. In the event of an emergency, the Directorate of Plans, Training, Aviation, Mobilization and Security (DPTAMS) is responsible for coordinating mass care operations such as designating sites for mass shelters, coordinating the provision of shelter support services with appropriate agencies, and conducting mass care registration services. DPTAMS is supported in this effort by the following divisions:

- The Directorate of Humans Resources (DHR) – responsible for activating and managing the Emergency Family Assistance Center (EFAC)
- Madigan Army Medical Center – responsible for conducting public health operations at mass care facilities
- 62nd Medical Squadron (PHA) – responsible for conducting public health operations at mass care facilities

Figure 4.1: Community Lifelines Assessed in this Study

COMMUNITY LIFELINES AND CRITICAL ASSETS

4.1.3 HEALTH AND MEDICAL



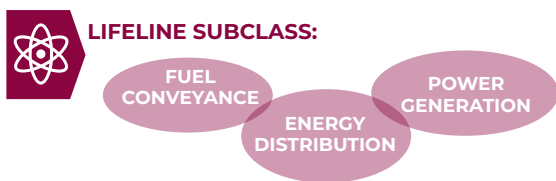
The Health and Medical Lifeline covers all aspects of medical services required during an emergency such as survivor care, fatality management, public health, and the medical supply chain.

In the MIRR Study Area. The local public health authorities serving the MIRR Study Area are the Thurston County Health and Social Services Department and the Tacoma-Pierce County Health Department. Both departments are governed by their respective Board of Health under state law. The highest rated trauma center within the MIRR study area is the Level-II MultiCare Good Samaritan Hospital in Puyallup; however, this Level-II status occasionally transfers to MultiCare Tacoma General Hospital when certain surgeons are assigned there. The closest Level-I facility is Harborview Medical Center in Seattle. Emergency healthcare coordination in the state of Washington is comprised of a system of disaster medical coordination centers (DMCCs) supported by the Northwest Healthcare Response Network (NWHRN). Portions of NWHRN's Central (King and Pierce Counties) and West (Grays Harbor, Lewis, Mason, Pacific, and Thurston Counties) Districts are contained within the MIRR study area. Forming the nucleus of this emergency coordination network, Harborview Medical Center in Seattle serves as the Washington Medical Coordination Center. Additionally, the West Region EMS and Trauma Care Council creates plans and conducts training in support of emergency

healthcare coordination for Pierce, Thurston, Grays Harbor, Lewis, and Pacific Counties.

On the Installation. Madigan Army Medical Center is the U.S. Army's second largest medical treatment facility and is one of only two designated Level II trauma centers in Army Medicine and one of four in the state of Washington. Madigan participates in a unique partnership with St. Joseph Medical Center and Tacoma General Hospital called the Tacoma Trauma Trust to provide care to non-beneficiary trauma victims beyond the gates of JBLM.

4.1.4 ENERGY



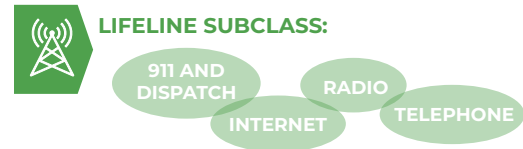
The Energy lifeline focuses on the infrastructure involved in the production and distribution of electricity and fuel to a community.

In the MIRR Study Area. The cornerstone of the electrical grid contained in the MIRR study area is comprised of infrastructure owned and operated by two primary electrical service utility providers: Tacoma Power (a subsidiary of Tacoma Public Utilities) and Puget Sound Energy (PSE). In some locations, the infrastructure within a municipal boundary is maintained by that municipality's public utility agency such as Lakeview Light and Power for the City of Lakewood. The Olympic Pipeline, owned by BP, delivers gasoline, diesel, and jet fuel to the City of Tacoma and Seattle-Tacoma International Airport from four refineries in the Puget Sound.

COMMUNITY LIFELINES AND CRITICAL ASSETS

On the Installation. The electrical infrastructure of the installation is managed and maintained by City Light and Power (CPL). The on-installation electrical grid sources its energy from infrastructure owned and operated by Tacoma Power. The installation receives natural gas from Puget Sound Energy (PSE) via the Williams Pipeline. Additionally, a tributary of the Olympic Pipeline provides jet fuel directly to the installation from a refinery in the Port of Tacoma.

4.1.5 COMMUNICATIONS



The Communications lifeline focuses on all the different types of communication needed to respond and help survivors during an emergency.

In the MIRR Study Area. The South Sound 911 (SS911) serves as the Public Safety Answering Point (PSAP) for Pierce County's and provides emergency communications support for 19 law enforcement agencies and 17 firefighting agencies. The PSAP for Thurston County is TCOMM 911 which provides countywide enhanced 911 through its emergency dispatch center which dispatches an appropriate level of response based on protocols provided by and agreed to by law enforcement, fire services, and Medic One. Capitol Peak, a 2,658-foot summit in Thurston County, is the site for multiple major cellular and radio facilities. Of these facilities, the Capitol Peak Radio Tower is a radio facility crucial for ensuring communications between local emergency management organizations (EMOs) and the Washington State Emergency Operations Center (EOC). Additionally, the newly installed Inter-RF Subsystem Interface (ISSI) provides radio interoperability between

Thurston County, Pierce County, and the installation.

On the Installation. The Network Enterprise Center (NEC) provides fixed voice telecommunications to the installation, network enterprise data and voice on both the non-classified and secret internet protocol router networks, and land mobile radio (LMR) communications support to the installation EOC and local agencies. Furthermore, the NEC is responsible for the operation and maintenance for the installation's communication infrastructure.

4.1.6 TRANSPORTATION



The Transportation Lifeline covers all forms of transportation necessary for moving resources and people to enable continuous operation of JBLM, critical business and government functions and is essential to human health and safety.

In the MIRR Study Area. Automotive transportation infrastructure in the MIRR study area can be summarized through three major roadway groupings: interstate highways, state routes, and arterials.

- Interstate highways:** Interstate 5 (I-5) is the only interstate highway within the MIRR Study Area and a major thoroughfare of the coastal, western U.S., running north-south from Canada to Mexico. I-5 has approximately 9 interchanges that provide access to and from the base along the 11 miles the two share a border.
- State Routes:** State Route 12 (SR-12) provides an east-west connection

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between the base and communities to the east such as Puyallup. SR-7 runs north-south from Tacoma down along the eastern border of the base through Spanaway before it splits. From this split, SR-507 runs southwest through a portion of the base to Roy and Yelm. Running northwest from Yelm along the border of the base, SR 510 bisects the Nisqually Reservation before emptying into I-5 in Tanglewilde-Thompson Place, a neighborhood of Olympia.

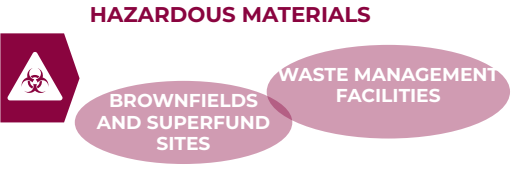
- **Arterials:** A large network of principal and minor arterials exists connecting I-5 and the state routes with the surrounding communities. This system is often used to bypass impacts on I-5, making it crucial for congestion relief in the region. One principal arterial of particular importance is Steilacoom-DuPont Road SW, as it connects the municipalities of Steilacoom and DuPont directly to the DuPont and Integrity gates of the base.

Key port facilities associated with the MIRR study area include the Port of Tacoma and Port of Olympia. Managed by The Northwest Seaport Alliance, the Port of Tacoma is a naturally deepwater port located on Commencement Bay in the south Puget Sound. With 2,500 acres of port-owned property, including several major container terminals, the Port of Tacoma is one of the largest container ports in the U.S. The Port of Olympia is a key economic partner in the South Puget Sound region and includes both marine facilities as well as the Olympia Regional Airport. Active rail lines associated with the MIRR study area include the BNSF Railway, Tacoma Rail Capital/Tidelands Division, and Union Pacific Railroad. Public transportation in the MIRR study area is handled by Pierce Transit and Intercity Transit for Pierce County and

Thurston County, respectively. The closest major regional airport is the Seattle-Tacoma International Airport.

On the Installation. The installation uses a rail track operated by the Burlington Northern and Santa Fe Railway (BNSF) that runs through the center of the base to transport equipment, especially between itself and the Port of Tacoma.

4.1.7 HAZARDOUS MATERIALS



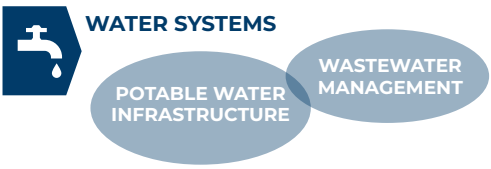
The Hazardous Materials Lifeline involves the management, containment, and removal of all hazardous substances.

In the MIRR Study Area. Both Pierce and Thurston Counties have active Local Emergency Planning Councils/Committees (LEPCs) that are responsible for the development of their respective county's Hazardous Materials Emergency Response Plans and the inventory of Tier Two reports from facilities that have a certain amount of hazardous chemical. According to the 2018 Pierce County ESF #10—Oil and Hazardous Materials Response Annex, the JBLM Fire and Emergency Services (DES FES) Hazardous Materials Team (HAZMAT 105) are one of the lead agencies for oil and hazardous response efforts in the county.

On the Installation. According to the installation's Comprehensive Emergency Management Plan, the Directorate of Public Works (DPW) and DES FES are the primary agencies for responding to hazardous materials incidents on the installation.

COMMUNITY LIFELINES AND CRITICAL ASSETS

4.1.8 WATER SYSTEMS



The Water Systems lifeline assesses the natural resources and infrastructure needed to produce and deliver potable water for consumption as well those needed to treat and return used water.

In the MIRR Study Area. The management of water systems within Thurston County is consolidated under the direction of the Thurston Public Utility District apart of the Washington Public Utility Districts Association. Conversely, the management of water systems within Pierce County is conducted by individual municipalities and larger public utility providers such as Tacoma Public Utilities. A robust system of levees and revetments exists along the Puyallup River system, notably the lower 10 miles of the river before it empties into the Port of Tacoma. Two major hydroelectric dams exist on the upper reaches of the Nisqually River that also function in a flood control capacity.

On the Installation. American Water owns and operates the on-base water collection, storage, treatment, and discharge systems. The Directorate of Public Works (DPW) is responsible for the maintenance of the potable water, wastewater, and sewer systems on the installation. Water is sourced from the Sequelitchew Spring and seven secondary groundwater sources that underlie the base and are part of a larger network of aquifers that extend outside the fence line.

4.1.9 NATURAL RESOURCES



The Natural Resources lifeline assesses the region's natural ecosystems and ecosystem services through the inventory of areas designated for preservation (e.g., parks, nature preserves), areas known to contain ESA-listed flora and fauna, tribal 'usual and accustomed' hunting and fishing areas, and assets required for effective resource management (e.g., wildfire fuel reduction, invasive species removal).

In the MIRR Study Area. The MIRR study area is located in an ecoregion known as the Puget Sound Lowlands characterized by forest, riverine and wetland, and meadowland habitats. The two major watersheds within the MIRR study area are those of the Puyallup and Nisqually rivers. The entire western edge of the MIRR study area is formed by the Puget Sound. Natural resources provide an array of ecosystem services, including certain hazard mitigation measures. An example of a prominent ecosystem service asset within the MIRR study area is the riparian areas along the Nisqually River. Almost 80% of the river's riparian areas are under permanent protection, ensuring the watershed's ability to provide reliable drinking water for 80% of Olympia's residents, and offering flood reduction for the communities of Ashford, Mineral, Elbe, Eatonville, Yelm, Roy, McKenna, and the Nisqually Tribe. The meadowlands of the Puget Sound Lowlands support the four subspecies of the Mazama Pocket Gopher, the Taylor's Checkerspot Butterfly, Oregon Vesper Sparrow, and the Streak Horned Lark.

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On the Installation. As part of the Army Compatible Use Buffer (ACUB) program with support from the Sentinel Landscapes Program, JBLM is currently working to sustain mission readiness by restoring habitat of the Southern Puget Sound lowlands. To date, the installation has enrolled 5,667 acres of prairie land in the ACUB program (609 acres of which are agricultural lands with NRCS conservation easements), performed invasive species removal and controlled burns, and established native flora and fauna re-introduction programs. By providing and restoring sensitive habitat that support ESA-listed species, the base is working to ensure such species continue to have accessible habitat beyond the fence line to reduce on-base encroachment issues and impacts to training and exercises. The Directorate of Public Work’s Forestry Division is responsible for the management of fuels within the forest and grass lands that exist within the installation.

4.2 Lifeline Distribution

Some assets are readily found within the Primary Study Area, a 5-mile-radius around the JBLM perimeter, and are more “local” in nature where close proximity to the installation increases the likelihood of mutual dependencies. Other critical assets may be located along a “linear” network that further extends geographically, or at distant singular “nodes” that may serve a wider geographic area than local assets. A linear asset is defined by length and often maintained in segments, such as a highway or water main, whereas local and nodal assets are typically defined as singular points. This approach is presented in Table 1: Community Lifeline Distribution.

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Regarding Community Lifelines and determining the MIRR study area, the next step is to identify which lifelines serve both JBLM and the adjacent communities. For example, what is JBLM reliant upon that is provided by an off-base entity (e.g., electricity) and where does that service source reside (e.g., hydropower dam in Cedar Falls). A preliminary list of known priority assets will be shared with communities and JBLM to document the services that are provided by the communities and support JBLM.

4.3 Asset Identification

The first step to estimating risk for the South Sound Region was to identify critical assets that hazards could impact. For the purposes of this project, a critical asset was defined as an asset that could lead to the loss of life, serious injury, health impacts, deterioration in quality of life, or threatened safety within the community if it were no longer operational. Using FEMA’s Community Lifelines Framework to inform the nature of assets to search for, nearly 7,600 assets were initially collected from the State of Washington, Pierce, and Thurston County databases, as well as various other publicly available datasets. This initial asset list was refined based on the MIRR study area perimeter, participant feedback received from Workshop #1, the GIS Web Viewer application, and lifeline interviews, resulting in approximately 550 assets. Survey respondents alone provided a list of 171 assets that were then screened to identify duplicates. Asset criticality was then re-evaluated during Workshop #2 after which SSMCP staff and Military Installation Representatives reviewed and refined the resulting asset list. As a result of this review, a final list of 82 assets were taken forward for the risk assessment.

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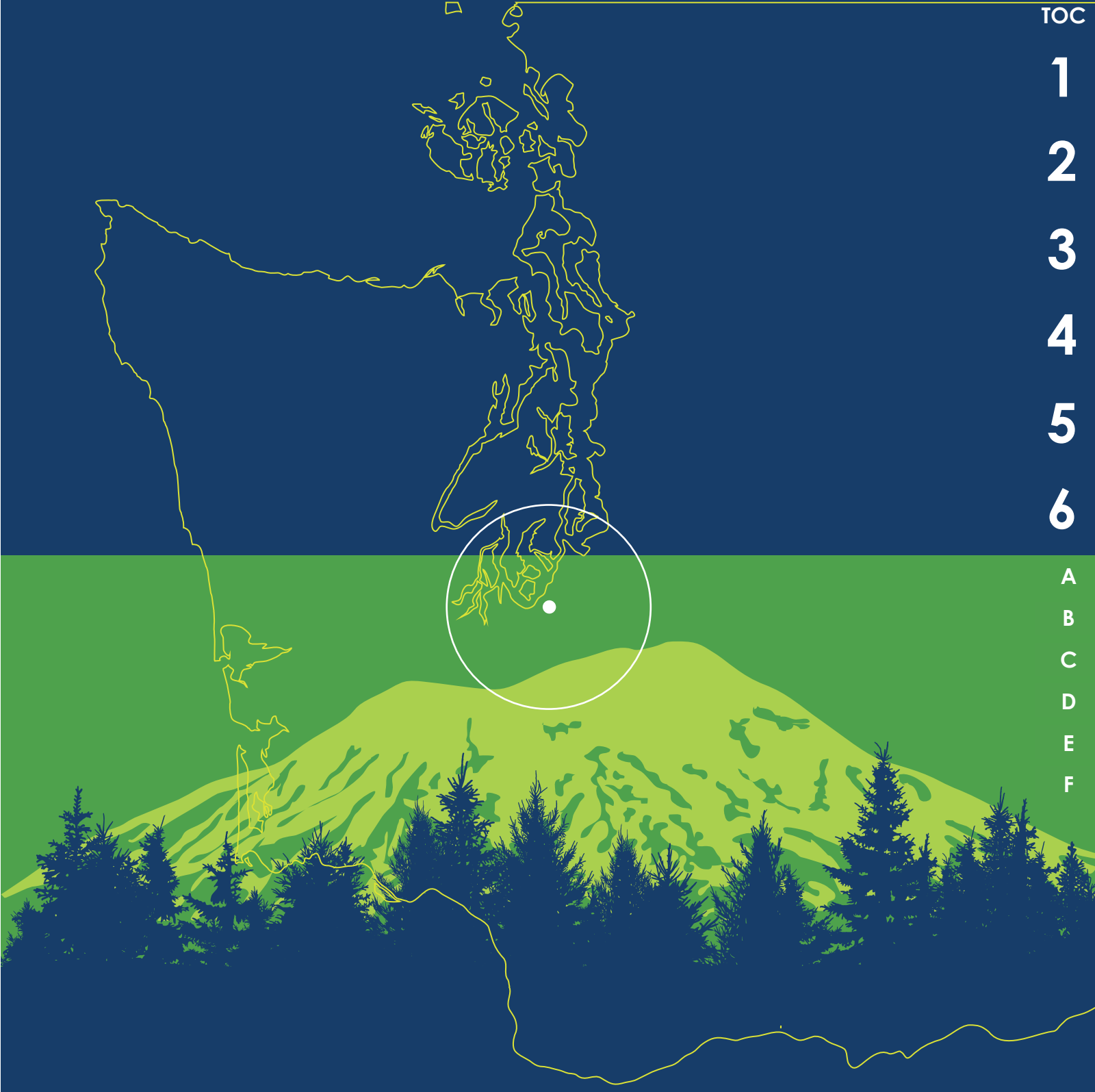
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The risk assessment is one of the most crucial phases of an MIRR because it identifies the vulnerabilities of key assets and facilitates the creation of resilience actions that can be developed into projects. Following the validation of the final asset list, the risk assessment of the JBLM MIRR was conducted from December 2023 to February 2024. *Advancing Resilience for Defense Communities: A Planning Framework* establishes six (6) steps for conducting the assessment:

- 1. **Identifying Assets and Services for the Assessment:** This process for the JBLM MIRR is described in Section 4.3.
- 2. **Determining Hazards or Climate Events:** This process for the JBLM MIRR is described in Section 5.1.
- 3. **Assessing Exposure of Assets and Services:** This process for the JBLM MIRR is described in the “Exposure” paragraph contained within each hazard profile under Section 5.5.
- 4. **Determining Hazard Probability or Likelihood:** This process for the JBLM MIRR is described in the “Likelihood” paragraph contained within each hazard profile under Section 5.5.
- 5. **Assessing Consequence of Hazard Occurrence on Assets and Services:** This process for the JBLM MIRR is described in the “Consequences and Impact” paragraph contained within each hazard profile under Section 5.5.
- 6. **Determining Risks of Asset and Service Exposure:** The risks for each asset were quantified using the equation described in Section 5.1. The results of the risk assessment conducted for the JBLM MIRR are explained in Section 5.6.

5.1 Hazard Identification

A hazard is any adverse event that has the potential to impact the functionality and/or structure of an asset. The MIRR takes a multi-hazard approach to addressing resilience in the local defense community with a focus on a set of priority hazards. These hazards were selected through an iterative process that included:

- **Draft List of Hazards** – Based on a review of jurisdictional hazard mitigation plans, other relevant planning documents, and existing hazard data sets for the MIRR study area, an initial list of 22 natural and manmade hazards was compiled. This list was then narrowed down to 12 hazards once the client determined that all manmade hazards, except for transportation impacts, were outside the project scope and the project team determined that some natural hazards were unlikely for the MIRR study area. This list of 12 hazards was presented for consideration by the SSMCP Resilience Task Force during Workshop #1.
- **Hazard Prioritization** – Following Workshop #1, a web-based prioritization survey was distributed to the Resilience Task Force that asked participants to rate the risk level for each hazard on a scale of 1-5 (1 being lowest and 5 being highest risk). Risk was further defined as the product of a hazard’s rate of recurrence and amount of destruction per occurrence. Fifteen individual responses were received.
- **List of Priority Hazards** – The culmination of data and documentation review and Resilience Task Force feedback produced a final list of eight priority hazards for the MIRR focus. Tsunamis, volcanic

Initial Hazards List
Coastal Flooding and Sea Level Rise
Inland Flooding (Riverine and Pluvial)
Atmospheric Rivers and Extreme Precipitation
Drought
Tsunamis
Volcanic Activity
Infectious Disease Outbreak
Extreme Cold and Freeze Events
Extreme Heat and Heat Waves
Severe Winter Weather (Windstorms, Snowstorms, and Freezing Rain)
Wildfire
Earthquake and Seismic Activity
Landslide, Debris Flows, and Erosion
Traffic and Transportation Hazards
Terrorism and Malevolent Attacks
External Acts of Aggression
Aquifer Contamination
Dam and Levee Failure
Power Grid Failure
Supply Chain Failure
Hazardous Material or Chemical Releases
Labor Strikes

Figure 5.1: Initial Hazards List

activity, and wildfires were removed from this list because none of the assets identified in the MIRR study were exposed to these hazards. Infectious disease outbreak and transportation hazards were removed due to an overall lack of data. This is not an indication that the omitted hazards are not present in, nor of high consequence to the JBLM Defense Community, but an effort to focus planning resources on hazards of greatest shared concern with JBLM.

See Figure 5.1 for the initial list of 22 hazards and Figure 5.2 for the final list of eight hazards.

Final Hazards List
Sea Level Rise
Inland Flooding (Riverine) of Nisqually & Puyallup
Extreme Precipitation
Earthquake and Seismic Activities
Landslide, Debris Flows, and Erosion
Heatwaves
Severe Winter Weather (Windstorms, Snowstorms, and Freezing Rain)

Figure 5.2: Final Hazards List

5.2 Exposure Analysis

An exposure analysis was conducted to determine the potential interaction of each hazard with each critical asset. The exposure analysis pairs hazard data with the locations of the critical assets and allows our team to determine if each asset would be exposed to each hazard. For each asset, only the hazards which geographically impact the asset were taken forward into the consequence scoring exercise.

It is possible to determine if a hazard geographically impacts an asset for hazards that vary spatially within the MIRR study area. The hazards that were included in the exposure analysis and the criteria for whether an asset was considered exposed or not are outlined below.

Given the nature of most atmospheric hazards and select others, these hazards were not included in the exposure analysis. For these hazards, all assets were considered equally exposed to the hazard. The following hazards were not included in the exposure analysis: extreme precipitation, heat waves, and severe winter weather (windstorm, snowstorms, freezing rain).

5.3 Hazard Likelihood Scoring

The natural hazards assessed during the risk assessment are grouped into one of two categories: chronic and acute.

Chronic hazards are those that gradually impact assets over a longer period (e.g., years to decades) or occur regularly on an annual basis, compared to short-term, acute hazards (e.g., hours to days) that occur once every few years, or more rarely. To address chronic hazards, it is important to consider how these events will change in the future because they can have significant impacts on assets and

people over time. Instead of looking at the probability of occurrence of a hazard event, relative changes in frequency compared to the baseline period are used to evaluate chronic hazard likelihoods (Figure 5.3).

Acute hazards are those that impact assets over a relatively short period (e.g., hours to days) compared to chronic hazards (e.g., years to decades). Since acute hazards occur less frequently (rarer) than chronic hazards, the hazard likelihood is evaluated based on the annual exceedance probability (Figure 5.4).

Hazard likelihoods were estimated for the baseline period (1981-2010), as well as the mid-century (2041-2070) and the end of the century (2071-2100) using data from climate projections and other resources. This approach provides a more comprehensive estimate of the changing likelihood of various hazards in the future and covers a sufficient period of time to allow for capital planning timelines and large infrastructure renewal.

Hazard likelihoods are quantified based on an 'Indicator' parameter. Indicator thresholds are defined for each hazard to identify when assets are likely to be impacted. The annual probability of an indicator exceeding the threshold is referred to as the Annual Exceedance Probability (AEP), which is used to estimate climate hazard likelihood in the risk assessment. As noted above, we consider the relative change in annual exceedance probability (or frequency) for chronic hazards, and the absolute annual exceedance probability for acute hazards.

Earthquakes underwent a distinct likelihood scoring rubric due to their unique characteristics and potential impacts on the project. For a detailed explanation, refer to Appendix C which outlines the specific criteria and scoring used for

Score	Change in Event Frequency/ Intensity	Qualitative Descriptor
1	>50% decrease compared to baseline	Likely to occur much less frequently than current climate
2	10-50% decrease compared to baseline	Likely to occur slightly less frequently than current climate
3	Within +/-10% compared to baseline	Likely to occur about as frequently as in the current climate
4	10-50% increase compared to baseline	Likely to occur slightly more frequently than current climate
5	>50% increase compared to baseline	Likely to occur much more frequently than current climate

Figure 5.3: Climate hazard likelihood scores for Chronic Hazards

Likelihood Score	Descriptor	Annual Recurrence Interval	Annual Exceedance Probability (AEP)
1	Rare	Greater than 1:100 years	0-1%
2	Unlikely	1:20 to 1:100 years	1-5%
3	Possible	1:6.5 to 1:20 years	5-15%
4	Likely	1:2 to 1:6.5 years	15-50%
5	Almost Certain	Less than 1:2 years	50-100%

Figure 5.4: Climate hazard likelihood scores for Acute Hazards

assessing earthquake risks. This approach ensures a more accurate representation of the probability and severity of seismic events relative to other climate hazards. The following subsections outline the hazards addressed in this study and provide a rationale for the assigned likelihood scores.

5.4 Consequence Scoring

Risk to an asset is a function of the consequences that would result if that asset were (negatively) impacted by a particular hazard. More specifically, consequences characterize the degree of severity of the outcome. Impact statements are used to constrain the consequence scoring exercise, by providing a description of the way in which an asset is likely to be affected by a particular hazard. Consequence scores were assigned for each combination of critical asset and hazard from 'none' to 'catastrophic' (Figure 5.5).

Impact statements and consequence scores for each asset/hazard combination were initially developed by Stantec risk assessors, followed by review and modifications by the relevant asset owners or other knowledgeable community members. The statements consist of concise 1-2 sentence descriptions of the likely outcome if a specific asset were exposed to a specific hazard.

Refer to Appendix C for a profile of each hazard containing its description as well as the results of its exposure analysis, likelihood scoring, and consequence scoring.

Score	Class	Consequence Description
0	Very low	<ul style="list-style-type: none">• No effects
1	Low	<ul style="list-style-type: none">• Measurable but cosmetic effects• Costs handled within normal budgeting for entity• Correctable using operations and maintenance practices
2	Minor	<ul style="list-style-type: none">• Some extra costs to repair but can be covered within current operations and capital budgets• Routine operations for minor incidents; community and assets have capacity to meet demand• Asset or service is still operable and accessible, although minor service disruption may be possible• Slightly reduced ability to perform scheduled maintenance
3	Moderate	<ul style="list-style-type: none">• Manageable asset or service damage but repair costs may be beyond current operations and maintenance and capital budgets• Asset or service still operable but some access limited• Brief service disruption may be possible; asset design capacity being reached
4	Major	<ul style="list-style-type: none">• Heavy burden on internal resources of the entity to repair or service assets• Significant threat to installation mission critical readiness• Asset or service still operable but accessibility limited• Lengthy service disruption; assets or services operating below capacity for lengthy periods of time
5	Catastrophic	<ul style="list-style-type: none">• Loss of life, property, mobility, access to emergency services, or power• Loss of installation mission critical readiness• Complete asset or service replacement due to hazard severity• Need for outside emergency funding (FEMA disaster declaration)• Significant service disruptions may be possible, requiring alternate service delivery• No access to assets

5.5 Risk Calculating

The project team applied the exposure, likelihood, and consequence data determined for each hazard to each critical asset creating an asset-hazard interaction. A risk score was developed for each hazard-asset interaction by multiplying the consequence and likelihood scores, following the equation:

Risk Score = Exposure x Likelihood Score x Consequence Score

Exposure Score – A binary categorization to distinguish assets located either within or outside of a mapped hazard area. Certain hazards, such as storms and extreme precipitation events, do not have defined hazard boundaries. In these cases, uniform exposure over the planning area was assumed.

Likelihood Score – An estimate of the probability of occurrence of a particular hazard.

Consequence Score – Semi-quantitative estimates that characterize the severity of the impact if a particular asset were impacted by a hazard.

To account for a changing climate, risks were evaluated for three separate time periods: the Baseline (1981-2010), Mid-Century (2041-2070) and End of Century (2071-2100). The condition of assets into the future is assumed to be well maintained and thus will provide a similar level of resilience to hazards (i.e., consequences do not change with time). The risk matrix classification applied is shown in Table 5.5, which includes Low, Medium, High, Shock (high consequence/ low likelihood) and Stress (low consequence/ high likelihood) classes.

Consequence	Catastrophic	5	5 (Shock)	10	15	20	25
	Major	4	4	8	12	16	20
	Moderate	3	3	6	9	12	15
	Minor	2	2	4	6	8	10
	Insignificant	1	1	2	3	4	5 (Stress)
		1	2	3	4	5	
		Rare	Unlikely	Possible	Likely	Almost Certain	
		Likelihood					
Risk Levels:		Shock/Stress	Low	Medium	High		

Figure 5.5: Risk Matrix Classification

5.6 Risk Assessment Results

The risk assessment assessed the 82 assets' exposure to eight hazards, known as asset-hazard interactions. The risk was evaluated over three timeframes resulting in 1,968 unique risks scores. Figure 5.6 (appearing on pgs. 38-43) illustrates all 1,968 risk scores, with the assets grouped by lifeline on the left and the hazards along the top, subdivided for the three timelines. Blank space within the scorecard shows a significant portion of the asset-hazard interactions did not result in a risk score. This is because the asset was not exposed to the hazard. It is clear from this view that earthquakes, storms, extreme precipitation and heatwaves have widespread impacts across the portfolio. Similarly, the Transportation lifeline is the most exposed.

To synthesize and make sense of the 1,968 risk scores, the data can be grouped or dissected in a variety of ways. The following subsections present insights and key takeaways for the risk assessment. For example, by grouping data by lifeline or hazard, risk scores can be aggregated in many ways. Two indicators used in the following subsection are: (1) the sum of the risk scores, and (2) the average of risk scores in each subset of data. The difference between these two indicators is that the average risk score is agnostic of the number of asset-hazard interactions; whereas a high sum of risk scores may indicate that risks are widespread across many assets.

Figure 5.5: Consequence Classification Criteria

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		Landslides, Debris Flow and Erosion			Earthquakes and Seismic Activities		
Lifeline	Proposed Asset	BL	MC	EC	BL	MC	EC
Water Systems	American Lake Dam				20	20	20
	American Lake Gardens Tank Storage Facility				12	12	12
	City of Sumner Wastewater Treatment Plant				16	16	16
	Hawks Prairie Reservoirs, Wellfield and Water Treatment Facility				16	16	16
	Intertie from JBLM to DuPont				20	20	20
	Mud Mountain Dam				20	20	20
	North Fork Clover Creek E1 Det Basin	25	25	25	20	20	20
	North Fork Clover Creek W1 Det Facility	25	25	25	20	20	20
	Philip Storage Facility	20	20	20	16	16	16
	Water Transmission Line between American Lake Gardens and Ponders Wellsite				16	16	16
Transportation	ADA Shuttle Service				12	12	12
	Burlington Northern Santa Fe Rail Line – Running through Base	15	15	15	12	12	12
	Interstate 5	25	25	25	20	20	20
	Nisqually Road / Old Pacific Highway	20	20	20	16	16	16
	Pierce County Central Maintenance Facility (CMF)				16	16	16
	Port of Olympia				12	12	12
	Port of Tacoma				12	12	12
	Seattle-Tacoma International Airport				20	20	20
	SR - 016	20	20	20	16	16	16
	SR - 512	20	20	20	16	16	16
	SR-507	15	15	15	16	16	16
	SR-510				16	16	16
	SR-7	15	15	15	12	12	12
	Thurston County Public Works Facility				16	16	16
	US - 101				20	20	20
Energy	Alder Dam	25	25	25	20	20	20
	LaGrande Dam				20	20	20
	Olympic Petroleum Pipeline	20	20	20	16	16	16
	US Oil Refinery 8" Jet Fuel Pipeline	20	20	20	16	16	16
	US Oil Refinery Facility and Tanks				16	16	16
Communications	8th & Fir Radio Site				16	16	16

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Storms (windstorms, snowstorms, freezing rain)			Sea Level Rise			Extreme Precipitation			Inland Flooding (Riverine) - Nisqually			Inland Flooding (Riverine) - Puyallup			Heatwaves		
BL	MC	EC	BL	MC	EC	BL	MC	EC	BL	MC	EC	BL	MC	EC	BL	MC	EC
						9	12	15									
5	5	5				12	16	20				6	9	12			
						9	12	15									
						9	12	15									
						9	12	15	10	15	15						
10	10	10				6	8	10							3	4	5
15	15	15	9	15	15	6	8	10	4	6	6	4	6	8	6	8	10
25	25	25	12	20	20	12	16	20	10	15	15	10	15	20	6	8	10
25	25	25				12	16	20	10	15	15				6	8	10
25	25	25				9	12	15							3	4	5
10	10	10		15	15	3	4	5							6	8	10
10	10	10			15	3	4	5							6	8	10
15	15	15				9	12	15							6	8	10
25	25	25	9	15	15	12	16	20	8	12	12				6	8	10
25	25	25				12	16	20	8	12	12	8	12	16	6	8	10
25	25	25				12	16	20	6	9	9				6	8	10
25	25	25				12	16	20	10	15	15				6	8	10
20	20	20				9	12	15	6	9	9				6	8	10
5	5	5				9	12	15							6	8	10
25	25	25	9	15	15	12	16	20	8	12	12				6	8	10
						9	12	15	10	15	15						
						9	12	15	10	15	15						
			9	15	15				2	3	3	2	3	4	6	8	10
			9	15	15				2	3	3	2	3	4	6	8	10
15	15	15			10										6	8	10
15	15	15													3	4	5

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Landslides, Debris Flow and Erosion					Earthquakes and Seismic Activities		
Lifeline	Proposed Asset	BL	MC	EC	BL	MC	EC
	Capital Peak Radio Tower				16	16	16
	Cellular Antennas on Lakewood Water District Water Tanks	15	15	15	16	16	16
	Crawford Mountain Radio Site				16	16	16
	Pierce County Alert				16	16	16
	South Sound 911 Dispatch Center				12	12	12
	TCOMM 911 Dispatch Center				16	16	16
	TEC Backup Center				8	8	8
	Thurston Community Alert / Public Safety Answering Point				16	16	16
	WA EMD Control PT				16	16	16
Safety and Security	Central Pierce Fire and Rescue				12	12	12
	City of Lacey City Hall				20	20	20
	DuPont Fire				12	12	12
	DuPont Police Department Precinct				12	12	12
	Lakewood Police Department Precinct				12	12	12
	Olympia City Hall/ Police Station				12	12	12
	Pierce County Emergency Management Headquarters				12	12	12
	Pierce County Sheriff Department - Headquarters				12	12	12
	Pierce County Sheriff Department - Parkland Substation	5	5	5	12	12	12
	Pierce County Sheriff Department - South Hill Precinct				12	12	12
	South Pierce Fire and Rescue				12	12	12
	Steilacoom Police Department Precinct				12	12	12
	Tacoma Police Headquarters				12	12	12
	Thurston County Courthouse & Sheriff's Office				12	12	12
	Thurston County Emergency Coordination Center				12	12	12
	West Pierce Fire and Rescue				12	12	12
	WSP District 1 Headquarters				12	12	12
	Yelm Police Department				12	12	12
	Health and Medical	Blood Works Northwest				16	16
Cascade Blood Center					16	16	16
Central Pierce Ambulatory Services					8	8	8
Franciscan Health St Joseph Medical Center					12	12	12

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Storms (windstorms, snow- storms, freezing rain)			Sea Level Rise			Extreme Precipitation			Inland Flooding (Riverine) - Nisqually			Inland Flooding (Riverine) - Puyallup			Heatwaves		
BL	MC	EC	BL	MC	EC	BL	MC	EC	BL	MC	EC	BL	MC	EC	BL	MC	EC
15	15	15													3	4	5
15	15	15															
15	15	15													3	4	5
15	15	15													3	4	5
15	15	15													3	4	5
20	20	20													3	4	5
10	10	10															
15	15	15															
15	15	15															
15	15	15			10	6	8	10							6	8	10
15	15	15				6	8	10							6	8	10
15	15	15				6	8	10							6	8	10
15	15	15				6	8	10							6	8	10
15	15	15				6	8	10							6	8	10
15	15	15				6	8	10							6	8	10
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15	15	15				6	8	10							6	8	10
15	15	15				6	8	10							6	8	10
10	10	10	3	4	5										6	8	10
10	10	10	3	4	5										6	8	10
5	5	5	6	8	10										6	8	10
5	5	5	9	12	15										6	8	10

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		Landslides, Debris Flow and Erosion			Earthquakes and Seismic Activities		
Lifeline	Proposed Asset	BL	MC	EC	BL	MC	EC
	Franciscan Health St. Clare Hospital				20	20	20
	MultiCare Good Samaritan Hospital	25	25	25	20	20	20
	MultiCare Mary Bridge Children's Hospital and Health Center				20	20	20
	MultiCare Tacoma General Hospital				16	16	16
	Olympia Blood Center				16	16	16
	Providence St. Peter Hospital				20	20	20
	West Pierce Fire Ambulatory Service				8	8	8
	Western State Hospital				16	16	16
Food, Hydration, and Shelter	Emergency Food Network Warehouse				20	20	20
	Niagara Bottling Co. Facility in Puyallup				12	12	12
Natural Resources	Center For Natural Lands Management Nursery				8	8	8
	Oregon vesper sparrow						
	Regional Aquifers				4	4	4
	Roy prairie pocket gopher (Mazama species)						
	Streaked horned lark recovery (2)						
	Taylor's Checkerspot butterfly (1)						
	Upland Prairie	15	15	15			
	West Rocky Prairie, Violet Prairie, and Scatter Creek Wildlife Areas (DFW)						
	Wildlife Refuge - Billy Frank Jr. Nisqually National Wildlife Refuge	20	20	20			
	Yelm pocket gopher (Mazama species)						

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Storms (windstorms, snowstorms, freezing rain)			Sea Level Rise			Extreme Precipitation			Inland Flooding (Riverine) - Nisqually			Inland Flooding (Riverine) - Puyallup			Heatwaves		
BL	MC	EC	BL	MC	EC	BL	MC	EC	BL	MC	EC	BL	MC	EC	BL	MC	EC
5	5	5				9	12	15							6	8	10
15	15	15				9	12	15							6	8	10
5	5	5				9	12	15							6	8	10
5	5	5				9	12	15							6	8	10
10	10	10				3	4	5							6	8	10
15	15	15				9	12	15							6	8	10
5	5	5				6	8	10							6	8	10
5	5	5				9	12	15							6	8	10
10	10	10				6	8	10							3	4	5
5	5	5				6	8	10							3	4	5
15	15	15													6	8	10
10	10	10				6	8	10							6	8	10
						3	4	5									
10	10	10				6	8	10							6	8	10
10	10	10				6	8	10							6	8	10
10	10	10				6	8	10	2	3	3				6	8	10
10	10	10				6	8	10	2	3	3				6	8	10
10	10	10				6	8	10	2	3	3				6	8	10
10	10	10	6	10	10	6	8	10	2	3	3				6	8	10
10	10	10				6	8	10							6	8	10

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RISKS BY COMMUNITY LIFELINE

The sum of risk scores and average risk scores for each lifeline are presented in Figure 5.7. The lifeline with the highest risk is Transportation, followed by Safety, Security, Health and Medical. For average risk, the Water Systems lifeline had the highest average risk score followed by Transportation and Energy. Transportation ranks highly for both indicators for two key reasons. First, there are numerous (15) assets in the lifeline. Second, there is a high level of exposure across the eight hazards. Of the 120 possible asset-hazard interactions within the Transportation lifeline, 70% of these result in a risk, almost all of which are high or medium (see Figure 5.8). In comparison, across all assets evaluated in the risk assessment, the proportion of high and medium risk is only 44%.

Sum of Risk vs Average Risk by Lifeline

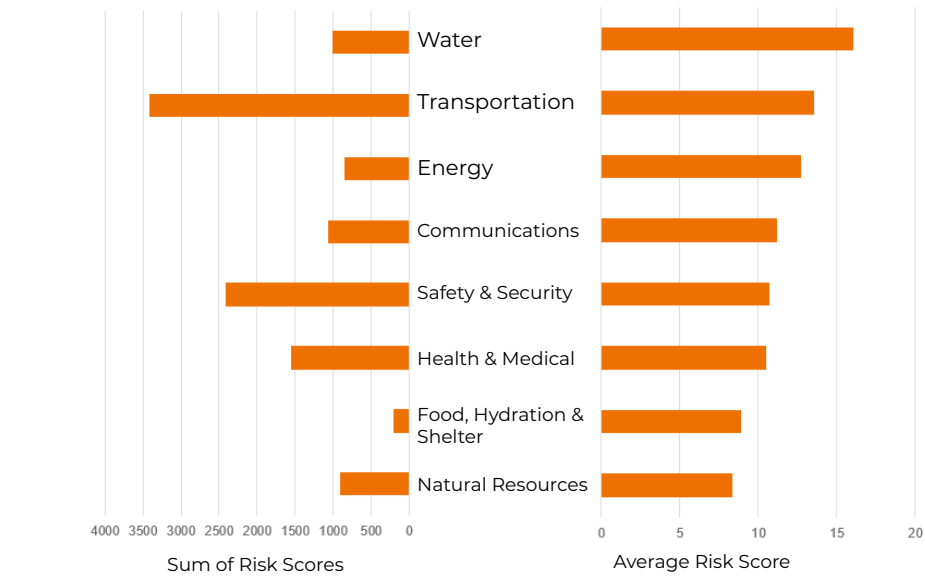


Figure 5.7: Sum of risk and average risk by lifeline

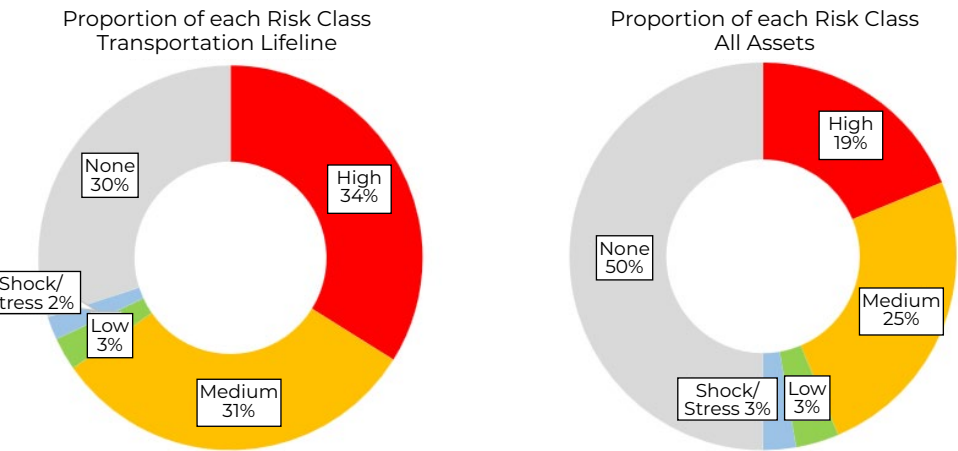


Figure 5.8: Proportion of each risk class for the Transportation lifeline (left) and all assets (right)

RISKS BY HAZARD

Some hazards were more impactful than others. Figure 5.9 presents information on the average and sum of risk scores per hazard. The values are also broken down by timeframe to show the evolution of the risk until end of century. Earthquakes and storms rank highly for both indicators. More than half of the evaluated risks driven by storms are high and 20% are medium (see Figure 5.10). Nearly 90% of the risks driven by earthquakes are high or medium.

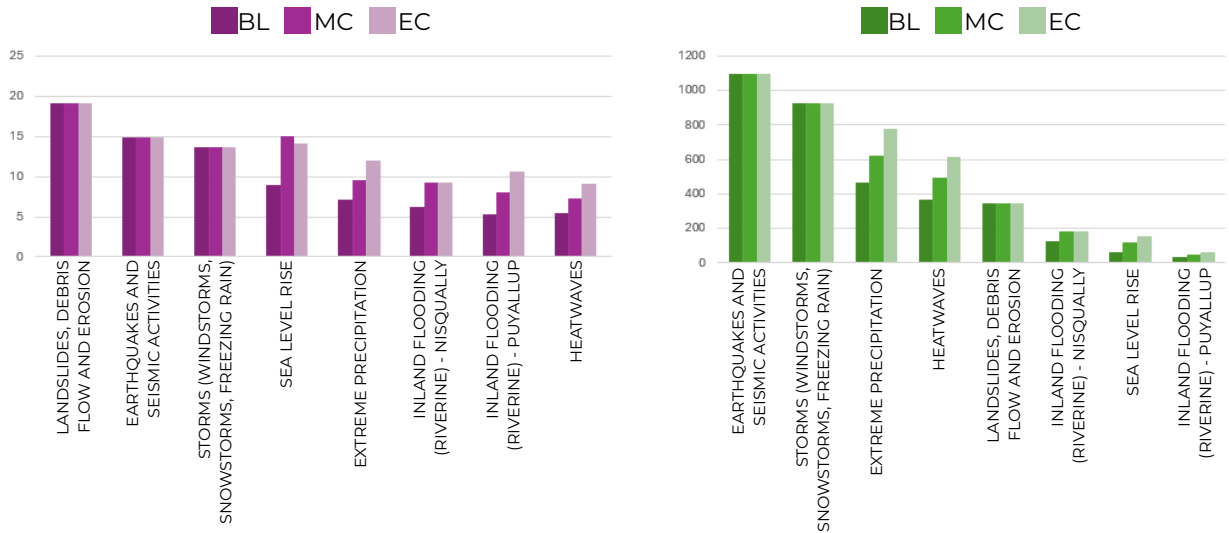


Figure 5.9: Average (left) and sum (right) of risk scores across all assets, separated by hazard and timeframe

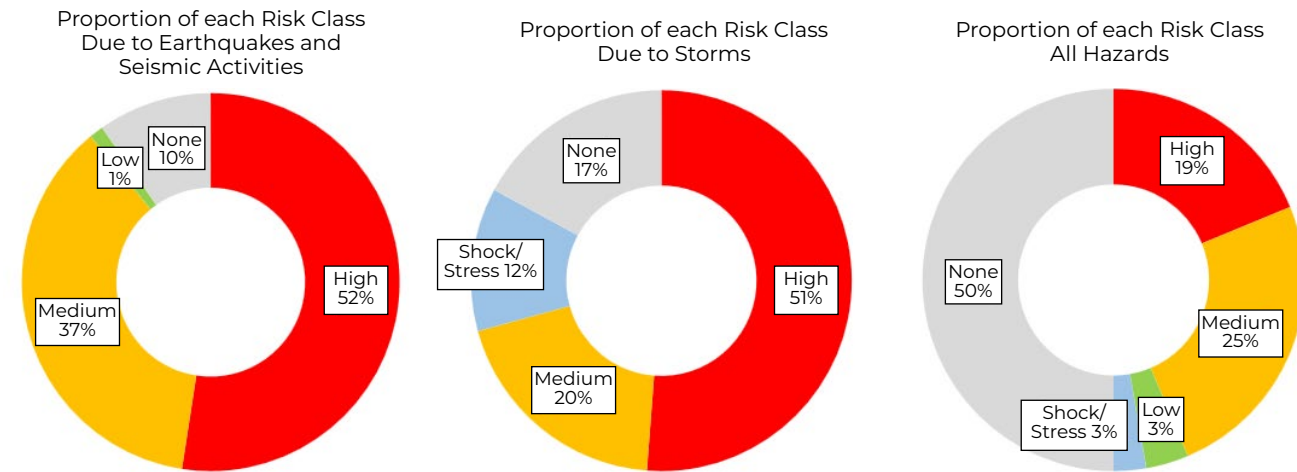


Figure 5.10: Proportion of each risk class due to earthquakes (left), storms (center) and all hazards (right)

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RISK BY HAZARD AND LIFELINE

Figure 5.12 synthesizes the results matrix, showing the average risk score for each interaction between hazard and lifeline. The hazards are ordered, left to right, by average risk across the entire hazard. Similarly, the lifelines are ordered, top to bottom, by average risk across each lifeline.

Landslides, Debris Flow and Erosion has the highest average risk score across the hazards. It interacts with all but one lifeline and six of these interactions are a high average risk. Despite the high ranking in terms of average risk, the impacts are limited to a small number of assets. Figure 5.11 illustrates the proportion of risks by class across the hazard. Only 22% of the assets are impacted. However, the impacts are almost entirely high risk.

Proportion of each Risk Class Due to Landslides, Debris Flow and Erosion

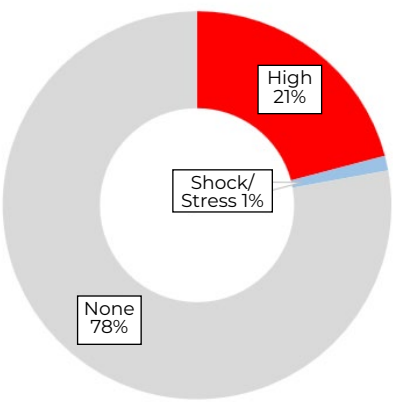


Figure 5.11: Proportion of each risk class due to landslides, debris flow and erosion

RISK ASSESSMENT: RESULTS

PRESENT AND FUTURE IMPACTS

The risk profile of the portfolio is expected to change over the timeframes evaluated due to climate change. Figure 5.13 illustrates the change in average risk score for each lifeline-hazard interaction. The area is already at high risk for earthquakes, landslides and storms as the baseline condition. Thus, although the risk increases over time, it is considered at high risk across all three time horizons. The lifelines that see the most change in their risk profile are Transportation, Safety and Security, and Energy.

Lifeline	Extreme Precipitation	Sea Level Rise	Heatwaves	Inland Flooding (Riverine) - Nisqually	Inland Flooding (Riverine) - Puyallup	Earthquakes and Seismic Activities	Landslides, Debris Flow and Erosion	Storms (windstorms, snowstorms, freezing rain)
Transportation	6.1	6.1	3.7	3.9	7.3			
Safety and Security	4.0	10.0	4.0	3.0				
Energy	6.0	4.3	4.0	3.0	2.0			
Water Systems	6.4			5.0	6.0			
Natural Resources	3.8	4.0	4.0	1.0				
Health and Medical	4.7		4.0					
Food, Hydration, and Shelter	4.0		2.0					
Communications	2.0		2.0					

Figure 5.13: Change in average risk score from the baseline to mid-century across lifeline and hazards. The largest changes in risk are driven by extreme precipitation, sea level rise, and heatwaves.

RISK ASSESSMENT: RESULTS

HIGHEST RISK ASSETS

The assets at highest risk are identified by the sum of the risk scores for each asset and ranking the assets by this total risk score. The top 20 assets are shown in the table below. Eleven of the top 20 assets are part of the Transportation lifeline, most of which are road and highways.

Lifeline	Asset Subclass	Asset Name	Total Risk Score
Transportation	Roads and Highways	Interstate 5	419
Transportation	Roads and Highways	SR - 016	330
Transportation	Roads and Highways	SR - 512	323
Transportation	Roads and Highways	Nisqually Road / Old Pacific Highway	300
Transportation	Roads and Highways	US - 101	282
Transportation	Roads and Highways	SR-507	267
Transportation	Railroad	Burlington Northern Santa Fe Rail Line -- Running through Base	247
Health and Medical	Hospitals	MultiCare Good Samaritan Hospital	240
Transportation	Roads and Highways	SR-510	240
Transportation	Roads and Highways	SR-7	228
Energy	Dam	Alder Dam	216
Water Systems	Dam	North Fork Clover Creek W1 Det Facility	216
Energy	Fuel	Olympic Petroleum Pipeline	188
Energy	Fuel	US Oil Refinery 8" Jet fuel Pipeline	188
Natural Resources	Wildlife Refuge	Wildlife Refuge - Billy Frank Jr. Nisqually National Wildlife Refuge	173
Safety and Security	Police Department	Pierce County Sheriff Department - Parkland Substation	171
Transportation	Road Operation	Pierce County Central Maintenance Facility (CMF)	171
Water Systems	Dam	North Fork Clover Creek E1 Det Basin	171
Health and Medical	Hospitals	Providence St. Peter Hospital	165
Transportation	Airport	Seattle-Tacoma International Airport	165

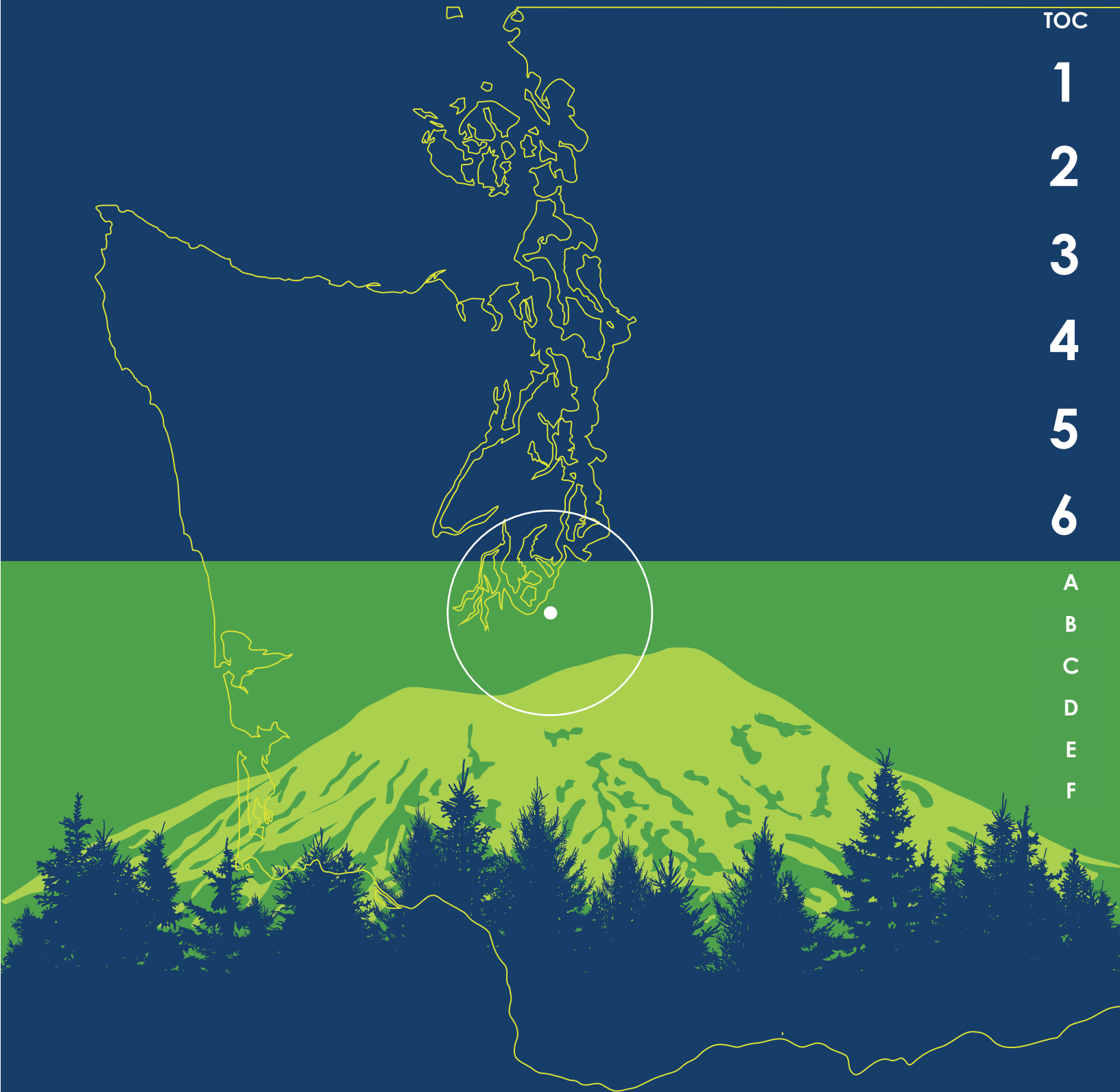
Figure 5.14: The twenty highest risk critical assets

RISK ASSESSMENT: RESULTS

FROM HIGH RISK ASSETS TO ADAPTATION PROJECTS

The outcome of the risk assessment is to identify high-risk assets that could inform the development of individual projects. With support from subject matter experts (SMEs), these projects could then be developed further, presented to stakeholders, and prioritized for inclusion in the Resilience Action Plan (RAP). Once identified in the RAP, these projects would include the identification of relevant funding sources to support further, more detailed project planning and development.

The next section of this report details those projects taken forward into the RAP, along with implementation plans and scoring metrics to support potential future funding applications.



RESILIENCE ACTION PLAN

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The Resilience Action Plan (RAP) provides SSMCP, JBLM, and the surrounding communities a roadmap of recommended resilience actions and projects, including recommended funding sources. The RAP is the culminating step in the multi-phased MIRR; it is a roadmap that identifies solutions for assets prioritized through the risk assessment and stakeholder feedback and developed by multi-discipline teams.

6.1 Project Identification and Selection

When developing resilience project design concepts and identifying funding, there is a need for relevant data. Designing infrastructure improvements will require climate scientists and engineers with expertise in resilient solutions and with specific understanding of how climate change may influence a design solution that is resilient to future climate conditions rather than current conditions.

To develop recommended resilience actions and project design concepts for the pressing issues and priority critical assets in the JBLM Defense Community, Stantec engaged our experienced SMEs to interface directly with the asset owners/operators to delve deeper into understanding specific asset vulnerabilities and prepare proposed resilience actions and projects. The SMEs represented expertise focused on the following topics — water system resilience, energy reliability, radio communications infrastructure and operations, geotechnical hazard assessment, and emergency management.

6.2 Project Action Plans

Project action plans were developed for the identified critical resilience projects with input from the identified project partners. Each action plan provides background,

scope, and cost estimates for the project for use in future funding applications and planning efforts. Specifically, each action plan contains the following components:

- **Background** – A brief description of the issue that prompted the creation of this project as presented to the project team.
- **Associated Hazards** – A list of the hazards that have been determined to be a risk to the project subject.
- **Associated Critical Assets** – A list of identified assets at risk to the relevant hazards that should be addressed by the project.
- **Approach** – A description of the core tasks necessary to address the issue described in the background component. (The approaches are not intended to be comprehensive scopes of work but serve as general frameworks for project development.)
- **Responsible Agencies** – A list of the agencies and organizations that should be considered to lead, contribute to, and implement each project.
- **Benefits** – A brief description of the outcomes each project is intended to achieve.
- **Related Issues and Opportunities** – A brief description of other issues associated with the project’s core issue that were identified during the MIRR.
- **Work Plan** – A tabular presentation of the planning-level approach for executing each project containing the phased approach to project implementation, estimated times to

RESILIENCE ACTION PLAN: PROJECTS

complete, rough order of magnitude (ROM) costs, and associated responsible agencies in task-level detail. Refer to Appendix D and its subsections for the work plans developed for each project.

- **Funding Strategy** – A tabular presentation of ranked funding sources that have been identified for each project. Refer to the Funding Directory contained in Appendix E for the summary profiles of recommended funding streams.

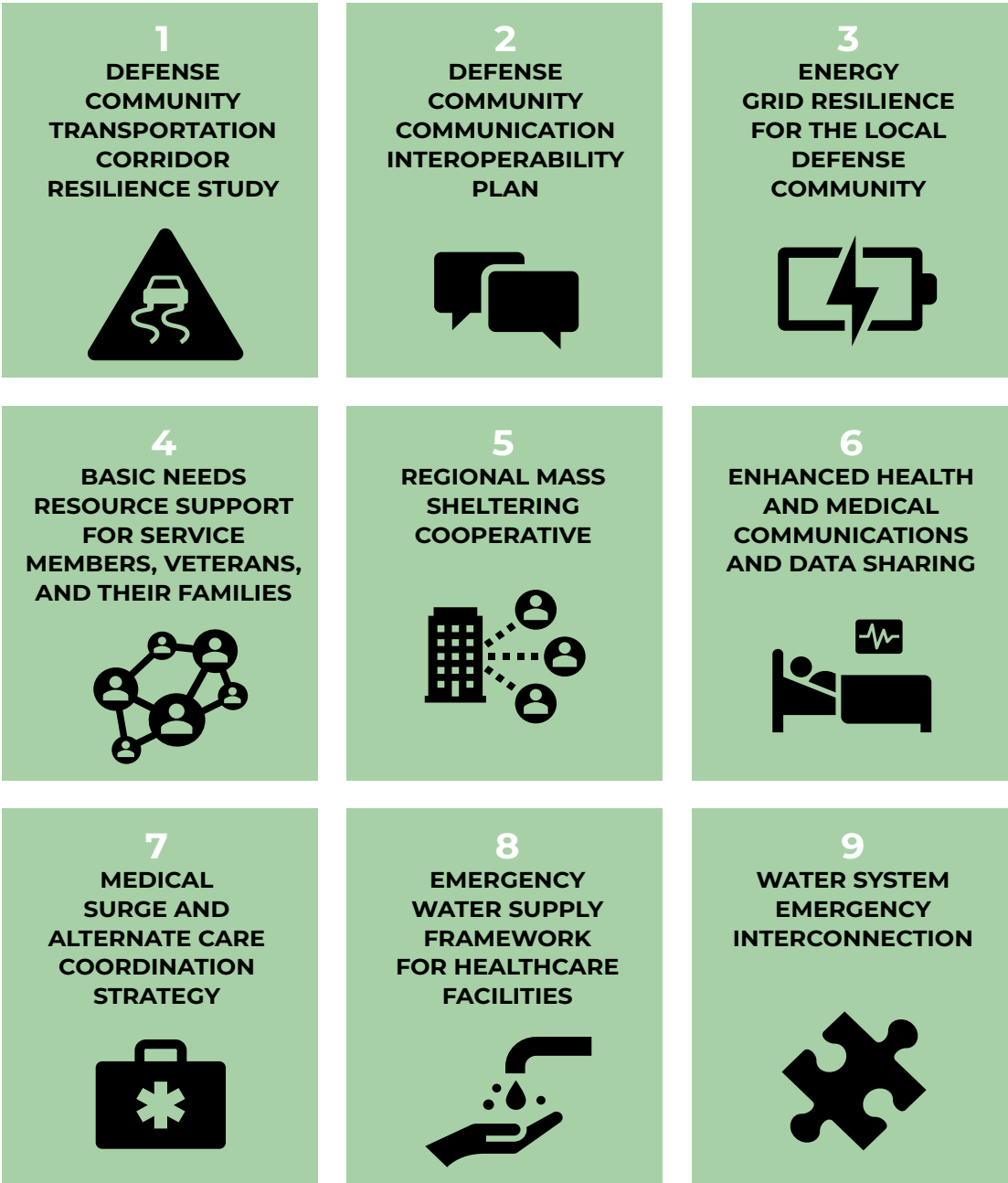


Figure 6.1: The 9 Project action plans.

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Project 1: DEFENSE COMMUNITY TRANSPORTATION CORRIDOR RESILIENCE STUDY

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Background
JBLM is a Power Projection Platform, or forward operating deployment base, supporting national defense efforts in the South Sound Region. This requires the ability to quickly deploy resources for defense operations. Eleven of the top 22 highest risk critical assets identified during the MIRR planning process were transportation assets at risk for considerable damage due to disaster events, most significantly a large earthquake.

This damage can significantly hinder JBLM's ability to deploy and respond during and after disaster events, particularly a large earthquake. In addition, several broader transportation issues associated with ensuring effective movement of service members and resources along key corridors were identified including the need for the installation to deploy people and equipment, installation access, congestion management, and emergency evacuation. The need for a resilient transportation system that supports these critical functions is key to the success of the installation's mission and a requirement of the Master Installation Plan.

Emergency transportation planning and system resilience is a focus of WSDOT and regional Metropolitan Planning Organizations (MPOs) that was highlighted by both the 2001 Nisqually earthquake and the 2016 Cascadia Rising exercise. The intent of the MIRR is to build upon that work through a lens that focuses on transportation support to the installation.

Associated Hazards

Transportation corridor assets are exposed to flooding, including that from extreme participation, seismic hazards (shaking, tsunami, ground deformation), sea level rise, winter storm impacts, and landslides.

Associated Critical Assets

Critical assets identified during the MIRR include the I-5, SR-507, SR-7, SR-512, and Nisqually Road roadway corridors as well as the Burlington Northern Santa Fe Railroad rail corridor. Critical assets within each corridor include pavements, rails and any embankments that support pavements and rails, approached and onramps that provide access, and over and under crossing structures. This includes not only structures that support the roadway/rail but also structures adjacent or over these corridors for other roadways that may fail and disrupt serviceability of the corridor.

Approach

Building on the MIRR and other regional transportation planning exercises, conduct a regional defense focused transportation corridor resilience study to identify, evaluate, and address gaps in transportation resilience in the JBLM region. Recognizing that system improvements sufficient to achieve this goal are not achievable in the near future, but more likely 10-20 years out, the assessment process will also develop recommendations for operational measures to respond to a disaster event during the interim in addition to the recommendations for capital improvement planning. The assessment consists of the steps outlined below.

- 1. Confirm Priority Transportation Corridors** – Build upon existing planning efforts and confirm priority transportation corridors supportive of military installation



access. Consideration should be given to road and rail routes required for installation operations for both blue sky and disaster response scenarios. Corridors should be identified that support installation access for personnel, supplies, and deployment operations as well as emergency transportation and evacuation needs.

- 2. Develop Project Stakeholders and Responsibilities for each Corridor** – Once priority corridors are identified, leverage work the SSMCP Transportation Work Group has completed to date and establish a project task force to oversee the study. The task force will work to identify the appropriate stakeholders for each corridor including owners and emergency managers that will contribute to corridor assessment and adaptation project development. In addition, the project team will develop a communication structure for the project and each corridor for improved interagency coordination.
- 3. Establish Key Planning Scenarios** – Work with JBLM and the identified agency representatives, to identify the key critical seismic and climate hazard scenarios from regional natural hazard mitigation planning efforts that are most critical to the identified transportation corridors. Based on the MIRR work and reviews, the likely most critical hazard scenarios are a large regional earthquake such as the Cascadia Subduction Zone earthquake and tsunami and a large flood event. However, precipitation events and the resulting effects, such as bridge scour, storms, land sliding and sea level rise should also be considered. Work with key stakeholders to complete a series of

scenario-based discussions to inform transportation corridor resilience study and help establish the critical scenarios.

- 4. Conduct Enhanced Risk and Resilience Assessment** – Work with transportation infrastructure owners (agencies) to collect, review, and build upon existing infrastructure and resilience assessments to develop an enhanced risk and resilience assessment for each priority corridor. These assessments will evaluate vulnerabilities to the infrastructure supporting transportation in each corridor and outline the anticipated service gaps for each hazard scenario.
- 5. Develop Adaptation Recommendations** – Work with transportation infrastructure owners (agencies) to build on existing capital improvement planning and identified hazard adaptation actions to develop adaptation recommendations for each priority corridor to improve resilience within the system and fill gaps identified during the risk and resilience assessment. Adaptation recommendations will include physical infrastructure improvements to build resilience in each corridor and operational improvements to fill resilience gaps while physical improvements are implemented. Operational improvements may include identification of temporary infrastructure repairs, stockpiling repair materials, and identification of detours and temporary transportation measures, such as temporary bridges and waterway detours or alternative access.

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6. Identify Funding Strategies and Implementation Plan – To complete the assessment, the team will work together to identify priorities within the physical and operational measures identified and potential funding opportunities for implementation. Finally, an overall implementation plan will be developed for improvements and measure implementation for the installation and the agency owners.

Responsible Agencies

- **Project Leads:** SSMCP Transportation Chair and Working Group in partnership with Washington Department of Transportation (WSDOT)
- **Installation Lead:** JBLM Directorate of Public Works and Directorate of Emergency Services
- **Project Partners:** Thurston Regional Planning Council (TRPC), Puget Sound Regional Planning Council (PSRC), Pierce County Planning Commission (PCPC), appropriate City and County Public Works/Roads and Emergency Management Representatives, Clover Creek Study Lead, waterway partners (USACE), and contractors for temporary repairs and recovery.

Benefits

Resilient transportation corridors will ensure the installation’s ability to fulfill their mission to rapidly deploy people and equipment for potential domestic and international deployments without disruption due to disaster events. Further, transportation resilience allows both the installation and the community to respond and quickly recover from climate and seismic disasters.

A completed resilience study will provide guidance for implementation of resilience building improvements and will provide additional funding opportunities to support agencies with adaptation and infrastructure improvements.

Recommended Funding Streams

1. Defense Access Roads Program; see appendix [E.1.1](#)
2. Rebuilding American Infrastructure with Sustainability and Equity (RAISE); see appendix [E.1.2](#)
3. DoD Military Installation Resilience Program; see appendix [E.1.11](#)
4. WA Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) Formula; see appendix [E.1.10](#)
5. Defense Community Infrastructure Program; see appendix [E.1.12](#)

Related Issues and Opportunities

- **Varied Ownership and Limited Funding for Mitigation:** The transportation system that supports JBLM and connects the installation to the surrounding community is owned, maintained, and managed by local and state agencies as well as private companies such as Burlington Northern Santa Fe (BNSF) Railway. Resilience of the infrastructure is the responsibility of these entities and prioritization of emergency routes may not include all routes critical for JBLM. Further, mitigation funding is often lacking for upgrades and retrofits, thus it may be difficult to advance JBLM priorities when they do not match local agency priorities.
- **Limited Availability of Temporary Transportation Elements:** Limited availability of temporary bridges and emergency bridge solutions will be a hindrance to transportation recovery in the event of a large earthquake and will be based on overall community needs, not only JBLM needs. Operational planning should consider the most critical needs in the event of a disaster and plan for temporary solutions. Area flooding will likely negate the viability of many temporary solutions, thus for the flooding scenarios alternate routes or other solutions should be considered.

- **Fuel Resilience.** Emergency response and recovery operations including road repair will heavily rely on the availability of fuel in the region. In a Cascadia scenario, fuel supply is expected to be greatly impacted. Resilient and redundant fuel supplies as well as alternative delivery options will need to be considered in planning efforts.
- **Evacuation Planning:** Certain hazards may require evacuation of the installation and/or the community. The corridors used during different evacuation scenarios may differ from those identified as critical corridors. Additional studies should be completed to establish evacuation scenarios, develop recommended routes, and include this work into long-term planning for the installation.

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PROJECT 2: DEFENSE COMMUNITY COMMUNICATION INTEROPERABILITY PLAN

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Background

The Communications Lifeline in the JBLM Defense Community can be best characterized as a “system of systems” connecting a network of partners and technologies. This includes partners with jurisdictional responsibility (e.g., service areas for law enforcement and fire service agencies) and partners with responsibility for specific assets (e.g., Washington State Patrol and Interstate 5). Recognizing this interconnectivity, partners in the region have made significant advances in enhancing communications interoperability in the region in recent years.

In many areas these systems are interoperable and communication flows seamlessly between partners, but there remain gaps, including areas around JBLM, that can create challenges when circumstances require quick and effective communication between partners using systems that lack interoperability. For example, in some cases the radio systems and frequencies/Talk Groups used in emergency response differ between JBLM and its surrounding defense community partners.

This lack of interoperability hinders effective coordination (e.g., issues of permission and authority) and communication (e.g., shared frequencies) during emergencies as well as creates barriers for interagency training.

Associated Hazards

This project addresses all hazards since operational communications is needed and may be impacted during any type of emergency.

Associated Critical Assets

Radio / cell towers, dispatch and communications centers and the structures they reside in, back-up power systems at centers and towers, trained operators.

Approach

Building on regional agency communication plans, the project team will develop a Defense Community Communication Interoperability Plan that better integrates regional emergency communications in the event of a disaster. The planning process will consist of the steps outlined below.

- 1. **Establish the Project Team:** Prior to advancing this effort, it will be important to ensure the participation of the right partners in the project. This includes both installation and emergency communications partners who are both owners of communications systems in the local defense community as well as the agencies that utilize those systems to communicate.
- 2. **Assess Local Defense Community Communications Capability.** The interoperability of communications systems and between partners varies across the community. For example, interoperability between Pierce County and JBLM is workable, but Thurston County still experiences challenges. As a first step, the project team will establish a shared understanding of the current state of communications interoperability in the local defense community. Collect relevant regional communications plans and develop an overview of the current emergency communications landscape of the defense community.



3. Develop Defense Community Communication Interoperability Plan.

Building on the results of the assessment, the project team will design and implement a planning process that establishes governance mechanisms and organizational roles and responsibilities for communications interoperability; outlines public safety technology and operations needed to maintain and enhance interoperability; and includes a strategy for improvement of defense community communications interoperability supported by funding strategies and an implementation plan.

- 4. **Training and Exercise Strategy.** An interagency training and exercise strategy will support the final plan that is developed in a manner consistent with local emergency communications plans, the Washington Statewide Communication Interoperability Plan, and the planned JBLM Base Interagency Communications Plan / Program. This will include opportunities to test existing operational communications response plans (e.g., Emergency Support Function 2) and the use of shared frequencies between the community and JBLM.

Responsible Agencies

- **Project Leads:** TCOMM 911, South Sound 911, Pierce County Communications Department
- **Installation Lead:** Directorate of Plans, Training, Aviation, Mobilization, and Security (DPTAMS) and Directorate of Emergency Services
- **Project Partners:** WSP, WSDOT, Washington State Military Department Emergency Management Division

Recommended Funding Streams

- 1. DoD Military Installation Resilience Program; see appendix E.1.11
- 2. Regional Catastrophic Preparedness Grant (RCPGP); see appendix E.1.13
- 3. Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Revolving Loan Fund Program; see appendix E.1.14

Benefits

A Defense Community Communication Interoperability Plan will enhance joint emergency management capabilities for the entire South Sound Region. This enhancement will come in the form of more efficient resource sharing, less confusion among first responders, and more comprehensive situational awareness. Furthermore, the process of developing this plan has great potential to strengthen the relationship between JBLM and the surrounding community.

Related Issues and Opportunities

- **Pierce County Single County-Wide Communications System:** Maintained by the Pierce County Communications Systems Division, this system comprises 24 sites that facilitate radio communications among entities within Pierce County. Opportunities exist for extending this system to Thurston County and the installation.

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PROJECT 3: ENERGY GRID RESILIENCE FOR THE LOCAL DEFENSE COMMUNITY

Background

The JBLM Defense Community and JBLM are reliant on power to perform many mission critical activities; hazard events can result in infrastructure damage and supply chain disruptions that impact the reliability of the grid. A key aspect of energy resilience is ensuring that the power generation, transmission, and distributions systems are supported by redundancy and that technologies employed are augmented by effective management and coordination strategies between partners. Tacoma Public Utilities provides electric power for JBLM through six primary substations. Currently, no built-in energy storage capacity exists at these substations, which means the installation and community may compete for the same energy resources during an emergency or disaster that disrupts the energy grid.

Additionally, JBLM is actively engaged in planning for energy resilience through exploration of strategies to allow the installation to function as an ‘island’ when the energy grid is disrupted outside the fence line. While on-base solutions are a key part of any solution, particularly with the availability of protected land, there is strong opportunity to collaborate on a strategy that is also beneficial to the JBLM Defense Community.

Associated Hazards

Multiple hazards can impact the resilience of the Energy Lifeline and will require implementation of strategies to manage use, prioritize scarce resources, and meet the needs of the local defense community. Power disruption is considered a cascading hazard and can result from hazards with

acute impacts (e.g., a severe storm damaging power transmission and distribution assets) or hazards with more slow moving impacts (e.g., more frequent extreme heat events straining the system due to increased demand for power for cooling).

Associated Critical Assets

Power generation, transmission, and distribution assets

Approach

The Energy Grid Resilience Study is designed to understand what combinations of power generation in the community and on the installation makes the most sense through the lens of energy resilience. It will result in an identification and prioritization of technologies that are of shared benefit to the community and JBLM.

- 1. Establish the Project Team:** Prior to advancing this effort, it will be important to ensure the participation of the right partners in the project. The focus of the study will include both installation and utility partners (e.g., Tacoma Public Utilities and City Light and Power) responsible for the energy infrastructure. Additional partners may be engaged as needed.
- 1. Determine Energy Resilience Courses of Action.** The project team will work with key subject matter experts to establish at least three courses of action that will be considered to understand the range of energy needs that should be contemplated for this project. A key aspect of these scenarios is the duration of the need and, at a minimum, the assessment of both shorter (3-day) and longer term (14-day) energy outages for the installation.



- 2. Establish Methodology and Conduct Analysis.** For each scenario, conduct an analysis to understand the energy needs for both the installation and the community. The analysis methodology should result in an understanding of considerations of demand, economics, and operations. This should include establishing an understanding of how energy resources will be prioritized during an emergency that impacts both the community and the installation. Project approaches should be consistent with key standards and best practices including the Army Climate Strategy requirements and National Institute of Standards and Technology (NIST) standards.
- 3. Identify Alternatives.** Based on the analysis results, review available technologies and establish alternatives to meet the energy requirements established for the project. The review will include assessment of the feasibility of each option including the opportunities for mutual benefit and sharing of cost among partners. Options may include a combination of a range of energy resilience solutions including battery storage, backup generators, and on base microgrids. The study will include identification of a preferred alternative.
- 4. Select Alternative and Plan for Implementation.** Upon selection of an alternative, initiate system planning and design including a proposed management strategy and procedures for ongoing system operations and maintenance.

Responsible Agencies

- Project Lead:** Tacoma Public Utilities (City of Tacoma)
- Installation Lead:** JBLM Directorate of Public Works
- Project Partners:** City Light and Power

Benefits

Ultimately, the system(s) selected and implemented need to create shared benefit between the Installation and the community. It needs to support JBLM’s energy requirements for backup power as well as support TPU in managing its operational constraints.

It is important to note that, at the time of release of the MIRR, Tacoma Public Utilities is in the process of developing its bi-annual Integrated Resource Plan (IRP) that establishes resource adequacy justifications for utility investments. The outlined planned investments will be highly influenced by the utility’s contract with the Bonneville Power Administration (BPA) currently under negotiation.

Recommended Funding Streams

- 1. Preventing Outages and Enhancing the Resilience of the Electric Grid FORMULA Grants; see appendix [E.1.3](#)
- 2. Grid Resilience and Innovation Partnerships Program; see appendix [E.1.5](#)
- 3. Clean Energy Fund - Grid Modernization Program; see appendix [E.1.4](#)
- 4. Transmission Facilitation Program; see appendix [E.1.6](#)



Related Issues and Opportunities

Washington Clean Energy Standards

Solutions designed to enhance energy resilience for the local defense community should be informed by local, state, and federal efforts to reduce reliance on fossil fuels and to meet regulatory established clean energy standards. For example, in 2019, the Governor signed into law the Clean Energy Transformation Act (CETA) that applies to all electric utilities serving retail customers in Washington and sets specific milestones to reach a 100% clean electricity supply. The law requires utilities to phase out coal-fired electricity from their state portfolios by 2025. By 2030, their portfolios must be greenhouse gas emissions neutral, which means they may use limited amounts of electricity generated from natural gas if

it is offset by other actions. By 2045, utilities must supply Washington customers with electricity that is 100% renewable or non-emitting with no provision for offsets.

Installation Energy Management

In March of 2016, the DoD published the DoD Instruction (DoDI) 4170.11 that requires DoD components to ensure energy resilience on their military installations. Per the requirements of DoDI 4170.11, the Office of the Assistant Secretary of Defense for Energy, Installations, and Environment (EI&E) published the Energy Resilience: Operations, Maintenance, and Testing (OM&T) Strategy and Implementation Guidance that outlines the technical and budgetary strategies that installations can use to enhance their energy resilience.

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PROJECT 4: BASIC NEEDS RESOURCE SUPPORT FOR SERVICE MEMBERS, VETERANS, AND THEIR FAMILIES

Background

The local defense community does not possess a comprehensive online platform that documents basic needs resources for service members, veterans, and their families (SMVFs) that are available through local nonprofit organizations, TRICARE and Veterans Affairs (VA) clinics. Additionally, due to losses in funding, Washington 211 no longer employs a Military Resource Navigator for assisting SMVFs in finding resources. These conditions have made it difficult for SMVFs to understand where to turn to in times of crisis and have led to an overburdening of the referral system. For example, in one month the Cohen VA Clinic received 200 health referrals from Madigan Army Medical Center.

Associated Hazards

Multiple hazards can impact or disrupt the basic needs or services that SMVFs require. Additionally, disasters can create new or exacerbate existing challenges, particularly for individuals and families who are displaced by a hazard or even experience injury or loss of a loved one.

Associated Critical Assets

Madigan Army Medical Center and TRICARE and VA networks.

Approach

SSMCP is currently exploring partnerships to enhance access among SMVFs to basic-needs service providers by developing a resource landing page connected with a smartphone application that contains listings for (1) housing support, (2) financial support, (3) mental health and peer support, (4) substance use disorder, and (5) food instability. This project will be completed in the following manner:

- Determine Needs:** SSMCP, leveraging its relationship with multiple SMVF working groups, will conduct a meeting with stakeholders to assess what SMVFs would like to see in this product and how it can be curtailed to their needs. This could be a series of small group meetings or one, single town hall meeting.
- Identify Examples:** United Way of Pierce County 211 (Washington 211) will conduct a desktop search and inquire about existing programs that are like this one's intended purpose and/or are housed somewhere within 211's national network. This step will determine the appropriate structure, resources requirements, and funding opportunities available to such programs.
 - Additionally, this step will involve assessing how Military Resource Navigators are used in other regions and ways they can be funded.
- Assess Resources:** Based on the outcomes of Task 1, Washington 211 will perform an assessment of their current resource inventory to determine which resources currently exist in their system for SMVFs as they relate to the five basic needs identified above. The assessment will provide an estimate of the number of individual resources that will need to be added to the proposed landing page, which are not currently listed elsewhere on their site.
 - This task's cost will be determined by how many additional resources not already contained on the site will be added.
- Integrate into Application:** Once the basic needs resource landing page is developed by Washington 211, SSMCP will work with the chosen smartphone application developer to integrate the contents of the landing page into a

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user-friendly smartphone application. Initially, a pilot system will be distributed to a specific number of SMVFs to gather feedback on the functionality of the application over a 3-month period. At the conclusion of the pilot period, feedback will be incorporated into refinement of the application before it is made available to the community.

Potential Alternative: The DoD's Morale, Welfare, and Recreation (MWR) program is currently exploring options to create a social media site through BaseHubs specifically for SMVFs of JBLM. If this effort is approved, the basic needs resources landing page developed by Washington 211 could be integrated into the social media site developed for MWR reducing or completely eliminating the cost of Task 4.

5. **Perform Updates:** Washington 211 will incorporate necessary updates to the basic needs resource landing page on a periodic schedule agreed upon between them and SSMCP. Washington 211 will retain the responsibility to alert the smartphone application developer of any updates that will need to be made to the smartphone application.

Responsible Agencies

- **Project Lead:** SSMCP and United Way of Pierce County 211
- **Installation Lead:** Madigan Army Medical Center
- **Project Partners:** Cohen Military Family Clinic and other regional Veterans Affairs (VA) clinics, BaseHubs, and regional TRICARE clinics.

Benefits

The landing page, its accompanying application, and, possibly, the reinstatement of the Military Resource Navigator will provide accessible basic needs resource and referral information for military members, veterans, and their families which will alleviate the strain on the limited facilities within Madigan's referral network.

Recommended Funding Streams

1. Various Loan Options: Direct Placement, Public Offering, Quick Loan; see appendix [E.1.17](#)

Related Issues and Opportunities

Behavioral Health for Active Service Members, Veterans, and Their Families

Increasing attention is being paid to the behavioral health of active service members, veterans, and their families whose experience and lives subject them to unique behavioral health challenges. Experiences such as frequent relocations, deployments, stressful experiences due to combat, and time away from family can have negative effects on mental health. Traumatic events can have long-lasting effects well beyond time of deployment or active duty. These challenges can be exacerbated during an emergency or disaster.

Information on existing behavioral health resources for JBLM active service members, veterans, and their families is available at <https://madigan.tricare.mil/Health-Services/Behavioral-Health>.



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Establish Defense Community Peer Support Resources

One key strategy that could be augmented in the defense community is the establishment of, or enhancement of existing peer support programs such as those being used to support first responders (e.g., law enforcement, fire services). This might include the identification of a cadre of peer support persons (PSPs) who, though not formally trained, can provide support to active service members, veterans, and their families. These individuals would be trained to provide daily emotional support and participate in response to critical incidents impacting the defense community. Access to peer support resources can be integrated into the referral services that are being built out for the project described above.

Enhanced Planning for Behavioral Health Support in an Emergency or Disaster

In the State of Washington, human services during an emergency, including behavioral health support, is coordinated through [Emergency Support Function \(ESF\) 6](#), Mass Care, Emergency Assistance, Temporary Housing, and Human Services. Under the State Comprehensive Emergency Management Plan (CEMP) the primary coordinating agency for ESF 6 is the Washington State Department of Social and Health Services and both [Pierce](#) and [Thurston County](#) have assigned lead agencies in their respective local CEMPs. Because JBLM is an important partner in whole community planning for behavioral health, it is important ensure these functional annexes, and their associated plans and procedures, consider the unique needs of active service members, veterans, and their families and the resources available to them.



PROJECT 5: REGIONAL MASS SHELTERING COOPERATIVE

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Background

A concerted effort among South Sound communities to develop a mass sheltering strategy does not currently exist. Rather, separate efforts are being undertaken by organizations such as the East Pierce Interlocal Coalition (EPIC) and Thurston County Emergency Management (TCEM) to identify and establish emergency shelters across their service areas. The American Red Cross South Sound and Olympics Chapter is heavily relied upon for providing emergency shelter to the South Sound communities, but their capacity is extremely dependent on community stakeholders offering their buildings. Additionally, JBLM's current emergency sheltering policy is to function as a safe haven for approximately 72 hours before non-essential personnel and their families must be moved off the installation and into community sheltering resources. However, their sheltering capacity within the first 72 hours following an incident is assumed to be inadequate to meet the needs of the community during a large-scale disaster.

Associated Hazards

This project is intended to address hazards that require individuals to leave their homes for multiple days such as severe winter storms, volcanic eruptions, severe flooding, and earthquakes.

Associated Critical Assets

The success of this project relies on various facility owners to register their buildings as potential mass shelter sites, a process that is currently ongoing.

Approach

Pierce County, Thurston Counties respective cities, and key mass care and shelter partners will establish a Regional Mass Sheltering Cooperative with the Installation where they can procure shared mass care and

shelter resources, conduct joint trainings and exercises, and coordinate planning initiatives. This cooperative can be created through the completion of the following tasks:

- 1. Initial Meeting and Charter Development – Determine which partners should be seated members in the cooperative and host a kick-off meeting with key personnel from the identified partner agencies that determines:
 - a. Goals and objectives
 - b. Governance structure and decision-making mechanisms (i.e. spheres of influence)
 - c. A meeting cadence (monthly, quarterly, or yearly) and expectations for attendance
 - d. Roles and responsibilities

Based on the outcomes of the kick-off meeting, draft a charter document for the Regional Mass Sheltering Cooperative. Distribute the draft charter to partners for review then incorporate any feedback. Once complete, send the finalized charter to partners for signature.

- 2. Develop Work Plan – Compile data gathered to date concerning shelter capacity for large-scale events, shelters that have been identified in the community, and the resource capabilities of the installation and greater network of partners. This data will be used to create a work plan that:
 - a. Outlines and evaluates additional data gaps that require further analysis to inform existing mass care and shelter capabilities and capacities, as well as associated gaps
 - b. Identifies specific labor, equipment and materials needs such as mobile and brick-and-mortar facilities as well as the minimum training and staffing needed to operate a shelter
 - c. Assigns responsibilities among



- d. Details a method for tracking progress of the collaborative

The Work Plan should be evaluated on an ongoing basis and new actions should be incorporated as additional needs are identified.

- 3. Develop a Multi-year Training and Exercise Plan – Determine the exact training/exercises needs, who needs to take them, and how often they should be conducted. Training and exercises for the first one to two years of the collaborative should be conducted among each partner agencies before large-scale joint exercises between both counties, partners, and the installation are attempted.
- 4. Identify Resources – Assess existing resource inventories of partners to determine capabilities and resource needs to inform resource sharing protocols and intergovernmental agreements. While the American Red Cross has access to nationwide resources that can be delivered in the event of an emergency, local resource inventories should be the focus of this effort to account for instances of islanding or situations in which outside resources may not be available for extended periods of time or at the early onset of a large-scale disaster.
- 5. Ensure Ongoing Cooperation – Ensure that Work Group is adhering to schedule, determining training/exercises, and resourcing.

Responsible Agencies

- Project Leads: Thurston County Emergency Management, Pierce County Emergency Management, and Tacoma-Pierce County Emergency Management.

- Installation Lead: JBLM Directorate of Emergency Services Emergency Management Division (DES-EM).
- Project Partners: Thurston County Public Health Department (TPCHD) and the American Red Cross South Sound and Olympics Chapter.

Benefits

Large-scale emergencies in which shelter-in-place has been determined to be unsafe for residents require the coordinated establishment of mass shelter locations where individuals and families can reside until the hazards associated with the incident have been eliminated. This cooperative will allow both counties (Pierce and Thurston), in coordination with the installation, to have the most strategic and resource-equipped mass shelter locations designated prior to an incident that can be activated in an event that forces the public to evacuate their homes.

Recommended Funding Streams

- 1. Emergency Management Performance Grant; see appendix E.1.18
- 2. Urban Area Security Initiative (UASI); see appendix E.1.19
- 3. Environmental and Climate Justice Community Change Grants Program; see appendix E.1.20
- 4. State Homeland Security Grant Program; see appendix E.1.21

Related Issues and Opportunities

Opportunity exists to pair this effort with the Basic Needs Resources for SMVFs project, as both involve educating military families about their options during crises. Both projects would benefit from the reinstatement of the Military Resource Navigator position at Washington 211 as this position would provide military families with sheltering information, how to reunite with their spouse on the base, and where they can obtain basic resources during and after an emergency.

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PROJECT 6: ENHANCED HEALTH AND MEDICAL COMMUNICATIONS AND DATA SHARING

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Background

Agile communications during emergency or disaster where access to health and medical data is critical to incident decision making (e.g., mass casualty incident, infectious disease outbreak) can massively improve the outcomes of the event. Enhancing communications among healthcare providers in the region, specifically for situations that involve significant coordination such as mass casualty events, is an impactful, yet attainable endeavor. Currently, the exchange of medical data between Madigan Army Medical Center and regional healthcare system partners, including Veterans Affairs (VA) and TRICARE clinics, is complicated by military security protocols and differences in the information management systems used by each facility. During the COVID-19 pandemic, these constraints were especially troublesome for local public health organizations when tracking infections and vaccinations in the region because the installation was initially unable to share this information.

Associated Hazards

Multiple hazards can impact the health and medical system and require effective communication and data sharing. This can include public health-specific incidents, such as a contagious disease outbreak or pandemic; hazards with acute impacts (e.g., an earthquake resulting in a mass casualty/fatality scenario); or hazards with more slow-moving impacts (e.g., health impacts from extended hazardous air quality or extreme heat events).

Associated Critical Assets

Defense community health and medical facilities and associated communications and information management assets

Approach

Madigan Army Medical Center will work with local VA and TRICARE clinics, nonprofit healthcare providers, and private healthcare providers to develop a medical communications and data sharing program that consists of the following components:

- 1. **Working Group Development** – Leverage SSMCP’s Healthcare Working Group consisting of key Madigan Army Medical Center personnel and key health and medical partners. Expand this working group’s membership to include representation from the Washington Department of Health, the Defense Health Agency (DHA), and other local healthcare partners that are critical to medical communications and data sharing. Develop a subcommittee within this working group whose purpose is to identify and address current issues of interoperability of medical communications and data. This subcommittee will focus on assessment, plan integration/alignment, training and exercise coordination, and other opportunities for partnership. Furthermore, this subcommittee should seek out any existing working groups or committees at the state or federal level dealing in medical communications and data sharing; if any are identified, they should be contacted for potential guidance and/or partnership.
- 2. **Current Conditions Assessment** – The subcommittee and its potential partners established in Task 1 will be responsible for assessing the current condition of medical communications and data sharing in the defense community through the following steps:
 - a. Document DHA security protocols that complicate or prevent certain kinds of medical communications



- and data sharing between Madigan Army Medical Center and regional healthcare providers.
- b. Review current information pathways between military and civilian health administration in the Defense Community. Determine what barriers exist for sharing clinical data such as lab results and vaccination statuses. Develop processes that can streamline these pathways.

- 3. **Medical Data Sharing Work Plan Development** – The subcommittee, in collaboration with its partners, will develop a work plan based on the findings of the current conditions assessment that covers the following areas of medical data sharing:
 - a. Brainstorm ways that Madigan Army Medical Center and regional healthcare providers can share medical data with each other while still staying in compliance with DHA-mandated security policies.
 - b. Develop procedures documenting how to use established clinical data sharing pathways. Distribute these procedures to regional healthcare providers.
 - c. Plan and conduct trainings within each organization on the use of the medical data sharing procedure documents and refine the documents based on the outcomes of each training, as needed.

Responsible Agencies

- **Project Leads:** Thurston County Public Health Department (TPCHD), Tacoma-Pierce County Health Department
- **Installation Lead:** Defense Health Agency and Madigan Army Medical Center
- **Project Partners:** Local TriCare and VA clinics

Benefits

This project will produce a regional healthcare system that can communicate more effectively and ensure the most informed care can be delivered to its beneficiaries regardless of their healthcare facility. Furthermore, this project will enhance emergency communications processes and procedures among the regional healthcare providers.

Recommended Funding Streams

- 1. ASPR Hospital Preparedness Program Cooperative Agreement; see appendix E.1.22
- 2. Public Health Emergency Preparedness (PHEP) Program; see appendix E.1.7

Related Issues and Opportunities
Alternate Disaster Medical Coordination Center Facilities for Pierce and Thurston Counties

A Disaster Medical Coordination Center (DMCC) is a designated regional hospital that coordinates patient movement during a mass casualty incident. The two primary DMCCs serving the local defense community are MultiCare Good Samaritan, serving Pierce County, and Providence St. Peter, serving Thurston County). Currently neither county has designated an alternate DMCC location and both existing County DMCC facilities were identified as high for criticality and risk. Pierce County has identified St. Joseph Medical Center as a potential alternate location, but this hospital’s communications infrastructure is assumed to be inadequate for the DMCC role. Madigan Army Medical Center, with approval from the DHA, could reinstate its position as the alternate DMCC facility for Pierce County as its communications infrastructure meets the recommendations for DMCC facilities.

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PROJECT: 7 MEDICAL SURGE AND
ALTERNATE CARE COORDINATION
STRATEGY

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Background

Large-scale events such as pandemics, natural hazards, and manmade threats can strain the local healthcare system by rapidly increasing the volume of patients in a short period of time; this occurrence is known as “medical surge.” During medical surges, regional healthcare providers must have effective coordination and communication on aspects of services, such as the available beds at key facilities. A prime example of this coordination in Washington state is the Disaster Medical Coordination Center (DMCC) framework. Currently, Washington state maintains the DMCC framework through the Northwest Healthcare Response Network (NWHRN) to coordinate patient movement during a mass casualty event. The framework comprises the Washington Medical Coordination Center (WMCC) at Harborview Medical Center in Seattle and a network of hospitals in the western region of the state.

The DMCC framework has a strong presence in Thurston and Pierce counties but could be enhanced with support of the installation, which is no longer an alternate local DMCC for Pierce County. Currently, Pierce County is served by its local DMCC at MultiCare Good Samaritan Hospital; Thurston County is served by its local DMCC at Providence St. Peter Hospital, which also serves four other counties (Grays Harbor, Lewis, Mason, Pacific). Neither DMCC has a designated alternate location and both facilities were identified as high for criticality and risk.

Associated Hazards

Multiple hazards have the potential to strain regional healthcare capacity and require enhanced coordination. This can include public health-specific incidents such as a contagious disease outbreak or pandemic;

hazards with acute impacts (e.g., an earthquake resulting in a mass casualty/fatality scenario); or hazards with more slow-moving impacts (e.g., health impacts from extended hazardous air quality or extreme heat events).

Associated Critical Assets

MultiCare Good Samaritan Hospital, Providence St. Peter Hospital, and Madigan Army Medical Center.

Approach

Northwest Healthcare Response Network (NWHRN) should work with major hospitals in Pierce and Thurston Counties, the installation, and local emergency management agencies to conduct an assessment of key capabilities associated with medical surge and provision of alternate care during an emergency or disaster that impacts the South Sound Region:

- 1. Develop Working Group** – Leverage SSMCP’s Healthcare Working Group consisting of key Madigan Army Medical Center personnel and key health and medical partners. Develop a subcommittee within this working group to include the Northwest Healthcare Response Network (NWHRN) and major hospitals in Pierce and Thurston Counties responsible for the capability elements established for the project.
- 2. Establish Planning Scenarios and Set Capability Targets:** Develop a set of scalable planning scenarios that selected capabilities can be assessed against. These could include a range of potential impacts including a mass casualty scenario, a contagious disease outbreak or pandemic, and less acute scenarios such as extreme heat or hazardous air quality incidents. The scenarios may also be geographic in nature and reflect the jurisdictional makeup of the South Sound Region.



- 3. Conduct Assessment:** Assess the capability of using existing or tailored criteria with a focus on key elements of planning, organization, equipment, training, and exercises. The assessment will result in recommendations that include a list of targeted deliverables that can enhance capability. Deliverables will be prioritized that support consistency in approach and process statewide.
- 4. Develop Targeted Deliverables:** Based on the results of the assessment, select and develop a set of targeted deliverables that address identified capability gaps or enhance capability strengths. These could include:
 - Enhanced forms and templates that support a consistent approach to documentation and information management
 - Updated medical surge, MCI/FYI, alternate care plans and procedures
 - New or updated criteria for alternate care facilities including DMCCs
- 5. Establish a Training Cycle:** Plan and conduct trainings within each organization on the use of the targeted deliverables and refine the documents based training outcomes, as needed.

Responsible Agencies

- Project Owner:** Northwest Healthcare Response Network (NWHRN) and Washington Department of Health (DOH)
- Installation Lead:** Directorate of Emergency Services (DES)
- Project Partners:** Providence St. Peter Medical Center, MultiCare Good Samaritan Medical Center, and other regional healthcare services and facilities willing to participate

Benefits

Local disaster medical coordination centers (DMCCs) are crucial nodes within the State-

wide system for coordinating the distribution of patients following large scale emergencies. Each local DMCC is responsible for assessing the capacity within its respective county. In the event of an emergency that destroys a county’s DMCC facility then patient coordination in that county could be forgotten or become a burden to the adjacent counties’ DMCCs. For this reason, Pierce and Thurston County must work to formalize alternate DMCC locations within each of their respective jurisdictions to maintain redundancy and boost resilience.

Recommended Funding Streams

- ASPR Hospital Preparedness Program Cooperative Agreement; see appendix [E.1.22](#)
- Public Health Emergency Preparedness (PHEP) Program; see appendix [E.1.7](#)

Related Issues and Opportunities

Alternate Local Disaster Medical
Coordination Centers for Pierce and
Thurston Counties

A Disaster Medical Coordination Center (DMCC) is a designated regional hospital that coordinates patient movement during a mass casualty incident. The two primary DMCCs serving the local defense community are MultiCare Good Samaritan, serving Pierce County, and Providence St. Peter, serving Thurston County). Currently neither county has designated an alternate DMCC location and both existing County DMCC facilities were identified as high for criticality and risk. Pierce County has identified St. Joseph Medical Center as a potential alternate location, but this hospital’s communications infrastructure is assumed to be inadequate for the DMCC role. Madigan Army Medical Center, with approval from the DHA, could reinstate its position as the alternate DMCC facility for Pierce County as its communications infrastructure meets the recommendations for DMCC facilities.

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PROJECT 8: EMERGENCY WATER SUPPLY FRAMEWORK FOR HEALTHCARE FACILITIES

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Background

General FEMA guidance for maintaining an emergency water supply is to have enough water to support three days (72 hours) of need; however, in the Pacific Northwest, during a catastrophic scenario such as a large earthquake or some contaminant scenarios, it is possible that potable water may be compromised for two weeks or longer, thus Washington Department of Emergency Management recommends that residents and facilities maintain an emergency supply adequate for at least two weeks. Many key lifeline partners in the local defense community may be underprepared to meet these requirements, including hospitals and health care facilities that require large amounts of water to maintain operations and will be critical facilities during a disaster response. These was demands will make disaster response and recovery difficult without reliable back up water supplies. Water supply systems are required to complete risk and resilience assessments as well as emergency response plans every five years under the American Water Infrastructure Act (AWIA). Work outlined in this scope may have been completed during these studies. This project is to build on that work through a lens that focuses on support to hospitals that serve JBLM and the community.

Associated Hazards

Water supply to hospitals is at risk due to earthquakes, terrorist attacks, contamination events, treatment flooding or storm damage, winter storms, and supply chain break downs for needed treatment chemicals.

Associated Critical Assets

Critical assets consist of the systems that provide potable/drinking water supply to area healthcare facilities, as well as the healthcare facilities themselves. This scope focuses on the water supply infrastructure, but additional evaluation of the healthcare facilities could also be made. In a large earthquake, the healthcare facilities are likely to be affected.

There are multiple agencies responsible for water services in the JBLM region including Tacoma Water, Thurston PUD, Lakewood, and DuPont water districts. The area water districts are generally sourced from surface water and groundwater wells. Critical water supply infrastructure includes the water source, inline storage, treatment facilities, and the transmission and distribution pipe networks. Emergency backup water systems specific to the hospital facilities that may include local storage, alternate sourced water (e.g., backup onsite wells), alternate connections for water delivery, and bottled/stored drinking water supplies are also critical in the event that water providers are unable to deliver water via the existing water distribution systems.

Approach

Complete an Emergency Water Supply Assessment for Healthcare Facilities that serve the installation and the surrounding area. The end goal is to provide sufficient water to healthcare facilities through conventional means and methods (distribution systems and storage) that are not dependent on a supply of bottled water so that the facilities can function as normally as possible during the identified scenarios. However, recognizing that system improvements sufficient to achieve this goal will not be achievable in the



near future (likely more than 10-20 years), the assessment process will also develop recommendations for alternate delivery options during the interim, as well as recommendations for capital improvement planning. The assessment consists of the steps outlined below. While this approach is written specifically for healthcare water supplies, the approach can easily be scaled to other utility systems.

- 1. Confirm Critical Healthcare Facilities**
– Work with the regional emergency planning agencies to build on existing planning efforts and conduct a regional healthcare study with a focus on confirming priority healthcare facilities supportive of military installation personnel. Consideration should be given to facilities required for installation operations for both blue sky and disaster response scenarios.
- 2. Develop Project Stakeholders and Responsibilities for each Facility**
– Once critical healthcare facilities have been identified, work to establish a project task force to oversee the project. The task force will work to identify the appropriate stakeholders for each facility including owners and users that will contribute to water supply assessment and adaptation project development. In addition, the project team will develop a communication structure for the project and each facility for improved interagency coordination.
- 3. Establish Key Planning Scenarios**
– Work with JBLM, health care provider representatives, and water providers to identify the key planning and hazard scenarios from regional natural hazard mitigation planning efforts that are most critical to regional hospitals and

healthcare facilities. An alternative to hazard specific efforts used for infrastructure vulnerability evaluation, key planning scenarios for hospital response can focus on the resulting impacts to the water systems caused by a hazard. That way multiple hazards can be considered for each scenario. An example of a suite of scenarios that focus on relative impact and encompass multiple hazards are as follows:

- a. Low Impact:** Water source/supply and/or treatment is compromised for over 72 hours, but transmission and distribution systems are not damaged. (Hazards may include a targeted attack, explosion, supply chain issue for chemicals, or contamination)
- b. Moderate Impact** – Source/treatment and water transmission system is compromised but distribution is not affected. (ex. Moderate earthquake or multi-phased attack)
- c. High Impact:** Water system is compromised. Source/transmission/distribution all impacted and require repair. (Catastrophic scenario such as a large earthquake.)

Scenarios will include estimates of casualties and emergency care needs at facilities as well as damage to transportation and other utility infrastructure to aid in estimation of base water needs as well as developing mitigation recommendations.

- 4. Collect Inventory of Water System Components** – Water providers and hospitals/health care facilities will collect existing data and fill in data gaps to develop a comprehensive database of the water system components that serve local healthcare facilities, including both water distribution system components

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(source, storage, treatment, transmission, and distribution), supply and storage redundancies, and onsite emergency and back-up systems at specific facilities.

5. Assess Baseline Water Needs – Health care providers using water usage data will evaluate a baseline level of water required to provide both normal and emergency services at each facility. This should include both drinking water for providers and patients that could be replaced with standard bottled or other delivered water supplies, as well as water for all hospital functions including laundry, sanitation, patient care, sterilization functions, and procedure support. The baseline water demand for emergencies should be based on the identified scenarios such that increased emergency care needs for each scenario as well as existing patient maintenance needs are considered.

6. Assess Resilience of Existing Water System – We understand that many of the water providers have completed system resilience assessments for seismic and other hazards. This effort will build on those existing efforts to evaluate and establish water system vulnerabilities to the identified hazards and/or scenarios focusing on water supply to hospital facilities. System components to be evaluated include supply, treatment, supply redundancies, storage, and transmission and distribution for systems that service key healthcare facilities in the defense community.

In addition, health care providers will evaluate the vulnerabilities of onsite and emergency backup water infrastructure to the identified hazards and/or scenarios

including additional onsite sources or storage and water connections or transfer facilities for temporary water delivery.

Once vulnerabilities to the two systems are identified, water providers and healthcare facilities will work together to conduct a gap analysis to evaluate the temporary water needs to meet the emergency baseline water needs developed for each scenario.

7. Develop Recommended Physical Improvements – We understand that many area water providers have risk and resilience assessments as well as capital improvement programs in process that often include resilience as a consideration. This project will identify which improvements will aid in closing the gaps between anticipated water system damage and the baseline water need for the identified scenarios. Water providers will identify any additional improvements that would address specific issues for health care supply identified for each scenario. This could include upgrades to the existing system and adding redundancy within the system.

In addition, health care providers will evaluate potential onsite improvements to the distribution and emergency backup water infrastructure that will increase the resilience of the water supply for the identified hazards and/or scenarios. Improvements could include additional onsite sources such as back-up wells, onsite storage, and the addition of water connections or transfer capacity for temporary water delivery by trucks or other temporary water delivery methods.



8. Establish Operational Procedures – Based on the identified gaps between expected system performance and baseline water need for each scenario and facility, operational measures will be evaluated to provide water between the event and system recovery. Key stakeholders for this task will be the health care providers and facility representatives, emergency management professionals (health care, agency, and water districts), and water district operations representatives. Options for consideration include providing bottled water, large capacity bladder or other trucked water delivery, portable treatment, and temporary solutions for damaged components. Operational strategies will include operating thresholds for implementation and roles and responsibilities for each delivery method including communication responsibilities in the event of a disaster.

9. Identify Funding Strategies and Implementation Plan – To complete the assessment, water providers, JBLM representatives, and health care providers will work together to identify priorities within the physical and operational measures identified as well as potential funding opportunities for implementation. Finally, an overall implementation plan will be developed for improvement and measure implementation for both water systems and health care water facilities used to provide water for care.

10. Emergency Water Supply Exercise Series – In order to test, refine, and practice emergency deployment of operational measures, the emergency

managers will work with facilities staff to develop an exercise series. The exercises should test emergency water distribution in each hazard scenario to understand where improvements can be made to operational and interim measures while physical resilience improvements are in process.

Responsible Agencies

- **Project Leads:** Local public utility districts, public works departments, and health care facilities
- **Installation Lead:** Defense Health Agency (DHA) and/or Madigan Army Medical Center.
- **Project Partners:** Regional, County, and City Emergency Management and Public Health Northwest Healthcare Response Network.

Benefits

The project will identify shortfalls in water delivery to hospitals and develop a plan to improve water delivery systems to provide resilient water service and operational measures to fill the gap in the interim so that health care facilities have consistent water supply to maintain operations throughout disaster events. This will build resilience to allow for both installation and community response and recovery to disasters and provide guidance and funding opportunities to support agencies with adaptation and infrastructure improvements.

Recommended Funding Streams

1. ASPR Partnership for Disaster Health Response System; see appendix [E.1.22](#)
2. Public Health Emergency Preparedness (PHEP) Program; see appendix [E.1.7](#)



Related Issues and Opportunities

Healthcare Facility Resilience

Although this study does not specifically address the resilience of the health care facilities themselves, this should be a consideration in regional planning and prioritizing resilience improvements. For example, many facilities will not be serviceable after a large earthquake and thus may not need resilience water supplies until the facility itself has been upgraded. Further, damaged facilities will impact the community and installation disaster response and post-disaster patient care.

Transportation Resilience

Transportation vulnerabilities in the event of larger disasters will greatly hinder operational measures to provide water during and after an event. Lack of access to physical infrastructure will lengthen the time to repair the water delivery system, which will require temporary water

solutions to serve longer than two weeks and may hinder recovery.

Electrical and Fuel Back-up

Providing health care services including sufficient water supply will likely require electricity and/or fuel. Electrical power and fuel supply/delivery are also vulnerable during events that hinder normal water delivery. Fuel will be needed for both electrical backup generators as well as for water delivery. Additional studies may be needed to evaluate resilience measures to ensure both systems are available for disaster response and recovery.

Water Interconnection Study

Another prioritized project identified during the MIRR was the need to evaluate a redundant or secondary water connection for the installation. Supply to on-base care facilities should be considered during evaluation of this project.

PROJECT 9: WATER SYSTEM EMERGENCY INTERCONNECTION

Background

This document explores the need for an intertie between an adjacent community and water utility provider, and JBLM's water system for redundancy. Currently, JBLM relies on the immediate groundwater system for its potable water supply. The existing emergency interconnections are not designed to serve the base in case of disruption to its main water source. Additionally, groundwater in the local defense community is susceptible to polyfluoroalkyl substances (PFAS). The following is a collection of related background information:

- **DuPont Connection** – An intertie currently exists between DuPont and JBLM, noted to be favor flow from JBLM's hydraulic grade line to DuPont's 400-foot pressure zone with a maximum capacity of 1,000 gallons per minute (gpm). In other words, it is designed to provide DuPont with an alternative source of water. The system requires manual intervention from JBLM and DuPont. There is the potential to explore the feasibility of a booster pump station to provide consistent bidirectional flow from DuPont to JBLM during an emergency.
- **Lakewood Connection** – Lakewood identified in its comprehensive plan a potential intertie point at 150th St. SW near JBLM that is available but not connected. Lakewood operates a 3 million gallon (3MG) reservoir at the perimeter of the base that uses a separate water supply from JBLM and could serve the base in case of a contamination event.
- **Tacoma Connection** – Tacoma Water's main supply facility is about one mile

away from JBLM's fence line and on higher ground. A water supply from Tacoma Water to JBLM would be gravity fed. Over 95 percent of Tacoma Water's supply is from surface water, the Green River watershed, so PFAS contamination of their supply is not a concern. This could increase the redundancy of water supply in response to potential on-base PFAS contamination or other emergencies.

Associated Hazards

Multiple hazards have the potential to severely strain the JBLM water supply, including a large earthquake, terrorism, and contamination of source wells.

Associated Critical Assets

Critical assets include source and transmission infrastructure for adjacent water utilities that may be candidates for a future intertie connection.

Approach

Coordinate with adjacent water utilities to complete a study to identify potential intertie options between the JBLM water system and other public water systems in the defense community, choose a preferred alternative, and complete design and construction of the proposed intertie. The project will (1) establish system requirements and assess options in a manner that results in selection of preferred alternative; (2) perform engineering design of the preferred alternative; and (3) implements the bid, construction, and operations and maintenance phases of the project. A more detailed description of the task and subtasks is found below.

1. **Develop Water System Level of Service Goals** – Determine the JBLM current, future, and emergency water demand (quantity and timing) including an estimation of how much water could JBLM need in an emergency, what



system pressure is required, and how quickly the water should be available in the event of a water supply failure.

start-up, testing, and commissioning of the intertie connection.

Responsible Agencies

Project Lead: Installation Directorate of Public Works.

Installation Lead: Directorate of Public Works

Project Partners: SSMCP, Tacoma Public Utilities – Water, Lakewood Water District, DuPont Public Utilities, American Water, and Thurston County Public Utility District.

Benefits

Aside from the provision of drinking water, communities depend on their water supply to complete a range of critical functions. Installing a water interconnection between the base’s water system and an adjacent community would increase the redundancy of sourcing for both systems and make them more resilient to hazards in general.

Recommended Funding Streams

- 1. Water Infrastructure Finance and Innovation Act (WIFIA); see appendix [E.1.8](#)
- 2. Planning and Engineering Loan & Grant (Drinking Water State Revolving Fund); see appendix [E.1.9](#)

Related Issues and Opportunities

PFAS Contamination and Regulations

PFAS contamination is a potential issue for ground water source wells in the region including JBLM. Current regulations are targeted toward drinking water supplies, but there is pending litigation for wastewater residuals, specifically bio-solids, because drinking water contributes to these streams where PFAS can become concentrated. CERCLA designation of PFOA and PFOS as hazardous materials took effect July 2024, and while the EPA is currently not targeting municipalities, legal action is not prevented from other groups or parties.

6.3 Recommendations for Implementation

CONTINUANCE OF RESILIENCE TASK FORCE

Background/Issue

Development of the MIRR and the Resilience Action Plan were informed through inputs from the SSMCP Resilience Task Force that provided a mechanism for bringing together JBLM and local defense community partners and subject matter experts across the range of community lifelines addressed in this study.

Recommendation

SSMCP should leverage the momentum the MIRR generated to formalize an ongoing mechanism for SSMCP members to collaborate on resilience issues and opportunities in the local defense community.

INTEGRATION WITH OTHER PLANNING EFFORTS

Background/Issue

The MIRR is just one part of the resilience planning landscape for the South Sound Region and is intended to implement in concert with other key strategic plans that include:

- Hazard Mitigation Plans – Text
- Comprehensive Plans – Text
- Comprehensive Emergency Management Plans – Text
- RCW 38.52.590: the emergency management division shall develop and administer a disaster resilience program to include:
 - » Strategies for addressing the impacts of all hazards, both natural and human-caused
 - » Participating in interagency efforts to advance statewide climate resilience activities, including collaborating on the

development of a statewide strategy and identifying opportunities to leverage funding to advance solutions that improve the resilience of communities, infrastructure, and ecosystems

Recommendation

SSMCP should ensure that the MIRR is made available to partners in the defense community and facilitate their awareness of its content and the solutions identified for implementation in the RAP. The findings of the MIRR and the contents of the RAP may be used by community partners to develop their own strategies for resilience that have a shared resilience benefit with JBLM.

6.4 Funding Approach

The Resilience Action Plan (RAP) includes input from Stantec’s North America Funding team to provide a roadmap for SSMCP and local defense community partners to develop funding strategies to turn the recommended resilience actions and projects into reality. Implementation actions for each priority critical asset identified in the Resilience Action Plan are linked to priorities and timelines for recommended federal, state, and regional funding opportunities. In total, 27 funding opportunities are identified and ranked for their relevance to the MIRR. Bundled projects are recommended for submission in a single funding application for particularly competitive or large grant opportunities, including the FEMA Building Resilient Infrastructure and Communities Program (BRIC) and the DoD Office of Local Defense Military Installation Sustainability Program.

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- 2. **Develop Understanding of Inter-tie Options** – Work with area water utilities to develop intertie options by determining the water quantity available, required treatment to match JBLM water quality requirements (including what is needed to mitigate corrosion or disinfectant blending concerns), and physical requirements to construct the intertie including the location, properties required, and any construction issues, including easements, environmental concerns, etc. Mixing water between systems can cause chemical releases in the receiving system including lead, iron, and manganese. Water quality parameters (e.g., pH, alkalinity, minerals, metals, temperature, organic carbon, chloride, sulfate mass ratio) and treatment/disinfection (e.g., chlorination) types should be included in the evaluation.
- 3. **Preliminary Design** – Develop a preliminary design and cost comparison of short-listed options including planning-level design documents at a 5% to 10% level to facilitate capital cost estimating.
- 4. **Alternatives Analysis** – Complete an alternatives analysis based on the available options, water supply, treatment needs, and preliminary design requirements and cost estimates. Identify the preferred alternative.
- 5. **Intertie Detailed Design** – Complete design and develop a bid package for the preferred intertie alternative.
- 6. **Intertie Construction** – Complete bidding, procurement of contractor, and construction of the final project including

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6.5 Additional Issues and Opportunities

Throughout the engagement process, community stakeholders identified other issues and projects that were not included in the list of prioritized Resilience Action Plan projects. Understanding that these issues and projects also hold potential opportunity as community endeavors, the project team has included short descriptions of these issues and projects that may warrant further support from community partners.

COMMERCIAL AIRPORT SITING Background/Issue

In 2019 the Washington Legislature created the Commercial Aviation Coordination Committee (CACC) to recommend a new primary commercial aviation facility and ways to add capacity to accommodate future demand at other aviation facilities. The CACC, which met from December 2019 through June 2023, was comprised of 15 voting members and 12 non-voting members representing a range of interests that included the airline industry, freight and trucking, planning organizations, airports, legislators, Washington state departments of commerce and transportation, members of the public and JBLM.

- The legislature tasked the CACC to meet three deadlines.
- **Phase 1** – Provide an initial list of six locations to the Legislature by January 1, 2021.
 - **Phase 2** – Provide a list of the top two locations by October 15, 2022
 - **Phase 3** – Provide a single preferred location recommendation by June 15, 2023.

The CACC tasked the Washington State Department of Transportation Aviation to

provide staff support for coordinating and administering the commission and technical assistance as requested by commission members. The consultant for the Washington Aviation System Plan conducted the technical analysis that served the needs of the CACC.

The CACC presented their final recommendations before the legislative transportation committees during its final meeting on June 9, 2023. The legislature had charged the CACC to provide a list of recommendations on the future facilities needed to meet anticipated commercial aviation, general aviation, and air cargo demands. These recommendations included the use of JBLM land as part of the long-term commercial aviation capacity solution. The CACC recognized Yakima Air Terminal-McAllister Field as the only existing airport interested in becoming the solution, but most CACC members did not believe that should be the location for the new primary commercial aviation facility. However, the final CACC member recommendations noted in their Commercial Aviation Coordinating Commission Report to Legislative Transportation Committees 2023 Final Recommendation (June 15, 2023) includes the recommendation to move JBLM to eastern Washington, in the vicinity of Moses Lake (a C-17 training facility) and Yakima (Army training facilities). Then repurpose JBLM into a new commercial aviation facility. The City of Yakima is willing to host the “preferred commercial aviation facility” and consider making Yakima Air Terminal/McAllister Field a joint military-commercial facility and relocating JBLM aviation assets there.

As the CACC completed their work in June 2023, the legislature created a follow-up group called the Commercial Aviation Work Group (CAWG) with different members and

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a different mission. However, the work group is to use the information the CACC found as baseline information to proceed with its work.

Through HB 1791 the Legislature created the work group to evaluate the long-range commercial aviation and transportation needs of the state, including alternatives for additional aviation capacity that includes expanding use of existing airports and multi-model opportunities. The goal of the work group is to recommend workable solutions to meet the travel needs of the region that may not mean building a new airport.

The Governor’s Office appoints 19 voting members to CAWG according to the categories designated in HB 1791. In turn, the voting members are to invite 11 non-voting members to join the work group, also according to the categories designated in HB 1791. Unlike the CACC, the work group does not include a representative from JBLM.

In May 2021, the Puget Sound Regional Council completed their Regional Aviation Baseline Study and shared the study results with the CACC. The Council designed the Baseline Study to provide an understanding of the regional aviation system and forecast future needs with a focus on the following.

- Identify roles of each airport and aviation activities within the Puget Sound Region.
- Provide a regional perspective on how aviation activities in the region interact with each other, the community, and broader economy.
- Obtain community input about their needs and build a collective understanding about aviation and airspace constraints.
- Identify future aviation needs within the region and set the foundation for future planning.

Three commercial service airports fall within the Puget Sound Region – Seattle-Tacoma International Airport, Payne Field that hosts a large aircraft manufacturing facility, and King County International Airport. This regional aviation system includes commercial passenger service, general aviation, and air cargo. The region can accommodate approximately 28.6 million enplanements by 2027, but the projected demand for passenger enplanements is 55.6 million by 2050, with a forecast gap of 27 million unmet enplanements each year by 2050.

As the population and jobs continue to grow across the region, roads will become more crowded resulting in the need to expand the Link light rail system and other multi-model solutions. Sea-Tac in particular faces airspace constraints, although new Federal Aviation Administration (FAA) navigation systems will help improve use of air space. Adequate runway capacity within the region’s aviation system is projected to accommodate general aviation demand through 2050. But the central Puget Sound region is projected to fall short of on-airport warehouse space starting in 2027. Inadequate warehousing and landside access facilities for both Sea-Tac and King County International Airport is expected starting in 2027. The Baseline Study includes identification of three scenarios to address the 2050 demand.

- Meet 50% to 60% of 2050 demand with current capacity as well as plans in place to increase capacity at Sea-Tac through their Sustainable Airport Master Plan.
- Meet 80% of 2050 demand with two commercial service runways at one or two airports, including Sea-Tac implementing projects outlined for their Long-Term Vision.
- Meet 100% of 2050 demand with three commercial service runways at up

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to three airports, including Sea-Tac implementing projects outlined for their Long-Term Vision.

The Baseline Study team completed a technical assessment of each airport in the Puget Sound Region to determine the expansion potential for each. Building a new airport was not assessed as part of the study effort. Of the 29 airports analyzed, most were eliminated for expansion because critical criteria was not met like runway length; conflicts with existing flight paths; impact to Sea-Tac operations; likelihood of flooding; roadway and transit access; impacts to residential areas, schools, or churches; ability to accommodate additional aircraft operations; or impact to aerospace manufacturing. The following remaining five airports were further analyzed.

- Arlington Municipal Airport
- Bremerton National Airport
- Paine Field
- Tacoma Narrows Airport
- Joint Base Lewis-McChord (JBLM was eliminated due to federal ownership and U.S. military needs).

The intent of the Puget Sound Regional Council Baseline Study was to provide a foundation for regional decision makers as they consider if the region should accommodate the growing demand for aviation, and how to do so. The council released their study findings to the public throughout the project, including council members and state and local elected officials. The council also provided the study findings to the CACC to assist their efforts to evaluate near-term measures to extend capacity of existing airports in Washington state while examining long-term solutions, including recommending a new primary commercial aviation facility.

Recommendations

The Governor's Office appointed the 19 voting members to the Commercial Aviation Work Group (CAWG), and in turn, the voting members invite 11 non-voting members to join the work group. Unlike the CACC, the work group does not include a JBLM representative, although the CACC 2023 Final Recommendation Report includes the recommendation to move JBLM to eastern Washington. Therefore, the Washington Legislature is recommended to direct the Governor's Office to appoint the JBLM Garrison Commander as an Ex-Officio member of the work group to ensure continued representation of the installation. Furthermore, as the State of Washington moves forward to evaluate the long-range commercial aviation and transportation needs of the state, including alternatives for additional aviation capacity through expansion of existing airports, multi-model opportunities, and possible new commercial airport siting, the Department of Defense should consider a request to join the FAA as a cooperating agency for any National Environmental Policy Act environmental impact analysis associated with assessment of additional aviation capacity through existing airport expansion or new commercial airport site alternatives.

The Code of Federal Regulations (CFR) Title 14 Part 157 – Notice of Construction, Alteration, Activation, and Deactivation of Airports provides guidance to persons proposing to construct, alter, activate, or deactivate a civil or joint-use (civil/military) airport or to alter the status or use of such an airport. Section 157.7 directs FAA to conduct an aeronautical study of an airport proposal and, after consultation with interested parties, issue a determination. FAA is to consider effects the proposed action would have on existing or contemplated traffic patterns of neighboring airports,

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existing airspace structure, and manmade and natural objects within affected area. The Feasibility and Site Selection Process for a new airport includes Airspace Evaluation Components. The FAA Air Traffic Organization, which includes Department of Defense representation, designates airspace use and considers Department of Defense operations, both current and future.

PFAS IN THE DEFENSE COMMUNITY

Background/Issue

Aquifers beneath and around the base have shown signs of contamination from per- and polyfluoroalkyl substances (PFAS), which are manmade chemicals valued for their strong chemical bond that resists heat, oil, grease, and water. This makes them popular ingredients in firefighting agents called aqueous film forming foam (AFFF). The Department of Defense (DoD) use of PFAS started in the 1970s, with the introduction of AFFF for fuel fighting purposes. PFAS are "forever chemicals" that are not known to break down in the environment and have been linked to many potential health concerns.

Some of the PFAS contamination in the aquifers beneath and around the base is attributed to JBLM's use, storage or disposal of AFFF chemicals related to fire-fighting training, fire-fighting equipment testing/ storage areas, and emergency responses in hangers and airfields. The Lakewood Water District has closed multiple drinking water wells due to the identification of PFAS contamination.

The Department of Defense (DoD) follows the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, also known as "Superfund", and long-standing Environmental Protection Agency (EPA) regulations for all chemicals in its cleanup program, including PFAS. The

Defense Environmental Restoration Program (DERP) statute provides authorities to DoD to perform and fund actions and requires they be carried out in accordance with CERCLA.

Since 2016, DoD has been actively testing and monitoring drinking water off-base at installations that may have used PFAS to identify potential impacts in drinking water found above 70 parts per trillion. DoD's actions are consistent with EPA's recommended actions that may include treatment of drinking water or providing alternative water supplies, such as bottled water, implementing a whole-house filtration system, or connecting residents served by private wells to public drinking water systems.

In July 2019, the Secretary of Defense stood up a task force to ensure a coordinated approach on DoD-wide efforts to address PFAS. Section 2714 of title 10, United State Code codifies DoD's PFAS Task Force and identifies its members and goals. The PFAS Task Force is focused on the following five goals:

- Mitigate and eliminate the use of Aqueous Film Forming Foam (AFFF)
- Fulfill DoD cleanup responsibilities related to PFAS
- Understand the impacts of PFAS on human health
- Expand PFAS-related public outreach
- Support PFAS research efforts

In accordance with Section 345 of the National Defense Authorization Act for Fiscal Year 2022, DoD is providing the final testing results for off-base drinking water located in "covered areas" that are areas adjacent to and down gradient from a military installation, formerly used DoD site, or National Guard facility. The sampling results are only reported for locations outside the installation

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boundary. DoD separately manages and reports on-base drinking water where DoD operates the drinking water system. DoD also addresses PFAS in groundwater that is not consumed as drinking water under CERCLA.

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As part of the Army Environmental Command’s commitment to supply quality drinking water to its service members, family members, and civilians, the Army has implemented a comprehensive drinking water testing program at Army facilities that may have used PFAS. In April 2016, JBLM proactively began testing its drinking water sources from the 23 drinking water production wells on the installation. Testing results confirmed the presence of PFAS in five drinking water wells on JBLM. In August 2020, JBLM Public Works Environmental Division conducted a Preliminary Assessment/Site Inspection, the first phase of the CERCLA cleanup process, to assess if PFAS has been released to the environment at JBLM and to identify locations that are of potential interest, based on whether there was use, storage or disposal of any PFAS-containing material and determine if a release to the environment has occurred.

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In collaboration with federal and state regulatory agencies and interested stakeholders, the Army follows the CERCLA process to investigate a release resulting from Army activities and to assess the appropriate cleanup actions based on risk to human health and environment. CERCLA is a complex, multi-phase process that provides a science-based approach for cleanup and may take years to complete.

As the Army moves through the CERCLA process, they work in collaboration with regulatory agencies, communities, and facilities to ensure open and transparent information sharing. Following CERCLA, the Army fully investigates releases and

determines the appropriate cleanup actions based on risk. The investigations include assessing potential off-installation migration of PFAS into drinking water. The Army’s actions are consistent with EPA’s recommended actions, which include treatment of drinking water or providing alternative water supplies. The Army may take interim actions at any phase during the CERCLA process. Interim cleanup actions may include removal of soil “hot spots” and installation of groundwater extraction systems.

At JBLM, the CERCLA Preliminary Assessment and Site Inspection phases are complete. The CERCLA Remedial Investigation/Feasibility Study phase is now underway with a June 2025 estimated end date.

Recommendation

Establish a programmatic approach to address PFAS in the local defense community’s water supply that (1) establishes a JBLM PFAS Restoration Advisory Board consisting of representatives from JBLM and the South Sound community; (2) establishes a joint strategy for investigation and ongoing monitoring of PFAS contamination in the region; and (3) supports its members through provision of technical and funding assistance.

Community engagements, in-person installation visits, outreach events, technical presentations, and reports and briefings are some of the tools DoD and the Army may use to engage with the public, Congress, and other stakeholders. DoD may also use Community Involvement Plans (CIPs), Restoration Advisory Boards (RABs) and the Technical Assistance for Public Participation (TAPP) to promote community engagement in the cleanup process to support communication, outreach, and transparency. The local installation will work with the community to determine the best options.

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Seismic activity and landslides pose a major threat to this asset, whose only contingency plan is trucking fuel from the Defense Logistics Agency (DLA) facility in Manchester, Washington. This tactic was employed in 2017 over three-and-a-half days with success, but its effectiveness over longer time periods is of concern to the base. Furthermore, potential legislation imposing limitations on aviation fuel distribution would eliminate the possibility for creating redundancy in this fuel distribution system.

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CIPs address how DoD will conduct outreach about cleanup activities and how the public can participate in decision-making throughout the cleanup process. RABs offer a structured, focused, and interactive opportunity for stakeholders to participate in the cleanup process by reviewing and commenting on cleanup documents and activities, serving as a liaison to and sharing cleanup information with the community, and providing a forum to exchange information about the schedule, type, and status of cleanup activities.

In 2022, DoD initiated the DoD Environmental Cleanup Communication and Outreach (ECCO) Initiative to enhance dialogue and communication with community residents, RAB members, environmental regulators, and other stakeholders. The ECCO Initiative includes DoD personnel installation visits and in-person attendance at RAB and other public forums, and one-on-one interviews to allow participants to voluntarily ask questions.

RESILIENCE OF JET FUEL SUPPLY

Background/Issue

JBLM relies on the U.S. Oil-McChord Pipeline (the “Pipeline,” herein) to deliver Jet-A fuel, the fuel required to power the 62nd and 446th Airlift Wing’s forty C-17s and Army Rotary Aviation units. The 6-inch diameter, 14.25-mile long pipeline runs from the U.S. Oil refinery in the Port of Tacoma to storage tanks on the perimeter of McChord Airfield. On average, McChord Airfield consumes about 2.18 million gallons of Jet-A fuel per month, making this high-volume delivery system essential to the base’s aviation readiness. About 7 million gallons of Jet-A fuel are stored on site monthly by the Logistics Readiness Squadron’s (LRS) Petroleum, Oil, and Lubricant (POL) unit.

Recommendation

JBLM could explore methods for retrofitting the Pipeline to withstand seismic activity and landslides or enhancing the area around the Pipeline to mitigate the effect of these hazards. Once strategies are identified, JBLM can work with the municipalities along the pipeline’s route to determine ways to implement these strategies without causing prolonged disruption to each community.

WILDFIRE RESILIENCE

Background/Issue

Wildfires have become a growing concern in the South Sound Region as their range and effects have increasingly expanded into the area over the past couple of decades. These events can significantly damage infrastructure in rural communities and create air quality conditions that are hazardous for urban populations. Furthermore, wildland-urban interface (WUI) areas have been identified in and around the municipalities of Roy, Yelm, Steilacoom, and Spanaway/Frederickson; all of which are adjacent to the installation.

Recommendation

SSMCP should establish a work group containing representatives from the installation, Washington Department of

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Natural Resources (DNR), local fire districts, local utility providers, and local public health authorities to develop an interagency strategy to address wildfire impacts in the defense community. Potential actions to be included in this interagency strategy are as follows:

- Work with public health authorities to develop a Wildfire Smoke Education and Preparedness campaign that uses community outreach to educate residents on the risks of wildfire smoke and the actions they can take to be prepared for the incident. This action can be paired with the provision of air filters, masks, and other resources that can be distributed to residents, specifically vulnerable populations.
- Work with local utility providers, Washington DNR, the installation's forestry division, and local fire districts to develop a fuel management plan that oversees the heavily wooded areas in and around the installation.

CATASTROPHIC DAM FAILURE AND VOLCANIC LAHAR EVACUATION ROUTE PLANNING

Background/Issue

The South Sound is home to many dams, some of which pose heightened risk to the public due to their size and location. Alder and LaGrande Dams are two consecutive dam structures on the upper reaches of the Nisqually River part of Tacoma Power's hydroelectric facility. Mud Mountain Dam is a large flood control dam operated by the Army Corps of Engineers on the upper reaches of the White River, a tributary of the Puyallup River. These three structures are considered High-Hazard due to their high potential to endanger lives in the event of a failure; that is, their inundation zone overlaps with residential and commercial areas. Refer to the Dam Failure Exposure Map in Appendix C.2 and on the following page for a depiction of Alder and LaGrande dams' collective inundation zone.

Mt. Rainier, an active stratovolcano located in the far eastern portion of Pierce County, has the potential to send massive debris flows, known as lahars, containing superheated mud, rock, and water into its several river valleys including the White and Nisqually. Lahars could flow down the White and/or Nisqually River valleys and destroy the dams in their path, creating an extremely dangerous flooding scenario.

Recommendation

Pierce and Thurston Counties, in collaboration with Washington Department of Transportation, should develop a Dam Failure and Lahar Evacuation Plan that includes designated evacuation routes, alert notification and signage protocols, operational coordination, and staging area locations and details to be implemented in response to a dam failure or volcanic lahar. Additionally, the plan should include details about maintaining a public preparedness campaign for the evacuation effort, as well as training for organizations and personnel who would be involved in the evacuation effort.

FLOOD RESILIENCE ENHANCEMENT

Background/Issue

The project team was informed of three prominent locations that currently experience and are estimated to experience increased impacts from riverine flooding: the lower 10 miles of Puyallup River, State Route 507 (SR-507) bridge crossing the Nisqually, and Clover Creek's intersection with Interstate 5 (I-5).

- **Lower 10 miles of Puyallup River:** Recent peak flow numbers for the Puyallup River system indicate that the levees located on its lower 10 miles are no longer sufficient to retain a 100-year flood. Failure of the Puyallup levee system would cause significant damage to the surrounding area and

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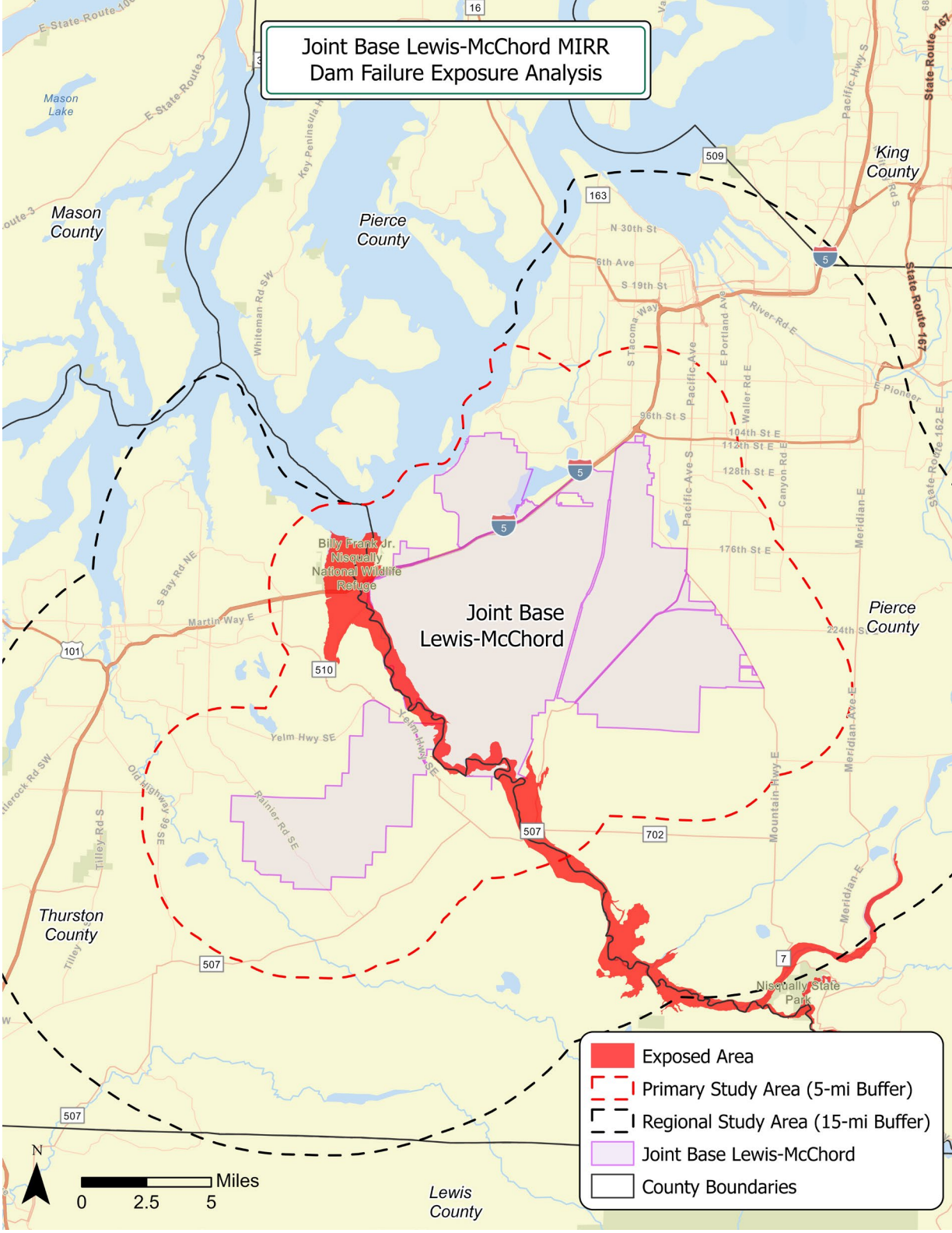
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potentially close portions of I-5 where it crosses the river.

- **SR-507 Bridge over the Nisqually River:** Research suggests that a 100-year flood in the Nisqually River would inundate the approaches to the SR-507 bridge where it crosses the river in the City of McKenna, effectively taking out this crucial route to the installation.
- **Clover Creek:** The City of Lakewood completed a Clover Creek Flood Study that found that significant flooding of Clover Creek will overtop I-5, Pacific Highway, and Bridgeport Ave. for up to two weeks. This impact to the transportation network could largely impact the installation's mission readiness.

Recommendation

The following recommendations were developed for each of the three issue areas:

- **Lower 10 miles of Puyallup River:** Pierce County Department of Flood Plain Management has dedicated many resources to studying and modeling the extent of future floods that could greatly impact this part of the watershed. Moving forward, the Department will need to identify strategic locations along this stretch of the river that should be prioritized for floodplain enhancements. This effort may require the acquisition of private land that can be converted back into floodplain.
- **SR-507 Bridge over the Nisqually River:** The Washington Department of Transportation, in collaborating with the City of McKenna, should identify floodplain enhancements,

levee construction/improvement, and/or other resilience building strategies along the Nisqually River near the 507 Bridge to mitigate the impacts to transportation caused by major floods.

- **Clover Creek:** The Engineering Study completed as part of the Clover Creek Flood Study found that an approach incorporating both levee construction and floodplain enhancements would generate the greatest benefits for the community.

HAZARDOUS MATERIALS EMERGENCY PREPAREDNESS

Background/Issue

Need for relationship building and coordination with key hazardous materials lifeline partners.

Recommendation

Enhanced Local Emergency Planning Committee engagement and emergency preparedness coordination and joint planning/exercising with rail and pipeline owner/operators.

SENTINEL LANDSCAPES/ACUB/ CRITICAL HABITATS

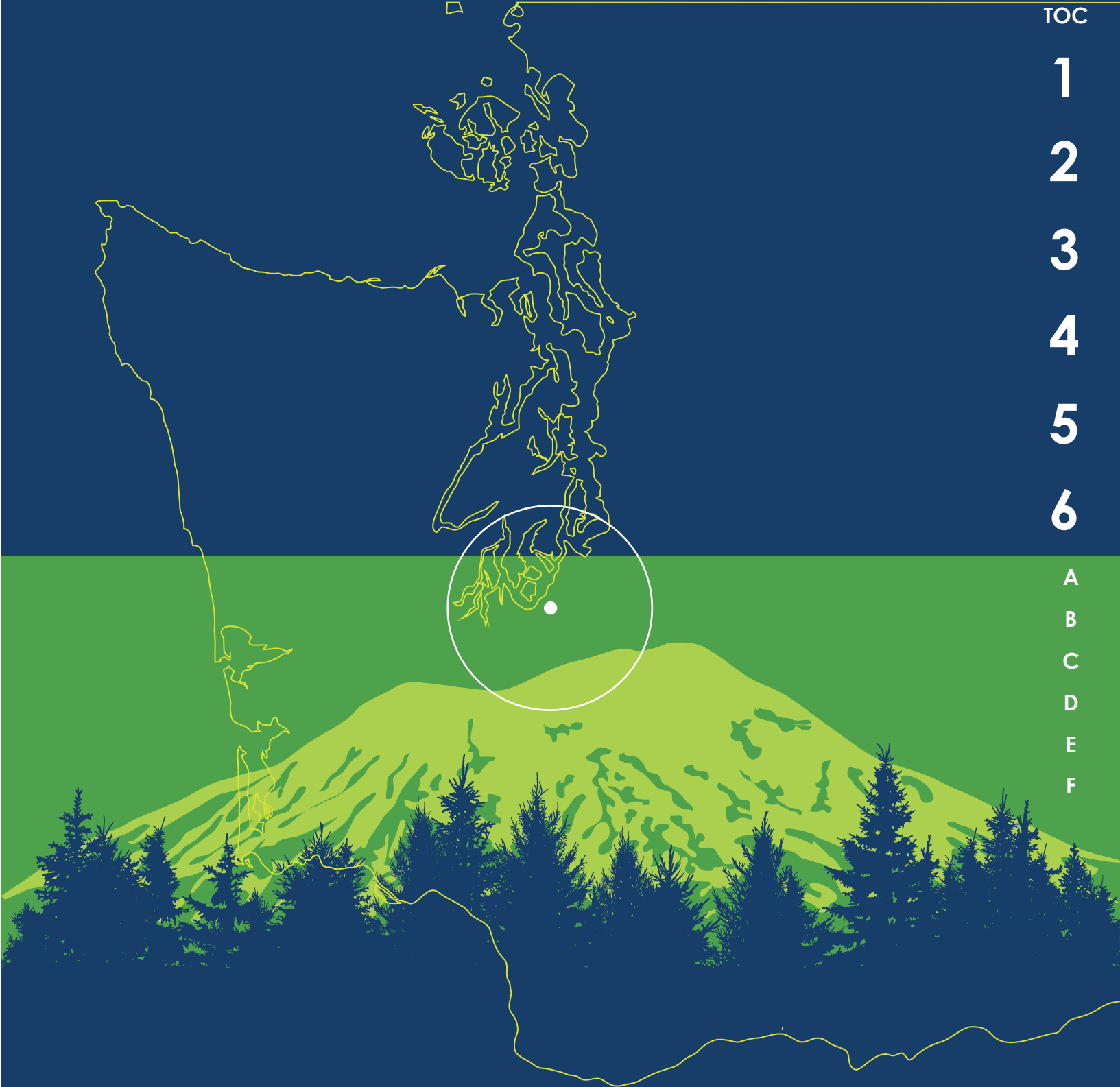
Background/Issue

The glacial outwash prairies of the South Puget Sound are one of the rarest ecosystems in the United States following decades of habitat loss and degradation. These prairies support a host of species listed on the Endangered Species Act (ESA) — such as two subspecies of the Mazama Pocket Gopher, the Taylor's Checkerspot Butterfly, and the Streak Horned Lark. JBLM encompasses the largest remaining intact tract of prairie in Western Washington; the presence of ESA-listed species restricts the extent of military training exercises on this prairie land within JBLM.

In response to this, JBLM has established the Army Compatible Use Buffer (ACUB), Conservation and Crediting Program (CCP), and the Sentinel Landscapes Partnership to support the recovery and conservation of these ESA-listed species and subspecies elsewhere so that restrictions on training land can be lifted.

Recommendation

JBLM should work through its ACUB, CCP, and Sentinel Landscapes Partnership, in conjunction with state and federal environmental regulatory agencies, to develop a decision-making framework that includes climate indicators for natural resource and ecosystem management. This effort can be supported with existing tools such as habitat suitability models.



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Acute Hazard	Hazards that impact assets over a relatively short period (e.g., hours to days).
Adaptation	In human systems, the process of adjustment to actual or expected climate and its effects to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects.
Chronic Hazard	Hazards that gradually impact assets over a longer period (e.g., years to decades) or occur regularly on an annual basis.
Climate	Climate is the long-term weather pattern in an area, typically over a 30-year period.
Climate Adaptation	Climate adaptation is the international practice of assessing and implementing strategies to respond to local variability in climate-related elements such as temperature, precipitation, wind, storm events, and sea-level rise. It is important for communities to assess how increased variability in climate trends might affect the daily lives of the people, processes, and systems within them. Adaptation can take many forms and can be tailored to the specific needs of a community or region.
Climate Change	A change of climate, attributed directly or indirectly to human activity, that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.
Community Lifelines ¹	Lifelines enable the continuous operation of critical government and business functions and are essential to human health and safety or economic security. The integrated network of assets, services, and capabilities that provide lifeline services are used day-to-day to support the recurring needs of the community and enable all other aspects of society to function.
Community Resilience	Is widely accepted in the planning industry as the sustained ability of a community to respond to, withstand, and recover from adverse situations. Resilient communities can respond to and adapt quickly to system shocks while maintaining their economic, environmental, and social functionality.
Consequences	The consequences of realized risks on natural and human systems, where risks result from the interactions of climate-related hazards (including extreme weather/climate events), exposure, and vulnerability. Impacts generally refer to effects on lives; livelihoods; health and well-being; ecosystems and species; economic, social, and cultural assets; services (including ecosystem services); and infrastructure. Impacts may be referred to as consequences or outcomes and can be adverse or beneficial.
Critical Asset	Are those where loss of functionality could lead to loss of life, serious injury, threatened safety, public health impacts, or quality of life reduction (e.g., long-term economic impacts or impacts to installation mission readiness).
Hazard	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

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Hazard Mitigation	Hazard mitigation is any action taken to reduce risk before, during, or after a hazard event. As a planning concept, it looks to reduce harmful impacts from natural hazards, such as flooding, wildfires, earthquakes, severe weather, and hurricanes, or from human-induced threats, such as chemical releases, cyberattacks, and terrorism. Hazard mitigation planning can incorporate climate adaptation by assessing and seeking to reduce future risks.
Likelihood	The chance of a specific outcome occurring where it might be estimated probabilistically.
Military Installation Resilience	The capability of an installation to avoid, prepare for, minimize the effect of, adapt to, and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions, that do, or have the potential to, adversely affect the military installation or essential transportation, logistical, or other necessary resources outside of the military installation that are necessary in order to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions.
Redundancy	The concept of redundancy within resilience focuses on achieving safeguards against the failure of a system. Redundancy aims to increase reliability and predictability by providing alternatives when a primary system or process fails.
Resilience	The capacity of interconnected social, economic, and ecological systems to cope with a hazardous event, trend, or disturbance, responding or reorganizing in ways that maintain their essential function, identity, and structure. Resilience is a positive attribute when it maintains capacity for adaptation, learning, and/or transformation.
Risk	The potential for adverse consequences for human or ecological systems, recognizing the diversity of values and objectives associated with such systems. In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change. In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system to the hazards. Hazards, exposure, and vulnerability may each be subject to uncertainty in terms of magnitude and likelihood of occurrence.
Sustainability	While resilience captures the ability to respond to shocks to a system, sustainability speaks to the long-term ability to maintain or improve functions. Sustainability emphasizes the importance of economic efficacy, environmental stewardship, and equity or social vitality through what is often referred to as the “triple bottom line” concept. Sustainability recognizes that these three pillars are essential in maintaining and improving long-term functionality and quality of life within communities. Defense communities face the added complexity of considering their relationship with the local military installation when striving to balance these goals during the decision-making process.
Vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Project Governance

The resilience planning team is typically comprised of individuals and organizations that work together to gather resources and data, contribute expertise, and help develop the path forward for the community through the representation of a broad range of interests. The resilience planning team for the MIRR includes a **Policy Committee**, which serves as the executive steering committee, and the **Resilience Task Force**, which represents a broader stakeholder group tasked with reviewing the vulnerabilities, risks, and development of resilience actions.

Additionally, **Military Installation Representatives (MIRs)**, individuals currently serving the installation, and **Subject Matter Experts**, personnel knowledgeable of certain aspects and/or hazards, were utilized for refining the scope and gathering in-depth information.

Policy Committee

For the JBLM MIRR the Policy Committee was comprised of the members from the SSMCP Steering Committee and Executive Leadership Team, who were tasked to review the vulnerability and risk assessment analysis findings and potential solutions, evaluate the recommendations and guidance from the other stakeholder audiences, and accept what resilience projects and actions to include in the final MIRR Report

Resilience Task Force

The JBLM MIRR Resilience Task Force was comprised of members of the SSMCP Working Groups, as well as other individuals identified to have applicable technical background and jurisdictional

representation. The Resilience Task Force was tasked to review the vulnerability and risk assessment analysis findings and potential solutions, as well as provide recommendations to the MIRR Policy Committee for final approval. Notably, the Resilience Task Force provided technical assistance and guidance on a variety of topics related to the MIRR.

Military Installation Representatives

The Military Installation Representatives included leaders and technical staff from DoD and JBLM to provide relevant reports and analyses associated with hazard resilience at JBLM, communicating long-range growth and operations plans for the base, reviewing findings, and providing feedback on potential resilience solutions. Throughout the MIRR study process, the Military Installation Representatives served in an ex officio role to advise the Policy Committee and Resilience Task Force on perspectives of the installation and military operations.

Subject Matter Experts

The Subject Matter Experts (SMEs) included individuals identified as having crucial knowledge of the region and were tasked to provide feedback, guidance, and advice on potential threats facing shared assets between JBLM and South Sound communities. Additionally, SMEs reviewed and refined the resilience solutions documented in the Resilience Action Plan.

Engagement Event Descriptions

Project Kickoff

The invitees for the Project Kickoff comprised almost entirely of Military Installation Representatives and local emergency managers. The majority of the meeting was dedicated to explaining the MIRR process, the outcomes of past MIRR studies, and the details of this specific MIRR (e.g., budget, approach, and sponsor). Once participants understood the purpose of the MIRR, they were then asked to record key issues and community entities associated with each lifeline. The responses gathered in this activity informed the establishment of the Resilience Task Force and set the early foundation for several projects in the Resilience Action Plan.

Workshop #1: Hazard Identification and Screening

Workshop #1 were individuals identified to serve on the Resilience Task Force, current SSMCP members, and individuals recommended by their organization or SSMCP. The first half of the workshop was committed to briefing participants on the process, expected outcomes, study area, and hazards identified so far for the MIRR study. In the second half of the workshop, participants gathered into small groups to provide their feedback on the hazards identified, identify assets of high concern, and provide any other notable information. The following results issued from these small groups sessions:

- Confirmation of sea level rise, earthquakes, riverine flooding, and transportation impacts as high priority hazards
- Identification of supply chain and labor shortages as issues that also affect the region
- Identification of notable assets including the Port of Tacoma, the

- Nisqually Bridge (I-5), SS911 Dispatch Center, notable hospitals and VA clinics in the region, Alder Dam, Solo Point Wastewater Treatment Plant, and the emergency water intertie between JBLM and the City of DuPont.
- Identification of important regional agencies such as the Disaster Assistance Council (DAC) and Washington 211 (provided by United Way of Pierce County).
- During the breakout sessions, a GIS Web Viewer application that Stantec developed was used to record information participants provided for individual assets in the MIRR study area. Following Workshop #1, a link to this application was distributed to the initial invitee list so the stakeholders could record additional assets. Following Workshop #1, JBLM personnel provided the project team a tour of the installation.

Lifeline Interviews

A series of five Lifeline-specific group interviews were conducted over the course of two weeks in early October 2023 to review assets with relevant community stakeholders and SMEs. The Food, Hydration and Shelter; Communications; and Safety and Security Lifelines were combined into one interview as they shared multiple assets among each other. No group interviews were conducted for the Energy and Hazardous Materials Lifelines due to a lack of responses from identified personnel.

The five group interviews were organized and conducted in the following order:

- Transportation – October 2, 2023
- Water Systems – October 3, 2023
- Health and Medical – October 3, 2023
- Food, Hydration, and Shelter; Communications; Safety and Security – October 10, 2023
- Natural Resources – October 10, 2023

For each interview, participants were presented with a list of assets identified for their respective Lifelines and asked to provide input on these assets. This process led to the identification of additional assets, ranking of asset criticality (low, medium, and high), the identification of past and predicted impacts for certain assets, and the provision of additional information on specific assets (past, active, or planned adaptation projects). If no participants were knowledgeable about a certain asset within their Lifeline during the interview, they were asked to provide the contact information of an individual who was knowledgeable, which led to additional follow-up.

Workshop #2: Asset and Asset-Impact Identification

Prior to Workshop #2, more than 7,500 regional assets were collected from databases that both Pierce and Thurston Counties provided as well as any recommendations received in Workshop #1 and via the GIS Web Viewer that was distributed to Workshop #1 participants. Once the project team vetted , this list was narrowed down to approximately 500 assets based on location in the MIRR study area and perceived importance. During this workshop, the list of 500 assets was divided by lifeline and provided to breakout groups to provide rankings. This process provided clarity on the function and importance of some assets, refined the asset list further based on priority, and led to the creation of nearly twenty 20 preliminary priority resilience project ideas.

Military Installation Review of Assets

On November 14, 2023, an Excel file containing a list of assets along with important information gathered from the engagements for each asset (criticality ranking and general information) was distributed to JBLM

personnel with the intent for them to provide feedback. Additionally, the file listed issue areas and project ideas generated to date for each Lifeline and provided area for comment from installation personnel. On December 11, 2023, the project team’s JBLM liaison provided a version of the file equipped with comments from installation personnel. This feedback confirmed the assets that are considered the most critical to both the South Sound communities and JBLM, as well as additional refinement of the issue areas and project ideas.

Workshop #3: Risk Review

This workshop focused on reviewing the results of the Risk Assessment, further explained in Chapter 5 of this report, with members of the project governance structure to solicit feedback. Minimal feedback was received from the participants regarding the Risk Assessment results; much of the discussion focused on the need to include a resilience project focused on wildfire smoke and the recommendation to include other assets. Due to budget and time constraints, recommendations to include additional assets in the assessment could not be satisfied.

Workshop #4: Project Vetting

Prior to this workshop, the project team worked with JBLM and SSMCP representatives to review and prioritize the 55 resilience projects that had been identified thus far. Following this process, 25 projects received high priority assignment from both JBLM and SSMCP. In Workshop #4, these 25 projects were further prioritized, which resulted in a final list of 12 projects.

Policy Committee Engagement

During the MIRR process, SSMCP staff, with support from Stantec staff, provided intermittent status briefings to the Policy Committee that typically followed major engagement events to keep them updated on the progress of the MIRR. These briefings were incorporated into existing SSMCP Steering Committee and Executive Leadership meetings.

Subject Matter Experts Interviewing Asset Owners

Throughout July 2024, the project team held meetings with asset owners, local subject matter experts, and Stantec SMEs to refine and obtain approval for each prioritized project proposed for inclusion in the Resilience Action Plan. These meetings were designed to build consensus among key stakeholders, validate the approach and funding mechanisms, and capture crucial details for each of the prioritized projects.

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Hazard Prioritization Survey

The Hazard Prioritization Survey was distributed to the Resilience Task Force members and open to responses from June to July 2023. Within the survey, participants were instructed to rate each hazard’s risk on a scale of 1-5 (1 being lowest and 5 being highest risk). Risk was further defined as the product of a hazard’s rate of recurrence and amount of destruction per occurrence. Fifteen responses were received and the average ranking for each hazard is summarized in the table below.

Hazard	Average Ranking
Transportation Impacts	4.27
Earthquakes and Seismic Activity	4.13
Wildfire	3.73
Extreme Heat and Heat Waves	3.53
Infectious Disease Outbreak	3.47
Severe Winter Weather	3.27
Atmospheric Rivers and Extreme Precipitation	3.2
Inland Flooding (Riverine and Pluvial)	3.13
Volcanic Activity	2.93
Coastal Flooding and Sea Level Rise	2.93
Landslides, Debris Flows, and Coastal Erosion	2.73
Tsunamis	2.2

Hazard Profiles

The following subsections describe the profiles of each of the eight hazards assessed in the risk assessment process of this study by providing a basic description of the hazard, how its exposure was assessed, how its likelihood was determined, and its resulting key consequences and impacts generated from the risk assessment within the MIRR study area.

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HAZARDS

(1) SEA LEVEL RISE



Hazard Description

Sea Level Rise (SLR) is the rate at which the average global height of the ocean rises due to ocean thermal expansion and the rate of glacial melting. These causes are attributable to increases in the global average temperature. Sections of both Thurston and Pierce counties are exposed to SLR due to their proximity to the Puget Sound. As the sea rises for Puget Sound, so do its tide and storm surge heights that increases the overall area exposed to such hazards.

Exposure

Sea Level Rise and high-tide flooding hazard exposure was determined based on data that University of Washington and the Washington Sea Grant produced. The dataset used was the product of a statewide 2018 projected SLR assessment⁹. The spatial data was provided by Washington Sea Grant and included spatial layers that represent relative sea level rise based on the

mean higher high water level (the expected average high tide mark). The data was provided for a current, mid-century, and late-century timeframe. Input projected values were based on a RCP 8.5 greenhouse gas emissions scenario and with an annual exceedance chance of 1%, the highest levels of sea level rise projected in the 2018 study. For the exposure analysis, assets were considered exposed to sea level rise and high-tide flooding, if they fell into the projected inundation area. The timeframe in which each asset was exposed to sea level rise was also factored into the exposure analysis to provide the most accurate vulnerability score possible.

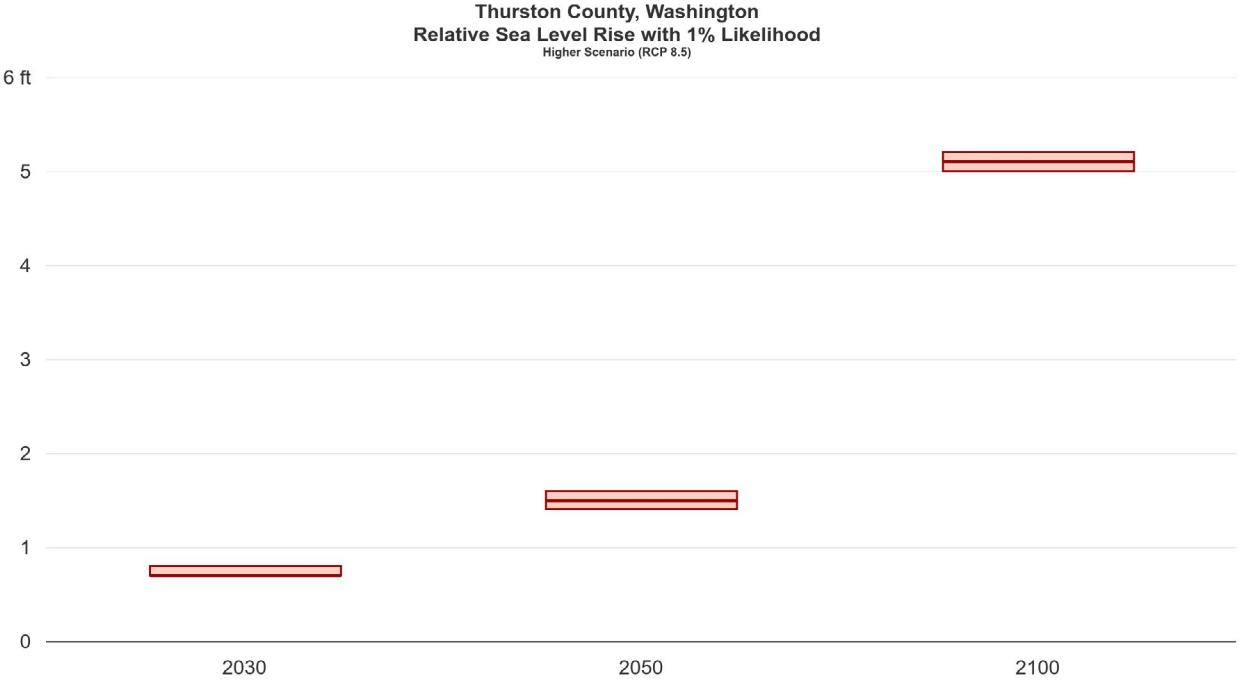


Figure C.1: Relative SLR with 1% likelihood for Thurston County

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HAZARDS (1) SEA LEVEL RISE

Likelihood

The Climate Mapping for a Resilient Washington webtool¹⁰ was used to evaluate anticipated changes in SLR, a chronic natural hazard. For the Thurston County area and under the RCP 8.5 scenario, the projections indicate a gradual increase in sea levels. The SLR is expected to rise from the baseline of 0.2 feet to 1.5 feet by mid-century and further escalate to 5.1 feet by the end of the century, with **corresponding likelihood scores progressing from 3 at baseline to 5 at both mid-century and the end of the century.**

Impacts and Consequences

- The key impacts of sea-level rise (SLR) are:
- Olympic and Jet Fuel Pipelines:** Inundation and access prevention; relocation would cause operational downtime.
 - Oil Refinery:** Risk of harmful releases into Puget Sound with relocation needed by century's end.
 - Transportation Routes (I-5, SR-016, US-101):** Increased flooding and dangerous conditions.
 - Ports of Tacoma and Olympia:** Costly infrastructure improvements are needed to prevent mid-century damage.

The consequences of these impacts are generally minor to moderate in the near term, with more severe consequences occurring later in the century. Based on our understanding, SLR is being considered in port infrastructure planning.

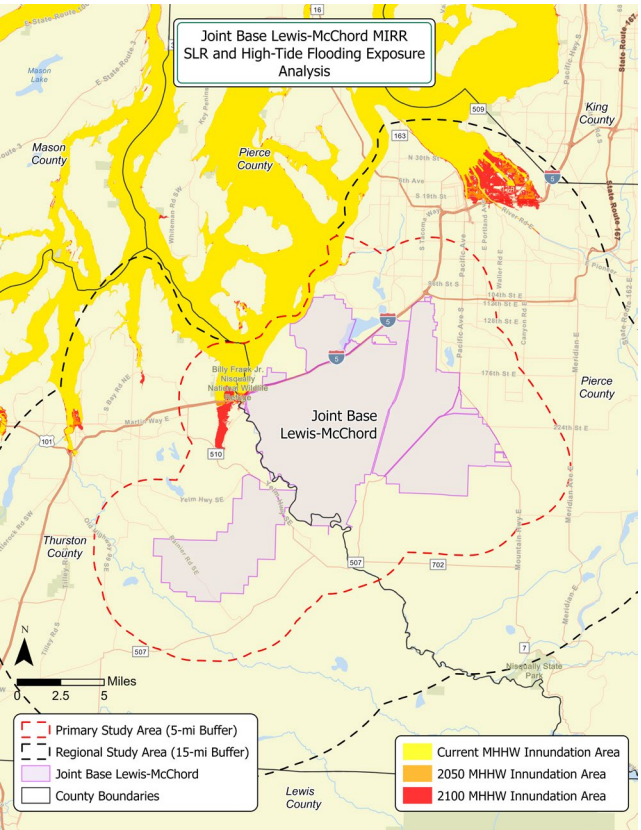


Figure C.2: Sea level rise exposure map

⁹ Miller, I.M., Morgan, H., Mauger, G., Newton, T., Weldon, R., Schmidt, D., Welch, M., Grossman, E. (2018). Projected Sea Level Rise for Washington State – A 2018 Assessment. A collaboration of Washington Sea Grant, University of Washington Climate Impacts Group, University of Oregon, University of Washington, and US Geological Survey. Prepared for the Washington Coastal Resilience Project. Retrieved from [Projected Sea Level Rise for Washington State – A 2018 Assessment \(uw.edu\)](https://data.cig.uw.edu/climatemapping/)
¹⁰ <https://data.cig.uw.edu/climatemapping/>

APPENDIX C: HAZARD PROFILES

HAZARDS (2) INLAND FLOODING (RIVERINE FLOODING)



Hazard Description

Inland, or riverine, flooding is a phenomenon in which a river extends beyond its historical boundaries as a result of heavy precipitation in its watershed. The damage resulting from inland flooding is very dependent on how the area around a river was developed: building on a river's flood plan increases the number of structures exposed to flooding and the presence of levees/revetments along a river's course increases water height and speed which leads to more flooding downstream. The Nisqually and Puyallup rivers are the two major watersheds in the MIRR study area and were used in this analysis.

Exposure

To determine if an asset was exposed to inland flooding a spatial analysis was run to determine which assets are located within the floodplain. This data is produced by FEMA for the National Flood Insurance Program and is publicly available for download through the FEMA Flood Map Service Center. The floodplain consists of the:

- Floodway** – the main channel of a river or stream and the area immediately adjacent that regularly floods;
- 100-year floodplain** – the area surrounding a river or stream that 1% annual chance of flooding;
- 500-year floodplain** – the area surrounding a river or stream, extending from the 100-year floodplain outward, that has a 0.2% annual chance of flooding.

If an asset fell within any of these areas it was considered exposed to inland (riverine) flooding.

Likelihood

The Climate Mapping for a Resilient Washington webtool was used to assess the expected changes related to inland flooding (riverine), an acute natural hazard. The Puyallup and the Nisqually river systems were assessed separately, as they cover different areas; see Figure C.4. on the following page. The return interval for the 25-year peak streamflow represents the frequency of historical high streamflow occurrences, specifically the event that transpires approximately once every 25 years on average. For the Puyallup this 25-year event becomes a 4-year peak stream flow event, while for the Nisqually it becomes about a 7-year peak streamflow event. These estimates translate to **a likelihood of 2 in the baseline period to 3 by end of century for the Puyallup and from 2 in the baseline period to 4 by end of century for the Nisqually.**

Impacts and Consequences

- The key impacts of riverine flooding are:
- Railroad:** Flooding would temporarily halt operations.
 - Wastewater Treatment Plant (WWTP):** Extensive damage could put the facility out of operation for months to years; some form contamination could also occur on account of this hazard.
 - Dams:** High flow events could trigger emergency releases or even dam

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APPENDIX C: HAZARD PROFILES

HAZARDS (2) INLAND FLOODING (RIVERINE FLOODING)

HAZARDS (3) EXTREME PRECIPITATION

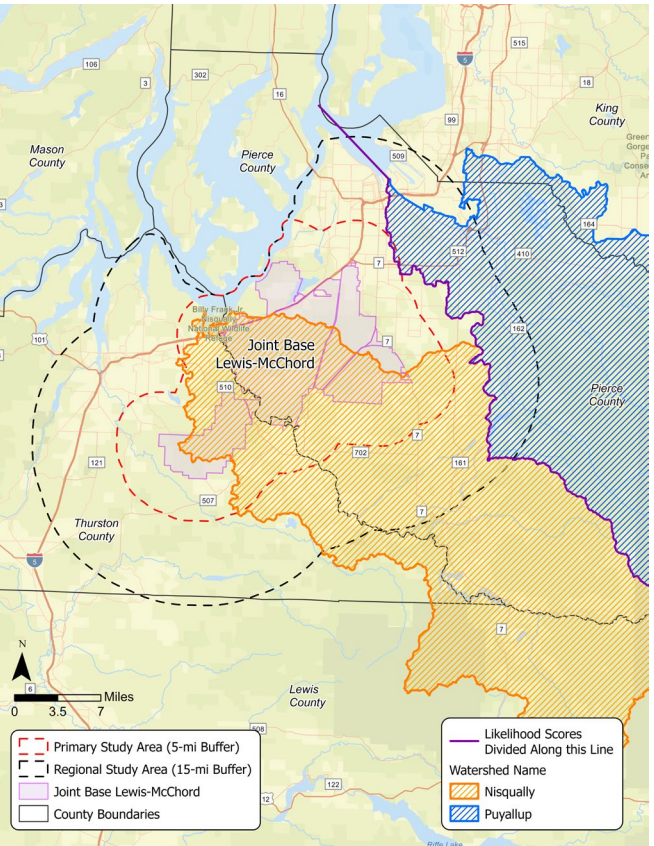
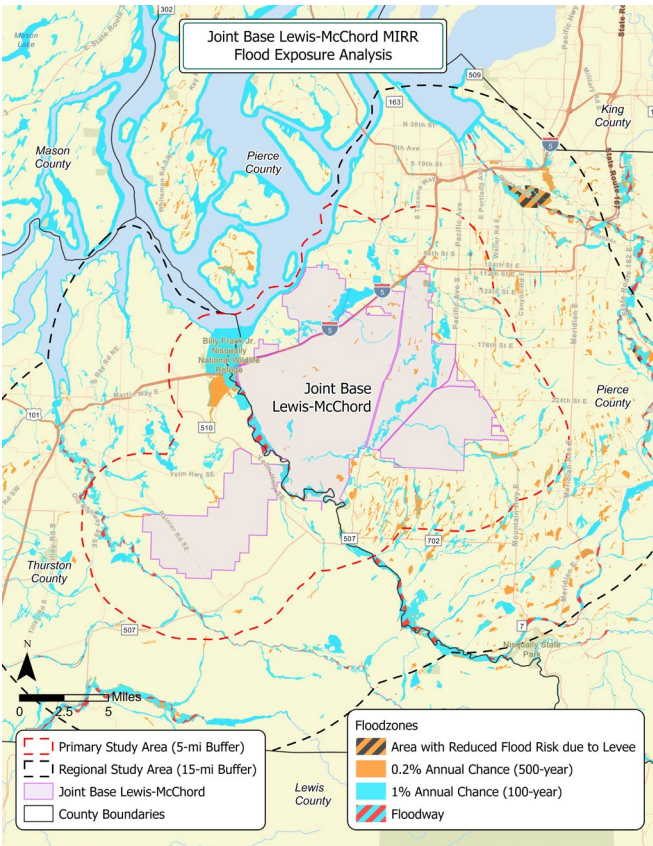


Figure C.3: Riverine Flooding Exposure Map

Figure C.4: JBLM Watersheds and Likelihood Scored Dividing Line

Hazard Description

Heavy rain is defined as 3 to 4 inches of rain falling with a 12-hour period. In the MIRR study area, this precipitation event is common during the fall and winter but becomes even more common during La Niña conditions that produce atmospheric rivers. This level of precipitation can cause riverine and pluvial flooding, land/mudslides, and structural damage to buildings. Damage to inland areas and areas away from waterways is possible during these events if natural or engineered stormwater systems are inadequate or get blocked due to debris and/or maintenance issues.

Exposure

Exposure to atmospheric hazards including extreme precipitation was assumed to be consistent across the entire study area. As a result, all assets were considered exposed.

Likelihood

The NOAA Storm Events Database was used to determine the baseline number of storm events, an acute hazard. A wind gust event of greater than 55 knots was used as an indicator for a storm event. This is expected to increase by 2-8% by the 2080s, under scenario RCP 8.5 for a 50-year return level event. This results in a steady increase from 0.63 days/year (baseline) to 0.68 days/year (end of century) with a **likelihood score of 5 across all time horizons.**

The Climate Mapping for a Resilient Washington webtool²⁴ was used to evaluate anticipated changes in extreme precipitation, an acute hazard. The percent change in the maximum water amount during a 24-hour rainstorm that, on average, occurs once every 25 years was the indicator, and compared to the average precipitation levels observed from

1980 to 2009. A 25-year storm event is equivalent to a 4% chance of occurring, this increases to a 35% (about a 3-year storm event) chance of occurring by end of century. The likelihood steadily increases from 3 to 5 across the time horizon.

Impacts and Consequences

The key impacts apart from flooding caused by precipitation are based on the potential for damage based on temporary failures or blockages of stormwater and/or natural drainage systems that result in ponding, flooding, and standing water that can hinder use of roads and trails and access to facilities, flood infrastructure or buildings, and damage equipment and utilities. Flooding can be very localized or more widespread in low lying areas or if natural systems fail to drain. In general, the consequences of extreme precipitation are:

- **Dams:** Increased water levels in reservoirs from heavy rains would necessitate releases and alter normal dam operations and could cause safety issues.
- **Wastewater Treatment Plants (WWTP):** Overwhelmed treatment plants could sustain damage due to water and flooding and overwhelmed stormwater facilities could force releases of untreated water into local waterways, impacting ecosystem and resident health.

failure if not properly managed, putting downstream areas at extreme risk.

- **Roads (Interstate 5, SR-512, SR-16, SR-510, US-101, Nisqually Road):** Dangerous driving conditions and closures would severely impact regional transportation and mission readiness. SR-507 and SR-7 have redundancy, so impacts are less severe.
- **Public Facilities (PC Parkland Station, TC Courthouse):** Flooding could halt operations, leading to longer wait times and impacting the central hub of the TC Sheriff's Office.

Wildlife Areas (TCB, Upland Prairie, DFW Wildlife Areas, BJF Wildlife Refuge): Temporary damage expected, but areas are generally resilient to flooding.

²¹ Federal Emergency Management Agency. (n.d.). Flood Map Service Center. Retrieved from [FEMA Flood Map Service Center | Search All Products](https://www.fema.gov/flood-map-service-center).
²² <https://data.ciq.uw.edu/climatemapping/>
²³ Based on - (Chegwidden, O. S., B. Nijssen, D. E. Rupp, P. W. Mote, 2017: Hydrologic Response of the Columbia River System to Climate Change [Data set]. Zenodo. doi:10.5281/zenodo.854763).

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HAZARDS

(3) EXTREME PRECIPITATION

- **Other Facilities:** Depending on locations and the extent of flooding, damage or loss of access and operability could occur to the following facilities. Damage and operational issues will depend on the extent of damage:
 - » Public safety facilities (fire stations, police departments, EOCs, dispatch centers)
 - » Healthcare facilities
 - » Public works and other types of maintenance facilities where access is required for emergency response
 - » Transportation corridors (road, transit, and rail) and airports

As stated above, overwhelmed or failing stormwater systems that are not able to handle larger precipitation events can cause significant damage, access issues, or delays in recovery. These effects can be widespread but are more likely to be localized and potentially hard to predict. Thus, the consequences of these impacts are likely to be highly variable and depended on season, storm, location, and infrastructure. Consequences have the potential to be fairly severe for the local economy and mission readiness, especially in future scenarios.

¹⁴ (Jeong and Sushama, 2019)
¹⁵ Based on (Salathé, E.P., Leung, L.R., Qian, Y., Zhang, Y. 2010. Regional climate model projections for the State of Washington. *Climatic Change* 102(1-2): 51-75. <https://doi.org/10.1007/s10584-010-9849-y>)

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HAZARDS

(4) EARTHQUAKES



Hazard Description

Earthquakes are the shaking of the ground caused by a sudden fracture, slip, or movement in the earth's crust. Faults, or fractures in the earth's crust resulting in the displacement of two or more plates relative to each other, are common hotspots for earthquakes. The MIRR study area, including Western Washington as a whole, is located near several active faults making it very susceptible to earthquakes. The most notable of these faults is the Cascadia Subduction Zone (CSZ) which has historically produced megathrust earthquakes at or above 9.0 magnitude. Both crustal and CSZ quakes will cause damage in the South Sound Region, but a CSZ event will affect several states and British Columbia, making it a much more severe event due to the extent of damage and distance that help will have to travel. Damage from earthquakes results from ground shaking, tsunami waves, and ground deformation including subsidence, liquefaction (significant soil softening), and lateral spread (movement of liquefied soils downslope).

Exposure

Two datasets were used to determine whether assets were exposed to earthquakes and seismic activity. For the earthquake exposure analysis, the 2014 National Seismic Hazard Model for the Conterminous U.S. was used to determine whether an asset was exposed to the hazard¹⁶. Based on the 2014 USGS Seismic Hazard Map for Washington and amount of damage associated with the various peak ground accelerations (PGAs) expected, high hazard is defined as an area that will be exposed to a PGA of greater than or equal to 20% of gravity (0.2g). The entire study area is mapped as likely to experience a PGA of or above 0.5g¹⁷.

The second dataset that was used as an input for the earthquakes and seismic activity hazard

was a liquefaction susceptibility dataset. The data provided was produced by the Washington State Department of Natural Resources (WA DNR) and can be used to assess the susceptibility of an area to liquefaction based on the subsurface geology of terrain¹⁸. The original dataset breaks the susceptibility into seven susceptibility ratings ranging from very low to high. We identified any assets in areas with a low-to-moderate, moderate, moderate-to-high, or high liquefaction susceptibility as exposed to this hazard.

Likelihood

Earthquakes are acute natural hazards. Earthquakes were cited as the most important hazard by community stakeholders in the survey and were noted as a high priority in the county hazard mitigation plan. Recent studies indicating a 37% chance of a significant earthquake in the next 50 years on the CSZ fault¹⁹. This event will be felt throughout the Pacific Northwest²⁰ and beyond.

¹⁶ Shumway, A.M. (2019). Data Release for the 2014 National Seismic Hazard Model for the Conterminous U.S. Retrieved from <https://doi.org/10.5066/P9P77LGZ>.
¹⁷ USGS. (2014). 2014 Seismic Hazard Map - Washington. Retrieved from [2014 Seismic Hazard Map - Washington | U.S. Geological Survey \(usgs.gov\)](https://www.usgs.gov/programs/seismic-hazard-map-washington).
¹⁸ Washington State Department of Natural Resources. (2010). Ground Response Dataset. Retrieved from [Geology GIS Data and Databases | WA - DNR](https://www.dnr.wa.gov/Geology/GIS/Data-and-Databases/WA-DNR).
¹⁹ (sources like the Oregon Department of Emergency Management and the U.S. Geological Survey). Oregon Department of Emergency Management : Cascadia Subduction Zone: Hazards and Preparedness: State of Oregon
²⁰ <https://www.usgs.gov/programs/earthquake-hazards/science/introduction-national-seismic-hazard-maps>

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HAZARDS (4) EARTHQUAKES

HAZARDS (4) EARTHQUAKES

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The CSZ event will be a result of a release of seismic pressure that is being continuously built by ongoing tectonic plate convergence. Thus, the probability of occurrence increases each year the earthquake doesn't happen, unlike discrete events such as hurricanes or tornadoes, making the treatment over the time horizon crucial. Further, the time horizon for earthquakes is on a geologic scale, and thus is hard to relate directly to climate hazards that are more frequent events on a human-planning scale. Thus, the **likelihood rating of 4 was given to the CSZ event for the baseline period and this rating is maintained throughout the remaining time horizons**; refer to Figure C.7 for geographic distribution of the likelihood of a damaging earthquake in the next 10,000 years.

Impacts and Consequences

An earthquake in the Puget Sound region will be a large disaster for the entire region, not just JBLM. Further, the much more likely CSZ event will cause widespread damage throughout the Pacific Northwest, California, and British Columbia, resulting in a regional disaster. Much of the infrastructure in the area was built before current seismic codes were in force, thus many recent studies including the Resilient Washington report, indicate that lifeline systems are expected to be out of service for weeks to years and the transportation systems will be severely impacted for several years. Resilience planning for the CSZ event should be at the forefront of efforts for the South Sound Region.

In addition to widespread failures in buildings, water, wastewater, transportation, energy, electrical and communications systems, widespread transportation system failures will mean that emergency response, damage repairs, and supply chains will be significantly hindered if not crippled. Specific

- key impacts of an a CSZ earthquake in the South Sound Region are discussed below:
- Hospitals and Medical Facilities:** Structural damage to hospitals could necessitate patient evacuations, overwhelming other facilities or requiring temporary hospital facilities. Damage to blood centers and access issues will result in critical blood supply shortages.
 - Transportation:** Damage to roads, highways, and railroads could halt evacuation efforts and first responder movements.
 - Fuel:** Fuel storage, refinement, and transmission is expected to be severely damaged and fuel for response, recovery, and operations will likely have to be brought in and distributed manually. Extreme shortages are expected.
 - Cellular and Radio Sites:** Local grid impacts could force cellular networks out of operation. Radio sites, even those at high points like Crawford Mountain and Capital Radio Tower, could be damaged, hindering communication capabilities.
 - Water and Waste Management:** Damage to water distribution systems and wastewater treatment plants could disrupt water delivery and waste management, impacting entire municipalities with landslides, debris flows, and erosion.
 - Dispatch Centers:** Both SS911 and TCOMM911 dispatch centers would likely face building damage and forced evacuations. While SS911 has a backup center, TCOMM911's backup lacks the same capabilities, making its loss more consequential.

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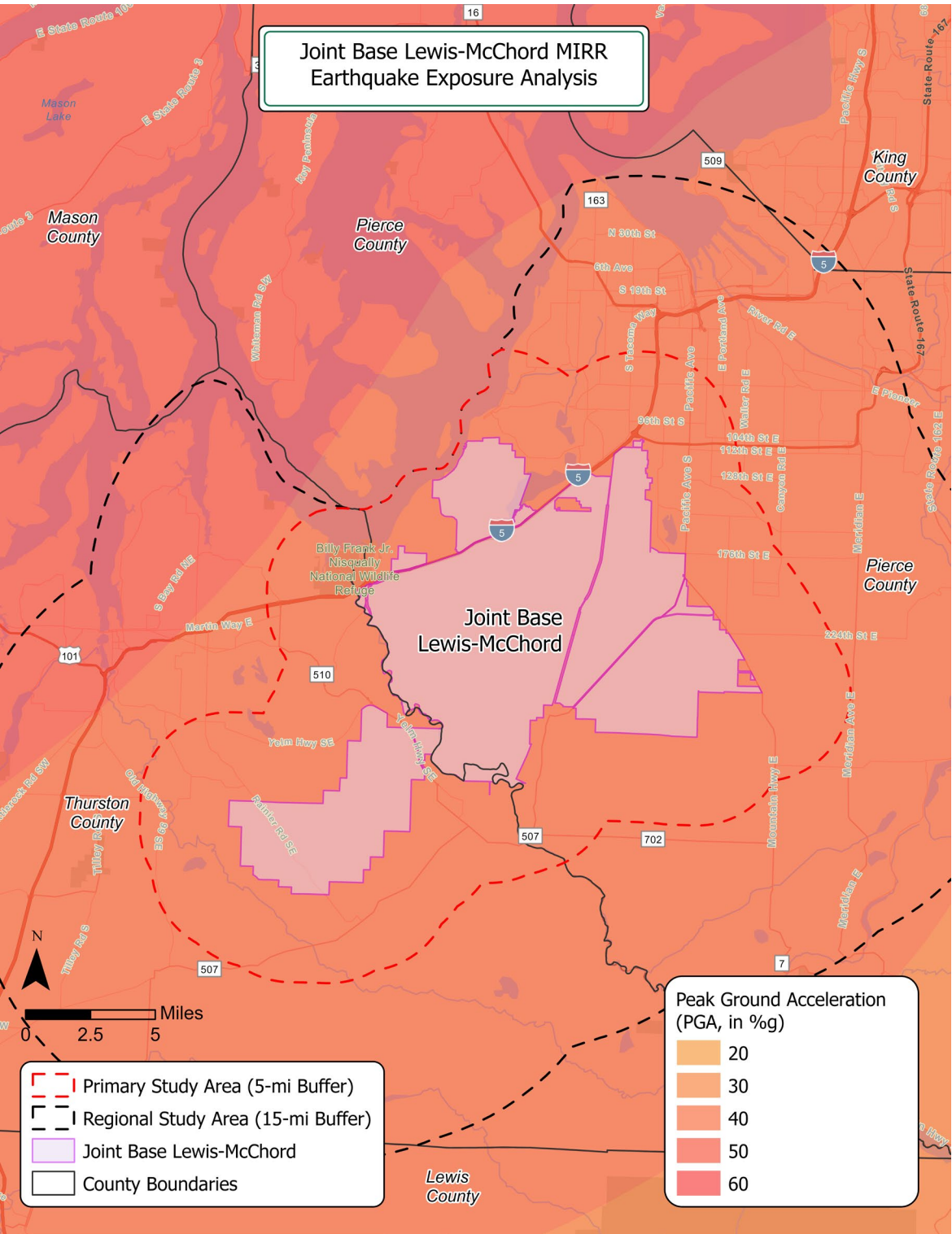


Figure C.5: Earthquake Exposure Map

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HAZARDS (4) EARTHQUAKES

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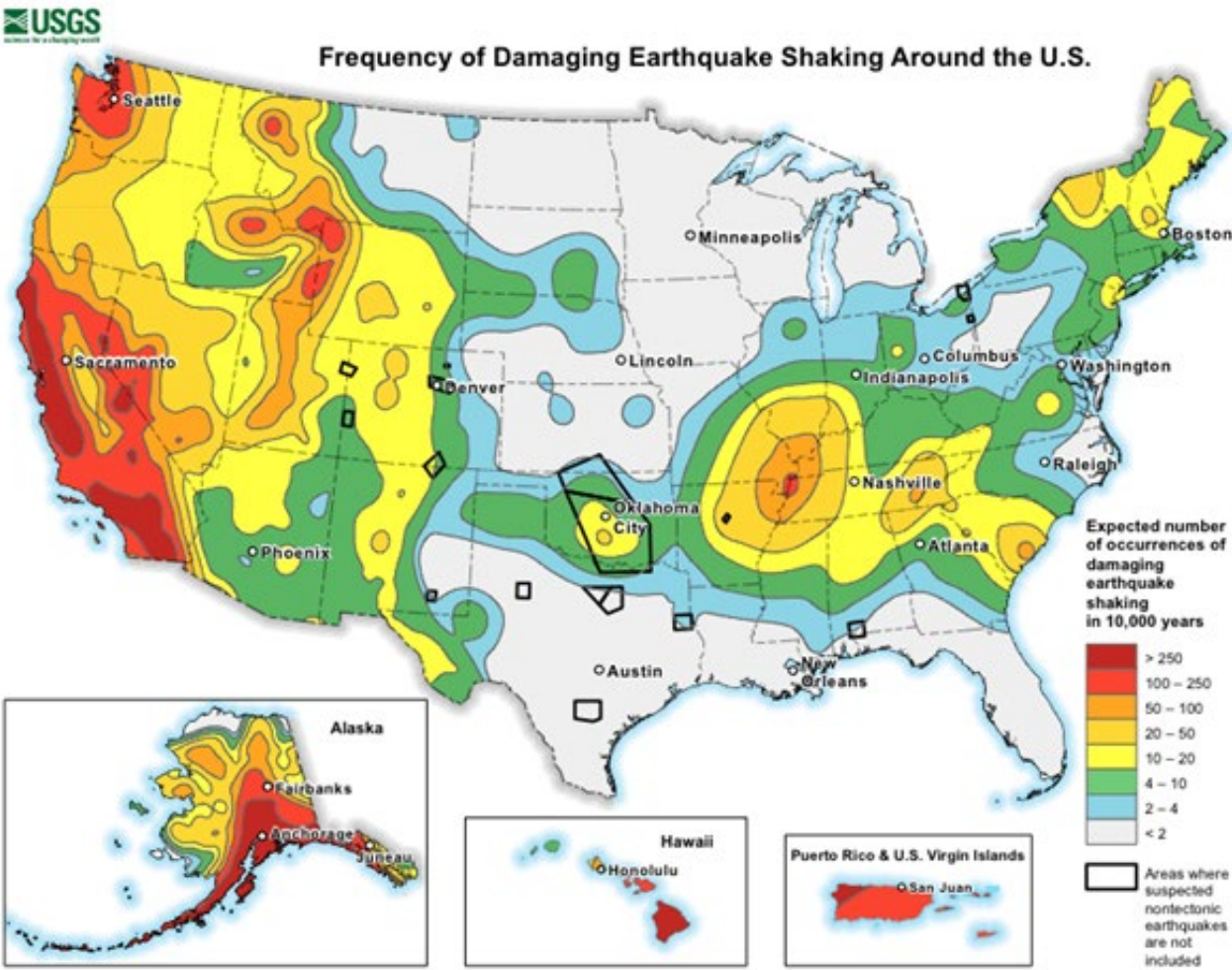
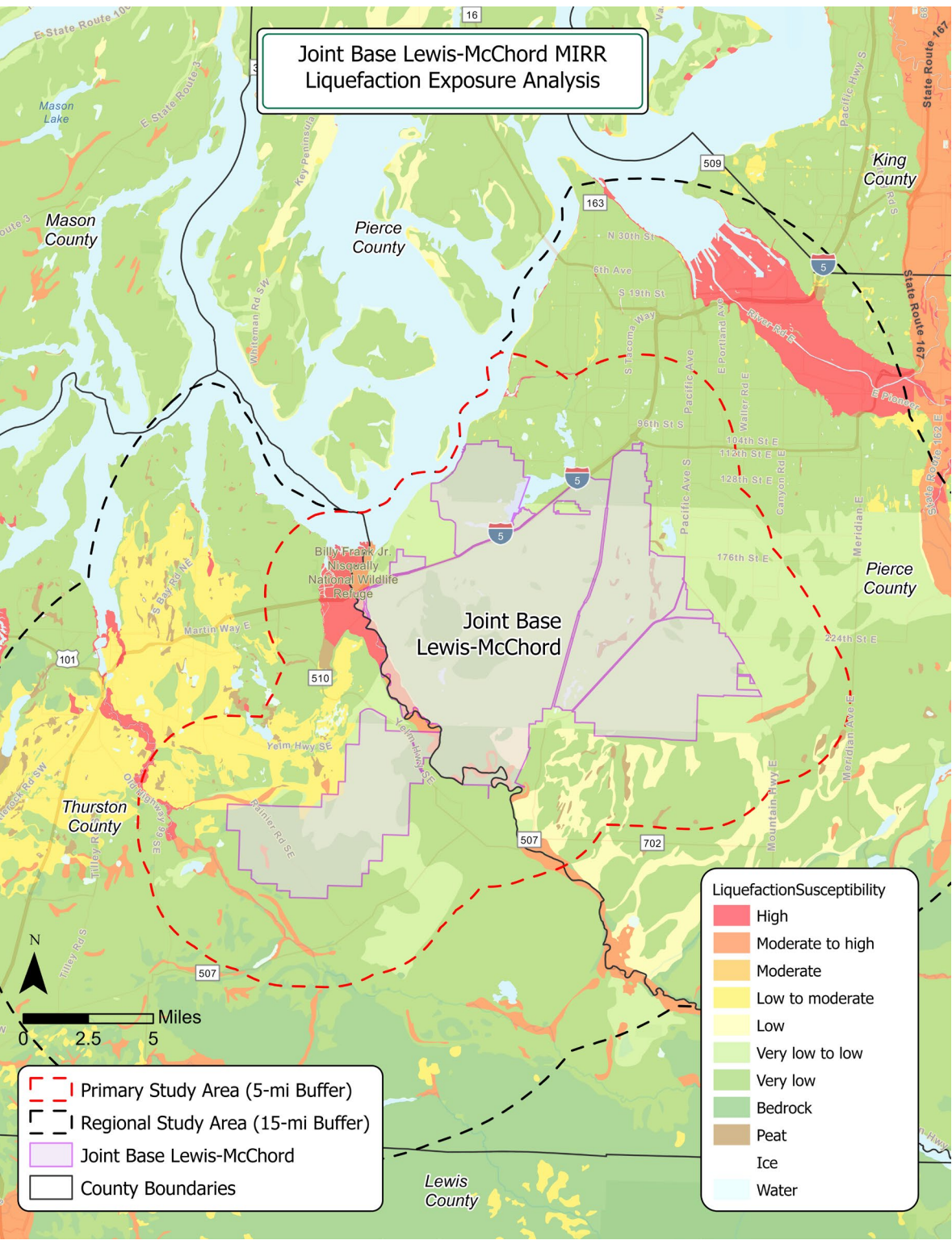


Figure C.6: Liquefaction Exposure Map

Figure C.7: Damaging Earthquake in the Next 10,000 Years Likelihood Map - USGS

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HAZARDS

(5) LANDSLIDES, DEBRIS FLOW, AND EROSION

Hazard Description

Landslides and debris flows are the sudden movement of ground material down a slope. Typically, these events are caused by heavy rain events that saturate soil, post-burn areas where the vegetation anchoring the slope dies, or liquefaction of a slope resulting from significant ground movement during an earthquake.

Exposure

To determine if an asset was exposed to the landslide, debris flow, and erosion hazard, the asset locations were compared to two datasets. The first, a landslide susceptibility dataset, was developed by the WA DNR was used to determine exposure to landslides and debris flows. The landslide susceptibility data was developed by performing an analysis of previous landslides. Seventeen unique attributes of each landslide were reviewed, and landslide susceptibility maps were developed to highlight areas that could experience a landslide in the future. The data can be viewed and downloaded on the WA DNR Geologic Information Portal. The landslide susceptibility was broken down into shallow and deep susceptibility areas, each rated as having low, moderate or high susceptibility. Assets that fell into the moderate or high areas for either shallow or deep susceptibility were considered exposed for landslides. The second dataset used for this hazard as part of the exposure analysis was an erosion hazard areas dataset developed by Pierce County. The dataset identifies areas that are susceptible to shoreline erosion (along freshwater lakes or ponds and the Puget Sound). The dataset identifies areas with active bluff retreat or active land retreat as a result of wave action. Any asset located within an erosion hazard area was considered exposed.

Likelihood

Heavy rainfall events are likely to increase by about 19% by the 2080s in the Puget



sound region. Intense rainfall in the Pacific Northwest often triggers landslides due to the region's steep terrain and the increased saturation of soil, elevating the risk of slope failures. Occurrence of landslides in the Puget Sound Region per year are at a baseline of 0.2 occurrence per year to 0.31 by end of century. These estimates translate to **a likelihood of 5 in the baseline period and maintaining this rating throughout the remaining time horizons.**

Impacts and Consequences

- Roads and Highways:** Landslides on major routes like Interstate 5 and SR-507 could lead to catastrophic road closures lasting over a week, severely impacting transportation and evacuation efforts.
- Railroads:** Landslides could temporarily halt rail operations, disrupting transportation and logistics.
- Linear Utilities (Electrical, Water, Communications):** Any linear utilities that travel through landslide prone areas can potentially be disrupted by a landslide. Repairs are often difficult due

²¹ Washington Department of Natural Resources. (n.d.). Landslides. Retrieved from [Landslides | WA - DNR](#)
²² Washington Geological Survey. (2023). Washington State Landslide Inventory Database-GIS data. Retrieved from [Washington Geologic Information Portal](#)
²³ https://cig.uw.edu/wp-content/uploads/sites/2/2014/11/ps-sok_sec05_sediment_2015.pdf - Climate Impacts Group, College of the Environment, University of Washington, 2015; section 5: Sediment.

APPENDIX C: HAZARD PROFILES

HAZARDS

(5) LANDSLIDES, DEBRIS FLOW, AND EROSION

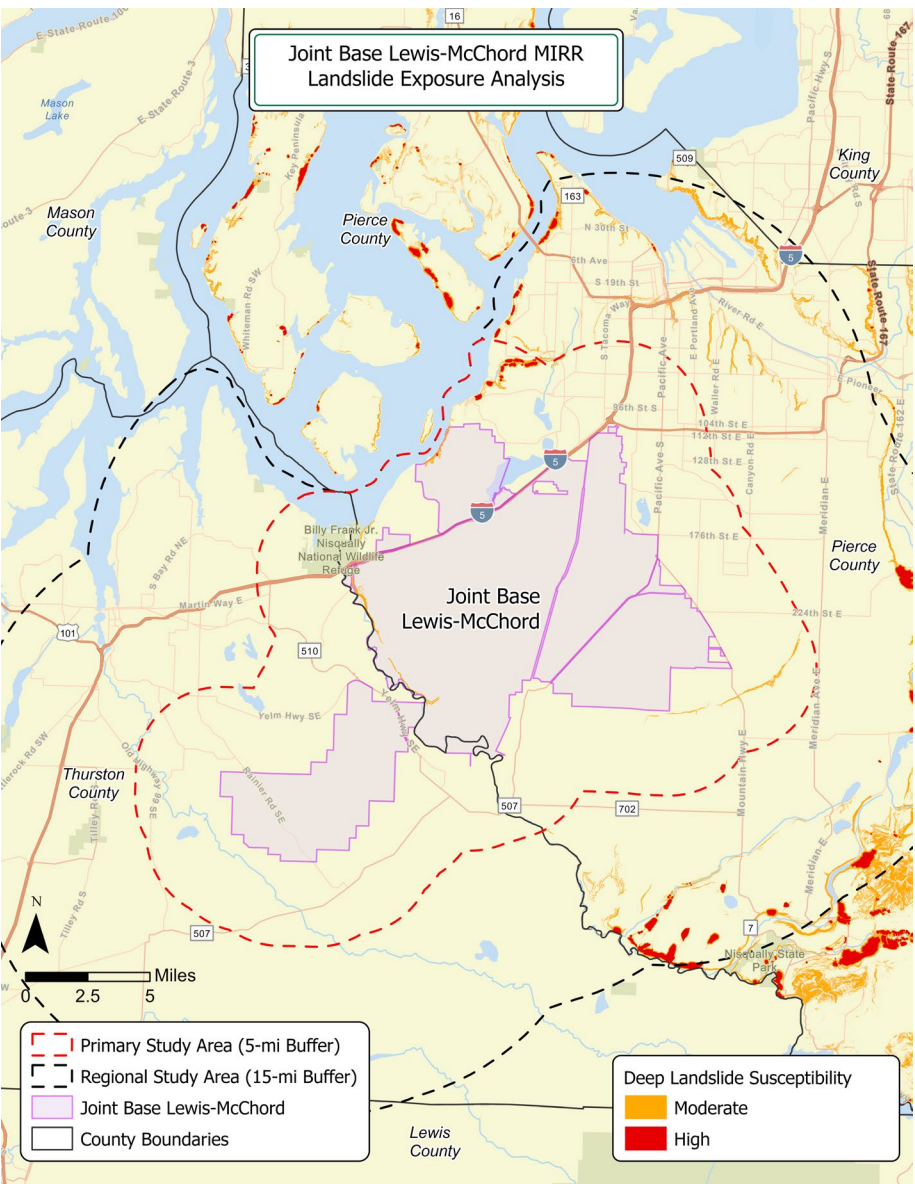


Figure C.8: Deep Landslide Exposure Map

to access and land movement and may result in outages that last weeks.

- River Systems:** Landslides could affect dam operations and flood risk reduction efforts, potentially leading to emergency releases (e.g., North Fork Clover Creek E1 Det Basin).

The consequences of such impacts could be major for impacted lifelines with the potential for prolonged shutdowns of drinking water or transportation infrastructure depending on the location.

APPENDIX C: HAZARD PROFILES

APPENDIX C: HAZARD PROFILES

HAZARDS

(5) LANDSLIDES, DEBRIS FLOW, AND EROSION

HAZARDS

(5) LANDSLIDES, DEBRIS FLOW, AND EROSION

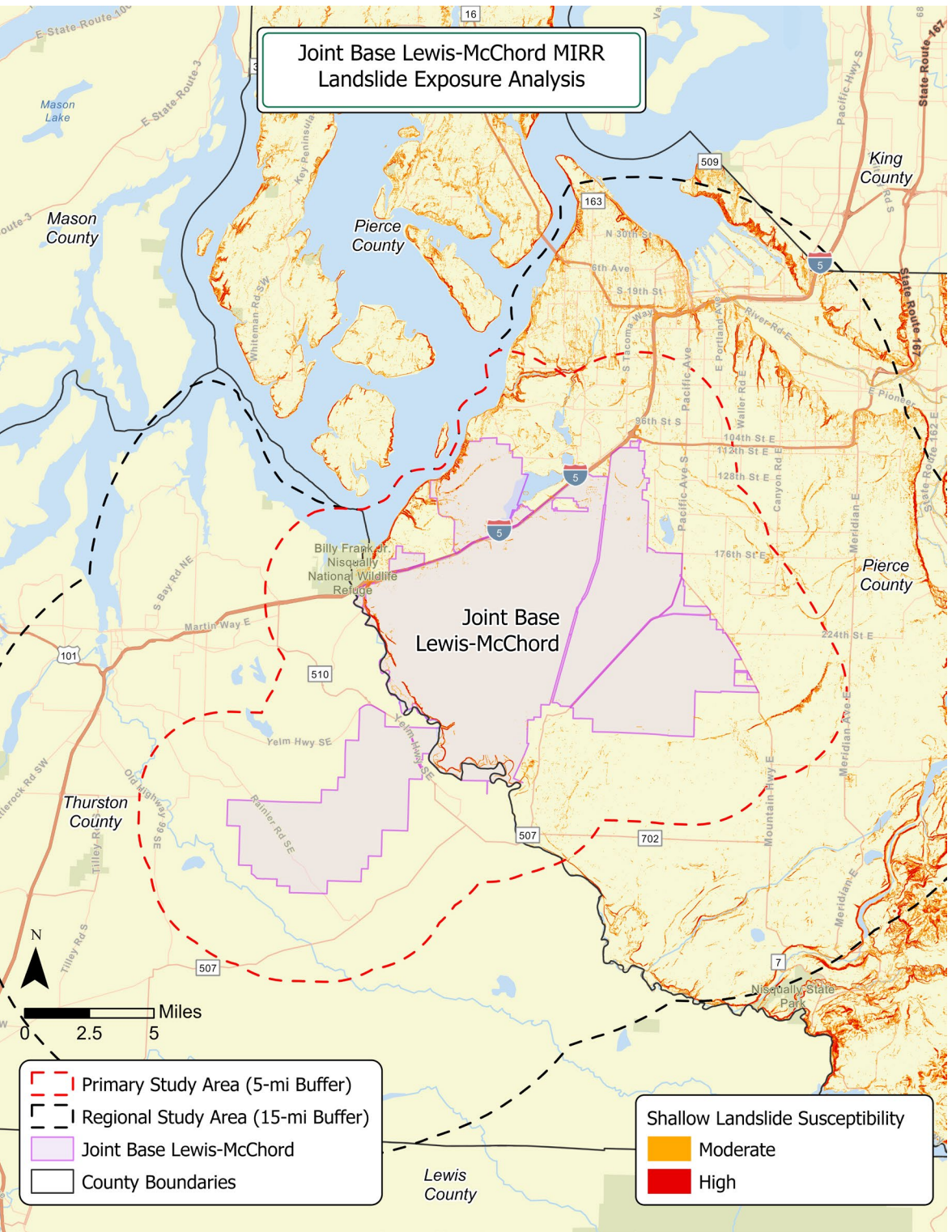


Figure C.9: Shallow Landslide Exposure Map

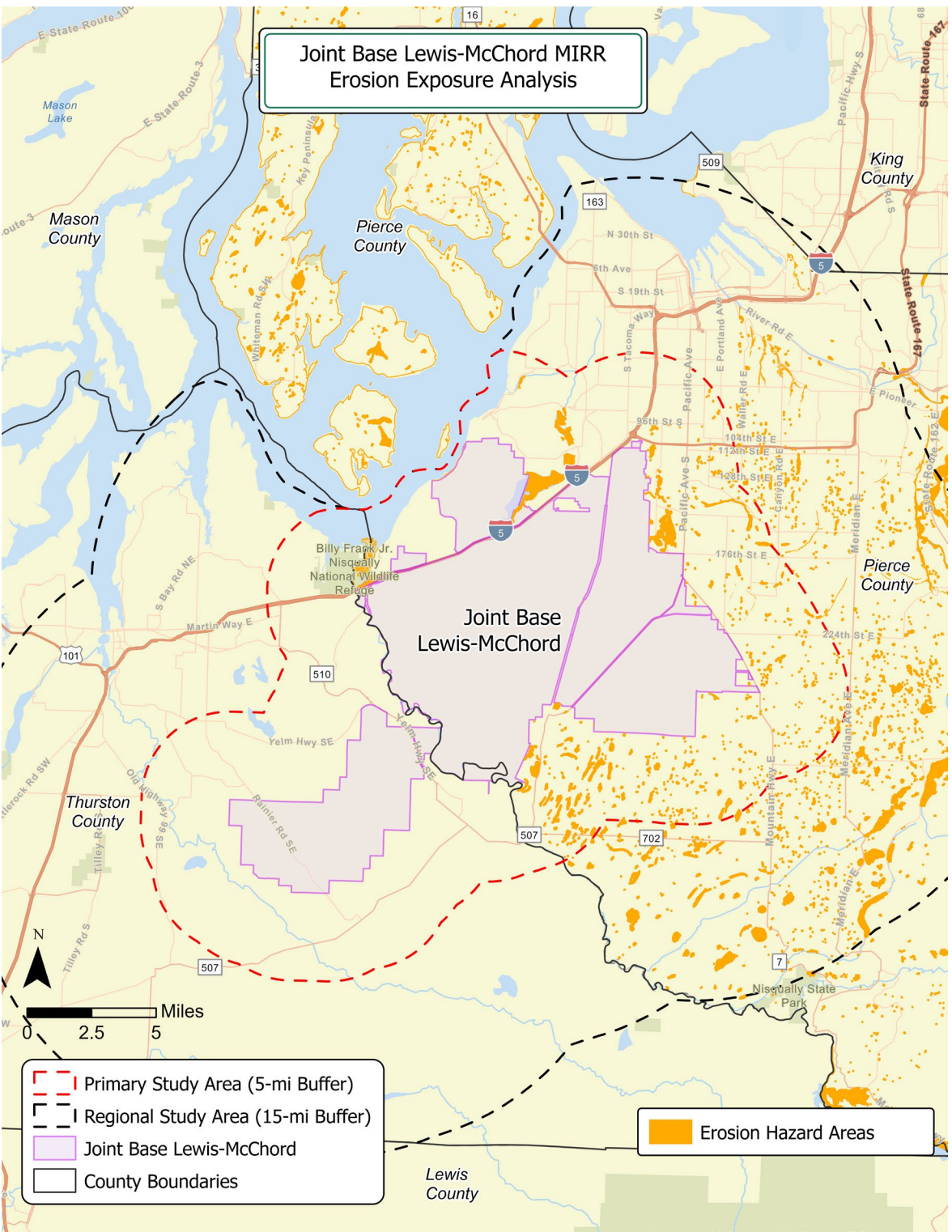


Figure C.10: Erosion Exposure Map

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HAZARDS

(6) HEATWAVES

Hazard Description

Heat waves are prolonged periods with higher than normal daytime temperatures and minimal nighttime cooling; humidity is an important metric in considering heat wave conditions. According to the Washington Department of Labor and Industries, employers must implement precautionary measures to prevent heat-related illness for outdoor workers when the temperature reaches 80°F. Heat waves in the MIRR study area are especially impactful to people and buildings in Western Washington because many buildings and most residential structures lack centralized air conditioning.

Exposure

Exposure to atmospheric hazards including heat waves was assumed to be consistent across the entire study area. As a result, all assets were considered exposed to heat waves.

Likelihood

The Climate Mapping for a Resilient Washington webtool²⁴ was used to evaluate anticipated changes in heatwaves, a chronic hazard. The change in the number of days per year with maximum daily temperature greater than 100°F relative to 1980-2009. The number of extreme heat events was estimated for the baseline period and projected out to 2100 for the RCP 8.5 scenario using statistically downscaled GCM temperature data provided by which is based on MACAv2-METDATA. The frequency of extreme heat events is projected to increase in the future. Over the baseline period JBLM experienced an average of 0.5



extreme heat events per year. By the mid-century, the frequency of extreme heat events is expected to increase by 0.6 days a year and is projected to further increase by about 1.9 days per year by the end of the century. These estimates translate to a **likelihood of 3 in the baseline period to 4 by mid-century and 5 by end of century.** JBLM is expected to experience many more extreme heat events in the near future.

Impacts and Consequences

- **Power Supply:** Increased demand for cooling can strain the power grid, leading to potential outages. Outages can cause health issues if air conditioning is not available.
- **Water Systems:** Higher temperatures can reduce water quality and availability, impacting both supply and treatment processes.
- **Transportation:** In areas where extreme heat was not considered in design, extreme heat can damage road surfaces, bridges and walls, electrically powered public transit systems, and rail tracks, causing delays and safety hazards.
- **Public Health:** Heatwaves can exacerbate health issues, leading to increased hospital admissions,

²⁴ <https://data.cig.uw.edu/climatemapping/>

APPENDIX C: HAZARD PROFILES

HAZARDS

(6) HEATWAVES

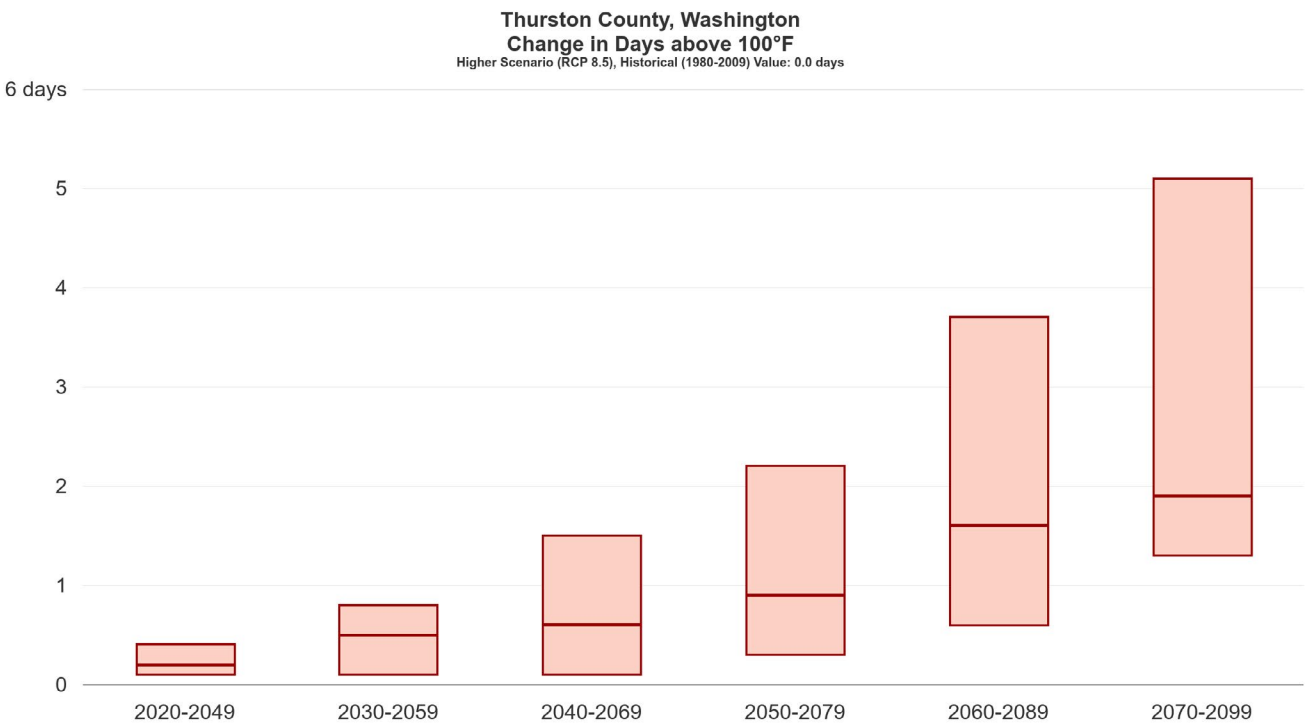


Figure C.11: Change in days above 100F for Thurston County

casualties, and strain on medical facilities as well as sheltering needs for those that need cooling centers.

- **Natural Resources:** Prolonged heat can stress ecosystems, affecting wildlife and plant health.

In general, infrastructure impacts are of low-to-moderate relative consequence as they can be repaired or recovered once the heat subsides, however human impacts can be high consequence.

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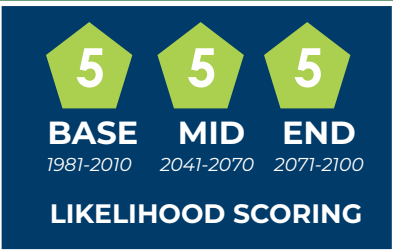
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APPENDIX C: HAZARD PROFILES

APPENDIX C: HAZARD PROFILES

HAZARDS (7) SEVERE WINTER WEATHER



Hazard Description

For the purpose of the MIRR , severe winter weather was assumed to consist of windstorms, snowstorms, and freezing rain events. According to the National Weather Service, a windstorm is when wind speeds of 40 mph or greater are sustained for at least an hour, or when wind speeds of 58 mph or greater occur for any period of time. A snowstorm is defined as four inches of snow over 12 hours or 6 inches of snow over 24 hours. Freezing rain, alternatively, does not have a threshold but is rather the combination of conditions that make rain cold enough to freeze on contact with surfaces. It should be noted that even small amounts of snow and freezing rain are quite uncommon in the Puget Sound and, thus, can be very impactful to local transportation systems and local and South Sound regional access. All three kinds of winter storms can knock out power lines, damage buildings, and create hazardous roadway conditions.

Exposure

Exposure to atmospheric hazards including severe winter weather was assumed to be consistent across the entire study area. As a result, all assets were considered exposed.

Likelihood

The likelihood of storms, including windstorms, snowstorms, and freezing rain, was determined by wind gust events reaching 55 knots, resulting in a likelihood score of 5. This score reflects the anticipated rise in the frequency of 50-year return level events, which are projected to increase by approximately 4-8% by the 2080s, according to Jeong and Sushama (2019).

Impacts and Consequences

- Roads and Highways:** Snow and ice can lead to dangerous driving conditions and potential closures, severely impacting transportation and evacuation efforts.
- Power Supply:** Severe storms can cause power outages, affecting critical services and infrastructure.
- Water Systems:** Freezing temperatures can lead to pipe bursts, disrupting water supply and potentially causing property damage.
- Public Health:** Extreme cold can lead to increased hospital admissions due to cold-related illnesses.

Some impacts (e.g., transportation infrastructure) could result in catastrophic damage such as loss of life due to unsafe driving conditions or a lack of access to services.

²⁵ Jeong, Dae Il, and Laxmi Sushama. 2019. "Projected Changes to Mean and Extreme Surface Wind Speeds for North America Based on Regional Climate Model Simulations" *Atmosphere* 10, no. 9: 497. <https://doi.org/10.3390/atmos1009049>

APPENDIX D: PROJECT MATERIALS

D.1 Project Work Plans

Each individual subsection of this appendix contains the work plan that was developed for each of the Resilience Action Plan (RAP) projects. In its respective work plan, each project is divided into sequential tasks, or phases, that are assigned an estimated time for completion, an estimated cost range, and lead agency.

D.1.1. DEFENSE COMMUNITY TRANSPORTATION CORRIDOR RESILIENCE STUDY

Work Plan: Defense Community Transportation Corridor Resilience Study				
Task	Description	Estimated Time to Complete	Estimated Cost	Lead Agency
Task 1	Confirm Priority Transportation Corridors	1-2 months	\$3,000 - \$5,000	SSMCP Transportation Chair and Working Group
Task 2	Develop Project Stakeholders and Responsibilities for each Corridor	1-2 months	\$3,000 - \$5,000	SSMCP Transportation Chair and Working Group
Task 3	Establish Key Planning Scenarios	2-3 months	\$5,000 - \$7,000	SSMCP Transportation Chair, Working Group and Infrastructure Owners (various)
Task 4	Conduct Enhanced Risk and Resilience Assessment	6-12 months	\$75,000 - \$125,000	Infrastructure Owners (various)
Task 5	Develop Adaptation Recommendations	3-6 months	\$50,000 - \$100,000	Infrastructure Owners (various)
Task 6	Identify Funding Strategies and Implementation Plan	1-3 months	\$10,000 - \$15,000	SSMCP Transportation Chair and Working Group and Infrastructure Owners (various)

D.1.2 DEFENSE COMMUNITY COMMUNICATION INTEROPERABILITY PLAN

Work Plan: Defense Community Communication Interoperability Plan				
Task	Description	Estimated Time to Complete	Estimated Cost	Lead Agency
Task 1	Establish the Project Team	24 months	\$15,000 - \$20,000	SS911, TCOMM911, Pierce Co. Communications Dept.
Task 2	Assess Local Defense Community Communications Capability	6-8 months	\$25,000 - \$30,000	JBLM DPTAMS and DES, SS911, TCOMM911, Pierce Co. Communications Dept.
Task 3	Develop Interoperability Plan	6-8 months	\$25,000 - \$30,000	JBLM DPTAMS and DES, SS911, TCOMM911, Pierce Co. Communications Dept.

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Task 4	Training and Exercise Strategy	2-3 months	\$15,000 - \$20,000	JBLM DPTAMS and DES, SS911, TCOMM911, Pierce Co. Communications Dept.
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D.1.3 ENERGY GRID RESILIENCE FOR THE LOCAL DEFENSE COMMUNITY

Work Plan: Energy Grid Resilience for the Local Defense Community				
Task	Description	Estimated Time to Complete	Estimated Cost	Lead Agency
Task 1	Establish the Project Team	4-6 Months	\$75,000 - \$150,000	TPU JBLM
Task 2	Determine Energy Resilience Courses of Action			
Task 3	Establish Methodology and Conduct Analysis			
Task 4	Identify Alternatives			
Task 5	Select Alternative and Plan for Implementation			

D.1.4 BASIC NEEDS RESOURCE SUPPORT FOR SERVICE MEMBERS, VETERANS, AND THEIR FAMILIES

Work Plan: Basic Needs Resource Support for SMVFs				
Task	Description	Estimated Time to Complete	Estimated Cost	Lead Agency
Task 1	Determine Needs	2-3 months	\$15,000 - \$20,000	SSMCP
Task 2	Identify Examples	1-2 months	\$15,000 - \$20,000	Washington 211
Task 3	Assess Resources	3-6 months	\$50,000 - \$75,000	Washington 211
Task 4	Integrate into Application	2-3 months	~\$25,000	Smartphone application developer
Task 5	Perform Updates	On-going	TBD	Washington 211 and smartphone application developer

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D.1.5 REGIONAL MASS SHELTERING COOPERATIVE

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Work Plan: Regional Mass Sheltering Strategy				
Task	Description	Estimated Time to Complete	Estimated Cost	Lead Agency
Task 1	Initial Meeting and Charter Development	2-3 months	Less than \$5,000	JBLM DES-EM
Task 2	Develop Work Plan	3-6 months	\$5,000 - \$10,000	JBLM DES-EM, Thurston County Emergency Management, Pierce County Emergency Management, and Tacoma-Pierce County Emergency Management.
Task 3	Develop a Multi-Year Training and Exercise Plan	3-6 months	\$5,000 - \$10,000	JBLM DES-EM, Thurston County Emergency Management, Pierce County Emergency Management, and Tacoma-Pierce County Emergency Management.
Task 4	Identify Resources	4-8 months	TBD – dependent upon identified needs	JBLM DES-EM, Thurston County Emergency Management, Pierce County Emergency Management, Tacoma-Pierce County Emergency Management, Thurston County Public Health Department (TPCHD) and the American Red Cross South Sound and Olympics Chapter.
Task 5	Ensure On-Going Cooperation	Ongoing	TBD – dependent upon identified needs	All

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D.1.6 ENHANCED HEALTH AND MEDICAL COMMUNICATIONS AND DATA SHARING

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Work Plan: Enhanced Health and Medical Communications and Data Sharing				
Task	Description	Estimated Time to Complete	Estimated Cost	Lead Agency
Task 1	Work Group Development	2-3 months to establish and then quarterly ongoing	\$40,000 - \$60,000	SSMCP
Task 2	Current Conditions Assessment	4-6 months	\$30,000 - \$40,000	DHA and Madigan, regional private and nonprofit healthcare providers, and VA and TriCare clinics.
Task 3	Medical Data Sharing Work Plan Development	8-12 months. Note: This time is only for initial strategy development. The strategy should be updated based on the outcomes of each Work Group meeting.	\$35,000 - \$50,000	SSMCP

D.1.7 MEDICAL SURGE AND ALTERNATE CARE COORDINATION STRATEGY

Work Plan: Medical Surge and Alternate Care Coordination				
Task	Description	Estimated Time to Complete	Estimated Cost	Lead Agency
Task 1	Develop Working Group	2-3 months to establish and then quarterly ongoing	\$40,000 - \$60,000	NWHRN and SSMCP Healthcare Working Group
Task 2	Establish Planning Scenarios and Set Capability Targets	1-2 months	\$10,000 – \$15,000	NWHRN, SSMCP Healthcare Working Group, and regional healthcare providers (various)
Task 3	Conduct Assessment	4-6 months	\$30,000 - \$40,000	NWHRN, SSMCP Healthcare Working Group, and regional healthcare providers (various)
Task 4	Develop Target Deliverables	3-5 months	\$20,000 - \$35,000	NWHRN, SSMCP Healthcare Working Group, and regional healthcare providers (various)
Task 5	Establish a Training Cycle	Ongoing	NA	NWHRN, SSMCP Healthcare Working Group, and regional healthcare providers (various)

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D.1.8 EMERGENCY WATER SUPPLY FRAMEWORK FOR HEALTHCARE FACILITIES

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Work Plan: Enhanced Health and Medical Communications and Data Sharing				
Task	Description	Estimated Time to Complete	Estimated Cost	Lead Agency
Task 1	Confirm Critical Healthcare Facilities	1-2 months	\$3,000 - \$5,000	Water providers and health care representatives (emergency management and facilities)
Task 2	Develop Project Stakeholders and Responsibilities for each Facility	1-2 months	\$3,000- \$5,000	Water providers and health care representatives (emergency management and facilities)
Task 3	Establish Key Planning Scenarios	2-3 months	\$4,000 - \$6,000	Water providers and health care representatives (emergency management and facilities)
Task 4	Collect Inventory of Water System Components	2-4 months	\$7,000 - \$12,000	Water providers and health care facility representatives
Task 5	Assess Base Water Needs	2-4 months	\$8,000 - \$12,000	Health care representatives (emergency management and facilities)
Task 6	Assess Resilience of Existing Water System	6-8 months	\$50,000 - \$75,000	Water providers and health care facility representatives
Task 7	Develop Recommended Physical Improvements	5-7 months	\$50,000 - \$75,000	Water providers and health care facility representatives
Task 8	Establish Operational Procedures	3-4 months	\$15,000- 25,000	Water providers and health care facility representatives, emergency managers
Task 9	Identify Funding Strategies and Implementation Plan	1-2 months	\$5,000 - \$7,000	Water providers and health care facility representatives, emergency managers
Task 10	Emergency Water Supply Exercise Series	Year 1 Tabletop Exercise - 6 mo. Year 2 Tabletop Exercise - 6 mo Year 3 Functional Exercise - 9-mo.	\$75,000 - 90,000	P/T County Public Health Departments Hospital Ems and Facilities staff.

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D.1.9 WATER SYSTEM EMERGENCY INTERCONNECTION

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Work Plan: Water System Emergency Interconnection				
Task	Description	Estimated Time to Complete	Estimated Cost	Lead Agency
Task 1	Develop water system level of service goals	1-2 months	\$8,000 - \$15,000	JBLM
Task 2	Develop understanding of intertie options	3-4 months	\$10,000 - \$20,000	JBLM
Task 3	Preliminary Design	1-2 months	\$10,000 - \$15,000	JBLM
Task 4	Alternatives analysis	2-3 months	\$10,000 - \$15,000	JBLM
Task 5	Intertie Detailed Design	6-12 months	\$50,000 - \$200,000	JBLM, Water District
Task 6	Intertie Construction	12-18 months	\$500,000 - \$1,500,000	JBLM, Water District

D.2 Initial Project List

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ID	Lifeline	Applicable Asset Name from RA	Asset Name (if any)	Project Name	Problem	Project Idea	Pre-Workshop Prioritization
C-1	Communications	n/a	Nisqually Bridge Fiberoptics	I-5 Nisqually Bridge Fiberoptic Redundancy	Large fiberoptics cables servicing both the installation and the South Sound communities run along the underside of Nisqually Bridge, which experiences coastal flooding and faces severe impacts from sea level rise. Any direct impacts from flooding or construction to improve the resilience of the bridge would halt the operability of these cables for some time.	Evaluate and retrofit protective barriers to fiberoptic cables along the I-5 Nisqually Bridge. Explore adding additional fibreoptics along alternate routes to increase redundancies and eliminate single points of failure. Develop satellite connections as back up/redundancy (e.g. StarLink)	High
C-2	Communications	n/a	Capital Peak Radio Tower	Intergovernmental Emergency Communications Plan	The interoperability of radio systems between JBLM, Pierce County, and Thurston County requires significant coordination when it is needed. The difference between the frequencies that the DoD operates on and what the local agencies run on make its difficult to operate on the same frequency; JBLM first needs to obtain authority to operate on the same frequency. First responders (specifically police) lack adequate training on radio usage to switch channels. Additionally, issues have been noted with Capital Peak Radio Tower's ability to facilitate radio communications between local emergency management agencies and Washington State Emergency Management.	Create an Integovernmental Emergency Communications Plan that outlines how to create Talk Groups between the counties and JBLM along with other communication operations. Supplement the plan with annual joint-training exercises to make sure first responders at all organizations within the three agencies are well versed in radio operations. Additionally, consider capital improvements to Capital Peak Radio Tower to further enhance regional radio communications.	High
C-3	Communications	NA		Near-Base Cell Service Enhancement	During Workshop 2, the project team noted poor cellular service near the base. Poor cellular service can lead to communication breakdowns and delays in emergency response situations.	Investigate cell service options to enhance available cell service for residents and service members. Coordinate with JBLM about progress made by the Army & Air Force Exchange Store, currently working to improve cellular coverage.	High

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ID	Lifeline	Applicable Asset Name from RA	Asset Name (if any)	Project Name	Problem	Project Idea	Pre-Workshop Prioritization
E-1	Energy	Olympic Petroleum Pipeline	Olympic Petroleum Pipeline	Olympic/McChord Pipeline Vulnerability/ Risk Assessment	This asset was identified as highly vulnerable through the risk assessment.	Assess areas along the pipelines route that are susceptible to landslides/erosion and conduct bank stabliization in these identified areas. Conduct multi-phase feasibility assessment for seismically retrofitting portions of the pipeline. Current methods for seismically retrofitting pipes consist of cure-in-place pipe (CIPP) linings.	High
E-2	Energy	US Oil Refinery 8" Jet fuel Pipeline	McChord Pipeline (US Oil Refinery Jet Fuel Pipeline)	Olympic/McChord Pipeline Vulnerability/ Risk Assessment	High scoring asset not associated with issue-driven project.	A part of the project identified for the Olympic Petroleum Pipeline since it's a distributary of it.	High
E-3	Energy	n/a	6 JBLM-Tacoma Substations	Battery Support for Tacoma Power Substations	There are six substations that draw Tacoma Power resources away during an emergency. These 6 substations are jointly managed by Tacoma Power and JBLM.	Assess feasibility to make 6 substations self-sufficient through battery support to avoid drawing Tacoma Power resources away during an emergency.	High
F-1	Food, Hydration, Shelter	Emergency Food Network Warehouse, Nourish Pierce County, Thurston County Food Bank	Food banks - 70 Emergency Food Bank locations	Local Food Security Plan	More coordination between regional food banks and distributors needed in case of large scale emergencies.	Food system planning is happening at a local level between partners and TPCHD using GIS mapping, community conversation and outreach and partnering between agencies.	Low
F-2	Food, Hydration, Shelter	n/a	Pierce County Mass Shelter	Pierce County Mass Shelter Identification	Pierce County's contracts for mass shelters have expired leading it to rely on Red Cross for support. Tacoma Dome has been considered as a site, but it has poor HVAC systems. Washington State Fairgrounds have been considered, specifically for livestock, but is privately owned and located on a floodplain.	Conduct a pre-disaster emergency shelter facilities assessment to look at staffing requirements, support services, material resources, funding, and agreements to support shelter operations for a range of capacities, durations, and needs. Conduct a study assessing priority locations among existing county properties to identify potential acquisition sites. Evaluate feasibility of including Tacoma Convention Center as a potential shelter site. Review West Pierce Fire and Rescue's training of Community Emergency Response Teams and city staff on identifying shelter locations.	High
F-3	Food, Hydration, Shelter	Niagara Bottling Co. Facility in Puyallup	NA	Thurston County Emergency Water Delivery Plan	Thurston County Emergency Management does not have a plan in place for delivering water to inhabitants if the regional potable water system goes offline.	Explore options with water providers inside and outside of Pierce and Thurston Counties including: Develop a contract with Niagara Bottling Co.'s facility in Puyallup Dvelop procedures for extracting and delivering water from reservoirs and tanks through trucks Study potential water sources for American Water (JBLM has an existing contract with American Water to provide bottled water)	Medium
F-4	Food, Hydration, Shelter	n/a	Thurston County Mass Shelter	Thurston County Mass Shelter Identification	Thurston County does not have any identified mass shelter locations and relies on the Red Cross whose capacity is 500 individuals. The county needs to conduct a comprehensive review and plan assessing their current and desired emergency shelter capacity and opreations	Conduct a pre-disaster emergency shelter facilities assessment to look at staffing requirements, support services, material resources, funding, and agreements to support shelter operations for a range of capacities, durations, and needs. Conduct a study assessing priority locations among existing county properties to identify potential acquisition sites. Evaluate feasibilty of including Thurston County Fairgrounds as a potential shelter site.	High

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ID	Lifeline	Applicable Asset Name from RA	Asset Name (if any)	Project Name	Problem	Project Idea	Pre-Workshop Prioritization
HH-1	Health & Medical	n/a		Extreme Heat Incident Response and Illness Prevention Plan	Extreme heat events have occurred in recent summers that strain the region's ability to keep vulnerable populations safe. Furthermore, extreme heat conditions pose health implications for base personnel during outdoor training.	Develop a countywide plan to improve the region's response during extreme heat incidents. The plan will identify capabilities and strategies needed to reduce heat-related injuries and deaths.	Medium
HH-2	Health & Medical	n/a	NA	Healthcare Data Synergy Enhancement	Overall data sharing between Madigan and regional healthcare system is lacking. There is a lack of access to Department of Health(DoH) data for infectious disease outbreaks. Transferring patients from Madigan to other hospitals is complicated due to the fact that external hospitals cannot receive images such as X-rays from Madigan	Strengthen collaboration and data sharing protocols between state and local agencies to ensure timely and efficient access to critical information.	High
HH-3	Health & Medical	n/a	Healthcare Staffing	Healthcare Staffing Frameworks	Health services within the region are underfunded, understaffed, and often at capacity. This has proven particularly problematic for behavioral health services.	Expand health services throughout the region, with a focus on behavioral health services. Pursue increased funding for new facilities as well as increased staffing at existing facilities. Additionally, adopt a Contingency Standards of Care framework to better equip the system to handle crises and emergencies. Clinical rotation program for army medics in which they are assigned to hospitals to alleviate understaffing	Medium
HH-4	Health & Medical	Hawks Prairie Reservoirs, Philip Storage Facility, & American Lake Gardens Tank Storage Facility	NA	Hospital Emergency Water Supply Plan	Identify backup water supply options for all hospitals. Water demands vary by hospital and the number of current/incoming patients, critical surgeries, etc. In theory, hospitals have 72 hours of water, but this can vary greatly depending on the use.	Develop a potable water plan to supplement the existing water supply and ensure that hospitals have access to sufficient water during emergencies.	High
HH-5	Health & Medical	n/a	NA	Military Health Resources Website and App Development	The base lacks a centralized system for healthcare resources. For example, the Cohen VA Clinic received 200 mental health referrals in a month from Madigan and was overwhelmed with the demand.	JBLM can collaborate with SS211 by providing information on the local VA and TriCare system. This data can be integrated into SS211's existing resource tracking system to develop a webpage specifically for military members, veterans, and their families. The webpage can be organized under 5 basic needs groups and provide regional healthcare resources. BaseHubs can integrate this webpage into an app that would be available to service members. According to BaseHubs, the cost of developing this app is a one-time payment of \$22,000.	High

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ID	Lifeline	Applicable Asset Name from RA	Asset Name (if any)	Project Name	Problem	Project Idea	Pre-Workshop Prioritization
HH-6	Health & Medical	MultiCare Good Samaritan Hospital?	St. Joseph Medical Center (MultiCare Good Samaritan)	Upgrade St. Joseph Medical Center Communications Capabilities	High scoring asset not associated with issue-driven project.	Increase redundancy of DMCC capability in Pierce County by developing a secondary location with the same communications capabilities: Franciscan Health St Joseph Medical Center? was identified as a secondary DMCC location but does not have the communications capabilities. Project idea would be to upgrade communications equipment at St. Joe's so that it can adequately service in an alternate DMCC role for Pierce County.	High
HH-7	Health & Medical	n/a	NA	Wildfire Smoke Preparedness Campaign	Smoke from wildfires port and industrial fires have caused recurring air-quality issues in the region.	A community preparedness campaign associated with hazardous air quality that explains the importance of wildfire smoke preparedness for families such as having extra inhalers, masks, and fan/filter for AC units. Box fan and filter distribution during heat and wildfire smoke events. There is an ongoing grant through the City of Tacoma (through 2025 for sure). There is a separate fund for rural locations (limited to 150 fans in 2024 only).	Medium
HM-1	HazMat	Solid Waste Hazohouse (TYPO?)	NA	Inter-jurisdictional Special Waste Removal Plan	The plans, infrastructure, and services for disposing off all sorts of waste including out of service vehicles, discarded furniture, and medical waste are inadequate.	Develop an Inter-jurisdictional collaboration plan for special waste removal.	Low
HM-2	HazMat	Port of Tacoma	Port of Tacoma	Port of Tacoma Sea Level Rise HazMat Resilience Plan	The Port of Tacoma is home to several hazardous materials storage locations. The containment of these materials in Port facilities can potentially be impacted by sea level rise.	Evaluate current safety protocols in place for HazMat storage at the port. Upgrade the protocol and procedures as necessary based on climate projections to ensure continued safety.	Medium
NR-1	Natural Resources	11 ACUB Emphasis Areas included in GIS data.	NA	ACUB Program Enhancement Framework	The Army Compatible Use Buffer (ACUB) program addresses many of the issues related to natural resource protection and sensitive habitats. However, there is currently a lack of policing and strong integration across agencies and authorities. Tribal treaty obligations, Nisqually, and traditional uses of the JBLM prairie landscapes are a critical part of natural resources and ACUB.?	Explore mechanisms and processes that can supplement ACUB, including expanding its scope to give it more rigor and enforcement authority. Develop a decision-making framework that includes climate indicators for natural resource and ecosystem management. Explore existing tools such as habitat suitability models to supplement the framework. Consider adding a community engagement component and an interagency coordination component.	Medium

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ID	Lifeline	Applicable Asset Name from RA	Asset Name (if any)	Project Name	Problem	Project Idea	Pre-Workshop Prioritization
NR-2	Natural Resources	n/a	NA	Environmental Systems Public Education Campaign	Communities lack an understanding of the interdependence of natural processes, which can lead to negative consequences such as unintentional environmental degradation.	Conduct public awareness campaigns to boost public understanding of why a systems outlook on natural resources is essential to public health and wellbeing.	Low
NR-3	Natural Resources	Wildlife Refuge - Billy Frank Jr. Nisqually National Wildlife Refuge	Nisqually Wildlife Refuge	Nisqually National Wildlife Refuge Slope Monitoring/ Stabalization Program	High scoring asset not associated with issue-driven project.	Since landslides pose the greatest risk to this asset, develop a slope monitoring and stabilization program within the refuge boundaries. This can be done as a research partnership with local universities.	Medium
NR-4	Natural Resources	Roy prairie pocket gopher (Mazama species), Yelm pocket gopher (Mazama species)	NA	Wildfire Resilience Improvement	Wildfires can cause significant damage to electrical infrastructure. Wildland-Urban Interface areas have been identified in and around the municipalities of Roy, Yelm, Steilacoom, and Spanaway/Frederickson, all of which are adjacent to the installation. Fuel management coordination and general community education and knowledge of prescribed burns and who is responsible on federal lands. Evacuation Planning for community. EPA Wildfire Grant – \$1 million dollars over 3 years focused on rural resiliency and preparedness. Education and outreach, as well as community symposia will result in a better understanding of what rural populations need.	Assess and test wildfire prevention and fighting strategies across JBLM Directorate of Public Works, adjacent municipalities, and other agencies. Research additional opportunities for improved coordination and funding to further reduce the risk of wildfire.	Medium

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SS-1	Safety & Security	South Pierce Fire & Rescue, Pierce County Sheriff Department - South Hill Precinct, Pierce County Sheriff Department - Parkland Substation, Pierce County Sheriff Department - Headquarters, and Pierce County Sheriff Training Center Additionally, there is Thurston County Emergency Coordination Center, City Hall (City of Olympia PD), Emergency Services Center - TCOMM 9-1-1, TC Bldg 2 - Courthouse & Sheriff's Office, CITY HALL (City of Lacey EOC), and Yelm Police Department. These are Safety & Security assets located in Thurston County.	NA	First Responder Staffing	South Pierce Fire and Rescue, Pierce County Sheriff's Office, and some other police departments and fire districts in Thurston County have reported issues with staffing.	Assess any existing mutual aid agreements (MAAs) between regional fire and police departments to determine areas that lack adequate coverage. Consider expanding JBLM's existing MAAs to help address these areas that lack coverage.	Low
T-1	Transportation	Burlington Norhtern Santa Fe Rail Line - Running through Base	BNSF Rail	BNSF Rail Line Resilience Enhancement	No documentatation whether rail line is seismically tested.	Research whether BNSF rail line is seismically retrofitted. Identify plan of action to retrofit accordingly.	Low
T-10	Transportation	SR-7	SR-7	WSDOT Resiliency Strategy for JBLM Transportation Access	High scoring asset not associated with issue-driven project.	The SR 7: 260th St E to I-5 Corridor Sketch Study completed by WSDOT in 2018 states that 61% of the corridor experiences regular congestion, two bridges along the corridor demonstrate a performance gap for seismic retrofit, and one section of the corridor has medium climate change vulnerability rating due to flooding/drainage issues from Clover Creek. Work with WSDOT to address these issues.	High
T-11	Transportation	SR-510	SR-510	Yelm Loop Phase 2 (SR 510 - Cullens Road to SR 507)	High scoring asset not associated with issue-driven project.	Work with WSDOT to incorporate resilience design in Phase 2 of the SR 510 Yelm Loop project that is slated to begin construction in Spring 2025.	High
T-2	Transportation	n/a	NA	Develop a Regional Transportation Resiliency Plan	There are existing concerns for installation access, congestion mangement, emergency evacuation routes, etc. that need to be studied and coordinated.	Identify and map "lifeline" transportation routes that are critical for regional mobility, public safety, and economic resiliency. A plan will guide long-term transportation infrastructure strengthening projects.	High

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ID	Lifeline	Applicable Asset Name from RA	Asset Name (if any)	Project Name	Problem	Project Idea	Pre-Workshop Prioritization
T-3	Transportation	Interstate 5	I-5	I-5 Regional Detour Management Framework	Interstate-5 is the most critical thoroughway running north-south across the region. It provides access to the installation and is crucial for moving people and freight. Disruptions on I-5 cause significant delays, as currently available detours add significant travel times. Closures on I-5 cause disruptions across community lifelines.	Develop a interagency detour plan in which communities can come together and establish procedures for maintaining detours in their communities without being overwhelmed when I-5 shuts down.	High
T-4	Transportation	SR-507	SR 507 Bridge	Regional Bridge Seismic Retrofit	Some bridges are not seismically retrofitted. While this bridge is not currently on WSDOT's priority list, it would be used as one of the only alternatives to a blockage to traffic on I-5.	Research options to seismically retrofit SR 507 Bridge over the Nisqually near McKenna. Coordinate with WashDOT about replacement and/or retrofit plans.	High
T-5	Transportation	n/a	NA	Western Washington Airport Siting	The State-created Commercial Aviation Coordination Commission (CACC) is currently exploring new airport locations in the South Sound. Some of the proposals directly conflict with military air operations.	In review of the legislation creating the CACC, appears no JBLM representative sits on the commission. Recommend State of Washington legislature take action to appoint JBLM Garrison Commander as an Ex-Officio member of the CACC. Consider DoD/US Army request join FAA as a cooperating agency to complete the NEPA analysis associated with assessment of new civilian airport site alternatives. NOTE: CFR Title 14 Part 157 provides guidance to persons proposing to construct, alter, activate, or deactivate a civil or joint-use (civil/military) airport or to alter the status or use of such an airport. Section 157.7 directs FAA to conduct an aeronautical study of an airport proposal and, after consultation with interested parties, issue a determination. FAA to consider effects the proposed action would have on existing or contemplated traffic patterns of neighboring airports, existing airspace structure, and manmade and natural objects within affected area. Feasibility and Site Selection Process for new airport includes Airspace Evaluation Components. FAA Air Traffic Organization, which includes DoD representation, designates airspace use and considers DoD operations, both current and future.	High
T-6	Transportation	SR - 016	SR - 016	WSDOT Resiliency Strategy for JBLM Transportation Access	High scoring asset not associated with issue-driven project.	Work with WSDOT to revisit the SR-16 Congestion Study (Tacoma Narrows Bridge to SR -3) completed in 2018 to expand the focus area from Tacoma Narrows Bridge to SR-16's interchange with I-5.	High
T-7	Transportation	SR - 512	SR - 512	WSDOT Resiliency Strategy for JBLM Transportation Access	High scoring asset not associated with issue-driven project.	Completed in 2023, WSDOT's SR-512 Corridor Study identifies multiple improvement strategies for the corridor. Work with WSDOT and military personnel that commute from Puyallup to determine which of these strategies pose the greatest benefit for the corridor.	High
T-8	Transportation	Nisqually Road / Old Pacific Highway	Nisqually Road / Old Pacific Highway	WSDOT Resiliency Strategy for JBLM Transportation Access	High scoring asset not associated with issue-driven project.	Since landslides pose the greatest risk and have occurred in the past along this roadway, an assessment of the potential slope failure points along the roadway should be conducted; slope stabilization projects should be conducted once these areas are identified.	High
T-9	Transportation	US - 101	US - 101	WSDOT Resiliency Strategy for JBLM Transportation Access	High scoring asset not associated with issue-driven project.	While outside the study area, an area of US-101 in Thurston County known as "Mud Bay" is susceptible to sea level rise. Consider a focused study on projected sea level rise in this area that leads to capital improvements such as sea wall development.	Medium

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ID	Lifeline	Applicable Asset Name from RA	Asset Name (if any)	Project Name	Problem	Project Idea	Pre-Workshop Prioritization
W-1	Water Systems	Alder Dam, LaGrande Dam, American Lake Dam, Mud Mountain Dam, North Fork Clover Creek E1 Det Basin (HHPD), North Fork Clover Creek W1 Det Basin (HHPD), Skookumchuck Dam (not scored in RA), Yelm Canal Dike Dam (not scored in RA)	Dam Assets	Evacuation Route Planning for Catastrophic Dam Failure and Volcanic Lahar	Evacuation routes and related emergency response planning are not sufficiently identified and socialized in the community in response to a dam failure and lahar hazards.	Develop an evacuation plan for potential dam failure and lahar hazards in coordination with residents, businesses, and other stakeholders. The plan will include routes, alert notification protocols, signs, staging areas, public education, emergency sheltering needs, operational plans, and training for organizations and personnel who would be involved in evacuation operations.This threat remains important for the community at large and it is likely that JBLM specific populations would be affected.	High
W-2	Water Systems	Intertie from JBLM to DuPont	NA	JBLM Emergency Water Supply Plan - 1	The installation has voiced some concern with their lack of redundancy in potable water supply.	Explore the need for an intertie between Lakewood and JBLM's water system for redundancy. Lakewood has identified a potential intertie within its Comprehensive Plan at 150th near McChord, that is available but not connected. Lakewood operates a 3MG (million gallon) reservoir at the perimeter of the base that is not on the same water supply as JBLM and could serve the base in case of a contamination event.	High
W-3	Water Systems	n/a	Tacoma Water Intertie	JBLM Emergency Water Supply Plan - 2	Lack of redundancy of the water system between Tacoma Water, JBLM, and possibly another local water utility.	Intertie between Tacoma Water main supply and JBLM. Tacoma Water's main supply facility is about 1 mile away from fence line and on higher ground, so supply from Tacoma Water to JBLM would be gravity fed. This would be important for increasing redundancy of water supply on base in response to the arising PFAS issue. Most of Tacoma Water's supply is from surface water (Green River watershed) at >95%, so PFAS contamination of their supply is not a concern.	High
W-4	Water Systems	n/a	Wastewater Discharge Facilities along Nisqually River	Nisqually Wastewater Discharge Facilities Resiliency	Wastewater Discharge Facilities along the Nisqually are reportedly susceptible to flooding	Work with the owners of these assets and the Nisqually Tribe to explore potential nature-based flood mitigation tactics and retrofits for these facilities.	Low
W-5	Water Systems	Regional Aquifers	NA	PFAS Filtration System Installation	Several aquifers beneath and around the base have shown signs of contamination by polyfluoroalkyl substances (PFAS), man-made chemicals known to cause a range of health impacts in humans. This contamination has been attributed to the base's application of these chemicals on its airfield runways to prevent and suppress fires. PFAS was also detected near Nisqually State Park (WS2 comment).	Investigate options to fund and install PFAS filtration systems for installation and community water systems in the event PFAS are detected in local water systems. Congress may authorize DoD OLDCC to provide community planning support (financial and technical) to assess and respond to PFAS issues adversely affecting the community. This effort would need to be done in coordination with the Military Service as DoD is always responsible for remediation of contamination they create	High

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ID	Lifeline	Applicable Asset Name from RA	Asset Name (if any)	Project Name	Problem	Project Idea	Pre-Workshop Prioritization
W-6	Water Systems	No associated asset in RA scoring spreadsheet.	Regional levee systems	Regional Flood Resilience Enhancement	<p>Areas downstream of Alder, near McKenna, are prone to flooding. McKenna was evacuated in 2006.</p> <p>Recent peak flow numbers for the Puyallup system indicate that the lower 10 miles are no longer sufficient to retain a 100-yr flood. A Puyallup system failure would cause a closure of I-5 that can potentially prevent access to the port.</p> <p>An extreme flood event causing flood stage on both the Nisqually and Puyallup Rivers would isolate the installation and likely impede access to it.</p> <p>Sedimentation is an issue and will increase as storms become more intense.</p> <p>Lakewood's study suggests flooding will overtop I-5, Pac Highway, and Bridgeport Ave for a couple weeks. Obvious impact to JBLM mission readiness. City funding and some state funding are being used to get this project started (30% of need) but in the end it may require an additional \$20M to \$30M to complete. Possible DoD funding thru DCIP a distinct possibility.</p>	Explore levee improvements, including land acquisition, in strategic locations along the Nisqually and Puyallup Rivers to reduce the potential for evacuation and access issues to both the installation and surrounding communities. Explore collaborations with Pierce and Thurston County emergency managers, floodplain managers, and USACE.	High
W-7	Water Systems	n/a	City of Lacey Water Storage Facilities	Seismic Retrofit for the City of Lacey's Water System	Lacey's water storage facilities do not meet current seismic codes.	Pursue seismic upgrades to Lacey's water storage facilities. Inspect and potentially retrofit the Union Mills Reservoir, Judd Hill Reservoir, Steilacoom Reservoir, Hawks Prairie Reservoir, and Nisqually Reservoir with seismic anchors. Ensure capabilities will not be severely impacted during a seismic event.	Low
W-8	Water Systems	n/a	Roy Water System	Seismic Retrofit for the City of Roy's Water System	City of Roy's Water System is susceptible to earthquakes and power outages.	Review preliminary plans for additional water storage tanks for City of Roy. Identify additional enhancements to reduce susceptibility to earthquakes and power outages.	Low

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W-9	Water Systems		Regional Water Systems	Thurston County Resiliency Strategy for Regional Water Systems	A series of mitigation actions from Thurston County's HMP collectively address improving the resilience of water systems in Thurston County and its constituent jurisdictions. These actions are geared at ensuring continued water supply during hazards, and range from retrofitting reservoirs to procuring emergency supply equipment.	From the City of Lacey HMP Annex Increase climate resilience by installing a supplemental drinking water well for S04. From the Public Utility District Annex, Thurston HMP 2024 - a. Installation of New Generators on Group A Water Systems b. Evaluate and Implement Mitigation to Vulnerable Wells Due to Drought c. Evaluate and implement manual water service after hazard event d. Installation of new generators on Group A Water Systems	Low

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D.3 Prioritization Criteria

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Resilience Project Prioritization Metrics

Military Installation Resilience Review for Joint Base Lewis-McChord

Purpose of a Military Installation Resilience Review

- Enable a “one community” response to Identify and implement actions to foster, protect, and enhance the sustainability of Joint Base Lewis-McChord.
- Support local jurisdictions partnership with the installation to identify man-made or natural threats that may likely impair the continued operational utility of the installation.
- Enhance infrastructure and other resilience measures and projects to protect, restore, and maintain natural features.

Military Installation Resilience

The capability of a military installation to avoid, prepare for, minimize the effect of, adapt to, and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions that do, or have the potential to, adversely affect the military installation or essential transportation, logistical, or other necessary resources outside of the military installation that are necessary in order to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions.

Source: FY 2019 National Defense Authorization Act

Qualitative Approach to Prioritize Projects

Prioritize resilience projects and actions with high-level criteria such as benefit factors important to the community and installation, feasibility, cost, and risk reduction. Prioritizing projects is essential for effective planning and resilience.

Prioritization Metrics



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Resilience Project Prioritization Metrics

Military Installation Resilience Review for Joint Base Lewis-McChord

Community Priorities

- Priority should be given to projects that support and enhance military value, mission assurance, and mission-essential functions.
- Consider additional benefits that the project may provide to key community resilience requirements and stakeholders.
- Consider political will and community support. Projects that have both community and political support will likely be implemented with minimal resistance or delays.
- Time-sensitive and critical nature of the project should be weighed.

Co-Benefits

- Evaluate the benefit and importance of the project among multiple stakeholders.
- Consider project effectiveness. Multiple goals may be achieved or multiple problems solved by one resilience project.

Partnership Opportunities

- What are the internal and external relationships created or strengthened by the project?
- Partnerships can play an important role in projects. Opportunities for partnership can increase project feasibility and efficiency.
- Partnerships may be developed with private sector, nonprofits, universities, and other organizations.

Feasibility

- Projects with identified funding, such as grants or grant eligibility, may be considered for higher ranking.
- Consider the anticipated difficulty associated with implementing the project as well as required technical expertise needed to complete.

Social-Economic Impact

- Vulnerable populations: Projects may be considered more effective and given priority if they provide a benefit to socially vulnerable populations.
- Equity and social justice: Consider how projects highlight social vulnerabilities and opportunities to alleviate negative impacts on disproportionate communities.
- Enhance value of military installation.

Environmental Impact

- Consider the externalities. Some projects, though having a resilience benefit to protect a certain facility, may also have external, unintended consequences on other facilities, natural resources, or ecosystems.

Costs

- Generalized cost estimates or ranges can be used to weigh projects. Consider both the initial and life cycle costs of projects. For nonstructural projects, regard the costs including planning costs and the demand for staffing.
- Time is an important factor to consider. This includes the estimation of project duration and completion. Political factors may potentially slow things down.
- The project should be compliant with policy or regulatory requirements.

Risk Reduction

- Consider the risk reduction, risk avoidance, or hazard mitigation benefits that the project may generate.
- Consider the broad estimate of the anticipated future losses avoided including life safety, property damage, and infrastructure damages.
- Resilience Team may place projects in broad monetary categories using estimates based on previous damages or simply categorize as high, medium, or low based on their expertise.



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E.1 Funding Directory

E.1.1 DEFENSE ACCESS ROAD PROGRAM

Agency: US Department of Defense (DoD) & Federal Highway Administration (FHWA)

Purpose/Goals: The Defense Access Road (DAR) Program provides a means for the military to pay their share of the cost of public highway improvements necessary to mitigate an unusual impact of a defense activity. An unusual impact could be a significant increase in personnel at a military installation, relocation of an access gate, or the deployment of an oversized or overweight military vehicle or transporter unit.

Eligible Applicants: Defense Communities Only. To initiate a DAR project, the local military installation identifies the access or mobility needs and brings these deficiencies to the attention of the Military Surface Deployment and Distribution Command (SDDC).

Eligible Use of Funds: If the project is determined to be eligible for financing either in whole or in part with defense access road funds, SDDC will certify the roadway as important to the national defense and will authorize expenditure of DoD funds. The Commander, SDDC, is the only representative of the DoD officially authorized to make the certification required by section 210, title 23, U.S.C., in behalf of the Secretary of Defense.

Terms/Requirements/Notes: No match requirement listed. Smaller applicant pool due to defense community applicability. Must confirm priority transportation corridor includes highway for eligibility.

Type: Grant

Funding Amount and Cycle: The SDDC will determine if the proposed work/project/improvements are eligible for DAR funds and certify the road/roads/intersection as important to the national defense if appropriate. Then the military service is responsible for requesting DoD funding for the project through their normal budgeting process. Once programmed by the military service, the funds must be authorized and appropriated by Congress. After Congressional approval, the funds are transferred to FHWA and allocated to the agency administering the project. Title 23 Federal-aid procedures are followed in the design and construction of the project.

Link: [Defense Access Road Program \(DAR\) | FHWA \(dot.gov\)](https://www.fhwa.dot.gov/dar/)

E.1.2 REBUILDING AMERICAN INFRASTRUCTURE WITH SUSTAINABILITY AND EQUITY

Agency: US Department of Transportation
Purpose/Goals: For road, rail, transit and port projects to build and repair freight and passenger transportation networks.

Eligible Applicants: State, local and tribal governments, including U.S. territories, transit agencies, port authorities, metropolitan planning organizations (MPOs), and other political subdivisions of state or local governments.

Eligible Use of Funds: The primary selection criteria are Safety, Environmental Sustainability, Quality of Life, Economic Competitiveness, and State of Good Repair. Specific eligible uses are as listed:

- 1. Capital Projects Eligible projects for RAISE grants are surface transportation capital projects within the United States

or any territory or possession of the United States that include, but are not limited to:

- a. highway, bridge, or other road projects eligible under title 23, USC;
 - b. public transportation projects eligible under chapter 53 of title 49, USC;
 - c. passenger and freight rail transportation projects;
 - d. port infrastructure investments;
 - e. intermodal projects;
 - f. projects investing in surface transportation facilities that are located on Tribal land and for which title or maintenance responsibility is vested in the Federal Government.
 - g. Research, demonstration, or pilot projects are eligible only if they will result in long-term, permanent surface transportation infrastructure that has independent utility
2. Planning Projects
- a. Planning, preparation, or design of eligible surface transportation capital projects.
 - b. In addition, eligible activities related to multidisciplinary projects or regional planning may include:
 - i. Development of master plans, comprehensive plans, or corridor plans;
 - ii. Planning activities related to the development of a multimodal freight corridor, including those that seek to reduce conflicts with residential areas and with passenger and non-motorized traffic.

Terms/Requirements/Notes: Grants not less than \$5 million and not greater than \$25 million, except that for projects located in rural areas (as defined in Section C.4.(a)) the minimum award size is \$1 million. Must provide 20% non-federal match. There is no minimum

award size, regardless of location, for RAISE planning grants. Total available is \$1.5 billion. Ties from project to solving a transportation problem, safety, and climate change make it competitive. Need to clarify the benefit to historically disadvantaged census tracts.

Type: Grant

Funding Amount and Cycle: Annual cycles from FY23-26. Current cycle is closed.

Link: <https://www.transportation.gov/RAISEgrants>

E.1.3 PREVENTING OUTAGES AND ENHANCING THE RESILIENCE OF THE ELECTRIC GRID FORMULA GRANTS

Agency: U.S. Department of Energy

Purpose/Goals: To improve the resilience of the electric grid against disruptive events by enhancing the capabilities of states and Indian tribes to address current and future resilience needs

Eligible Applicants: States and Indian tribes, who can then “subaward” to the following eligible entities for resilience projects that implement resilience measures:

- Electric grid operators
- Electricity storage operators
- Electricity generators
- Transmission owners or operators
- Distribution providers
- Fuel suppliers
- Any other relevant entity, as determined by the funding agency.

Eligible Use of Funds: To implement a wide range of resilience measures intended to mitigate the impact of disruptive events, including:

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APPENDIX E: FUNDING STRATEGY

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- Weatherization technologies and equipment
- Fire-resistant technologies and fire prevention systems
- Monitoring and control technologies
- Undergrounding of electrical equipment
- Utility pole management
- Relocation of power lines or the reconductoring of power lines with low-sag, advanced conductors
- Vegetation and fuel-load management
- Use or construction of distributed energy resources for enhancing system adaptive capacity during disruptive events, including microgrids and battery-storage subcomponents
- Adaptive protection technologies
- Advanced modeling technologies
- Hardening of power lines, facilities, substations, or other systems
- Replacement of old overhead conductors and underground cables

Terms/Requirements/Notes: Funding will be distributed on a formula basis according to the allocations. Applicants must provide a 15% match on Federal allocation. Strong alignment with energy resilience. Project will need to apply through the State. Application strength increases if disadvantaged community benefits are well identified.

Type: Grant

Funding Amount and Cycle: Most recent round of funding closed on June 17, 2024. Total funding available for these FY24 grants is \$562 million.

Link: <https://www.energy.gov/gdo/grid-resilience-statetribal-formula-grant-program>

E.1.4 CLEAN ENERGY FUND – GRID MODERNIZATION PROGRAM

Agency: Washington State Department of Commerce

Purpose/Goals: Funding for Washington electric utility projects that advance clean, renewable energy technologies and transmission and distribution control systems; support renewable energy source integration, distributed energy resource deployment, and sustainable microgrids; or increase utility customer choice in energy sources, efficiency, equipment, and utility services.

Eligible Applicants: Community organizations, local governments, federally recognized tribal governments and their affiliates, public and private retail electrical utilities. Applicants that are not electrical utilities must demonstrate partnership with their respective load serving utility.

Eligible Use of Funds: Project must conduct activities necessary to the deployment of capital assets with a lifespan of 13-plus years and planned to be located in the State of Washington. Application must demonstrate a commitment to completing the minimum scope of work for the corresponding application track. Applications will be evaluated under two tracks: (1) planning and development for new projects / feasibility and early stage design, (2) implementation, installation, and commissioning. Project must primarily address one or more of following areas: a) Battery energy storage, b) Demand management, c) Distribution protection and automation for integration of renewable energy and/or distributed energy resources, d) Microgrids using renewable energy or other renewable distributed energy resources, e) Transactive controls, f) Building thermal or district energy systems, g) Reduce transmission or distribution congestion issues limiting renewable energy resources, h) Other

APPENDIX E: FUNDING STRATEGY

clean, distributed energy resources (must not be conventional and commercially available technology such as solar PV systems, smart meters, etc.)

Terms/Requirements/Notes: Program will award up to \$10.67 million in grants. \$5 million is carved out for Track 1 projects, rest will be for Track 2. Applicants can only receive at most one award from Track 1 and one for Track 2. Min award for Track 1 is \$75,000, max is \$400,000. Min award for Track 2 is \$750,000 and max is \$2 million. Minimum match required. Amount depends on organization type of the applicant, e.g., medium and large electrical utilities will need to match \$1 for every \$1 received; non-profits, local gov, and small utilities need to match \$1 for every \$4 received. Clean energy/renewable energy component can make projects more.

Type: Grant

Funding Amount and Cycle: There have been five cycles of funding, the most recent one closed in Sept 2023. Historically there have been two phases of applications: first from March through May, then from August through September.

Link: [Energy Grid Modernization - Washington State Department of Commerce](#)

E.1.5 GRID RESILIENCE AND INNOVATION PARTNERSHIPS PROGRAM

Agency: U.S. Department of Energy (DoE) Grid Development Office

Purpose/Goals: Enhance grid flexibility and improve the resilience of the power system against growing threats of extreme weather and climate change. Offers three sub-programs: Grid Resilience Utility and Industry Grants (\$2.5 billion), Smart Grid Grants (\$3 billion), and Grid Innovation Program (\$5 billion)

Eligible Applicants: Varies by sub-program, but broadly eligible entities that can apply for these grants include: electric grid operators; electricity storage operators; electricity generators; transmission owners or operators; distribution providers; fuel suppliers. Applicants must first submit a concept paper as first step of the application process.

Eligible Use of Funds: Varies by program, but in general, grants will fund transmission and distribution technology solutions that will mitigate hazards (Grid Resilience Utility and Industry Grants); increasing capacity of the transmission system; preventing faults that may lead to wildfires or other system disturbances, integrating renewable energy at the transmission and distribution levels, and facilitating the integration of increasing electrified vehicles, buildings, and other grid-edge devices (Smart Grid Grants); and use innovative approaches to transmission, storage, and distribution infrastructure to enhance grid resilience and reliability (Grid Innovation Program).

Terms/Requirements/Notes: Competitive national program. Dependent on activities and technology identified for implementation.

Type: Grant

Funding Amount and Cycle: The program will provide up to \$10.5 billion over five years (FY22-26). The first funding cycle opened in November 2022 and closed in December 2022. Concept papers for FY24-25 round were due in January 2024, with the full application deadline due in April 2024.

Link: [Grid Resilience and Innovation Partnerships \(GRIP\) Program | Department of Energy](#)

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A.1.6 TRANSMISSION FACILITATION PROGRAM

Agency: Department of Energy (DoE) Grid Development Office

Purpose/Goals: Develop new large-scale transmission lines and upgrading existing transmission that would otherwise not be built.

Eligible Applicants: Any entity with an eligible project. Eligible project is a project that a) constructs a new or replaces an existing eligible electric power transmission line and b) increases transmission capacity of an existing eligible electric power transmission line. The program uses a two-part application process to screen potential applicants.

Eligible Use of Funds: Projects that construct, replace, or upgrade a transmission line that is either not less than 1,000 megawatts (MW) for new lines or 500 MW for existing lines as well as a project that connects microgrids in select States and U.S. territories. Best for projects that rely on firm point-to-point transmission. There have been two rounds for Capacity contract projects and one for public-private partnership Projects. Capacity contract projects have focused on increasing grid capacity and accelerating transmission buildout. Public-private partnership focused on connecting existing microgrids to a larger operating transmission system.

Terms/Requirements/Notes: Funding terms vary by financing tool offered and specific requests for proposals associated with each funding cycle. Very competitive national program with two-step application process.

Type: Loans, capacity contracts, public-private partnerships

Funding Amount and Cycle: There have been two rounds for capacity contract projects, with the most recent one closing in March 2024. Round 1 awarded four projects funding.

Link: [Transmission Facilitation Program | Department of Energy](#)

E.1.7 PUBLIC HEALTH EMERGENCY PREPAREDNESS (PHEP) PROGRAM

Agency: Centers for Disease Control and Prevention

Purpose/Goals: To help health departments build and strengthen their abilities to effectively respond to a range of public health threats, including infectious diseases, natural disasters, and biological, chemical, nuclear, and radiological events.

Eligible Applicants: Current 62 PHEP recipients (State of Washington is a PHEP recipient).

Eligible Use of Funds: Public health preparedness planning through public health preparedness capabilities and activities such as information sharing, emergency operations coordination, community preparedness, public health surveillance and epidemiological investigation, laboratory testing, responder safety and health and medical material management and distribution.

Terms/Requirements/Notes: Washington’s FY23 PHEP total funding was \$13,364,241. Estimated total funding at \$3.3 billion with award ceilings of \$50 million per recipient, award floor is \$370,000.

Type: Cooperative Agreement

Funding Amount and Cycle: Annual program, depending on appropriations. Most recent cycle application deadline was April

2024. Anticipated award date of July 2024. Performance period length for the funding program is five years. Expect to have 62 recipients.

Link: https://www.cdc.gov/readiness/php/phep/2024-phep-cooperative-agreement-guidance-budget-period-1.html?CDC_AAref_Val=https://www.cdc.gov/orr/readiness/phep/index.htm

E.1.8 WATER INFRASTRUCTURE FINANCE AND INNOVATION ACT (WIFIA)

Agency: Environmental Protection Agency

Purpose/Goals: Accelerates investment in nation’s water infrastructure by providing long-term, low-cost supplemental loans for regionally and nationally significant projects

Eligible Applicants: Local, state, tribal, and federal government entities; partnerships and joint ventures; corporations and trusts; Clean Water and Drinking Water State Revolving Fund (SRF) programs.

Eligible Use of Funds: Construction of publicly owned treatment works, non-point source pollution management, national estuary program projects, decentralized wastewater treatment systems, stormwater management, water conservation/efficiency/reuse, watershed pilot projects, energy efficiency, security measures at publicly owned treatment works, and technical assistance. No ongoing maintenance activities.

Terms/Requirements/Notes: Funds up to 49% of project costs (51% match required, can come from other sources such as the Washington SRF).

- **\$20 million:** Minimum project size for large communities.
- **\$5 million:** Minimum project size for small communities (population of 25,000 or less).

- **49 percent:** Maximum portion of eligible project costs that WIFIA can fund.
- Total federal assistance may not exceed 80 percent of a project’s eligible costs.
- **35 years:** Maximum final maturity date from substantial completion.
- **5 years:** Maximum time that repayment may be deferred after substantial completion of the project.

Interest rate will be equal to or greater than the U.S. Treasury rate of a similar maturity at the date of closing. Projects must be creditworthy and have a dedicated source of revenue. Aligned with the implementation phase of project, if it meets funding award minimum.

Type: Loan

Funding Amount and Cycle: Annual cycle, rolling deadlines. EPA may announce multiple selection rounds in a single notice of funding availability (NOFA). NOFA will indicate deadline for required letter of interest.

Link: [Water Infrastructure Finance and Innovation Act \(WIFIA\) | US EPA](#)

E.1.9 PLANNING AND ENGINEERING LOAN & GRANT (DRINKING WATER STATE REVOLVING FUND)

Agency: Washington State Department of Health

Purpose/Goals: Intended for planning and engineering activities that prepare the water system to begin construction on eligible projects.

Eligible Applicants: Publicly or privately-owned Group A community water systems,

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non-community water systems owned by a non-profit, tribally owned Group A water system. A Group A water system has 15-plus service connections; or serves an average of 25-plus people per day for 60-plus days; or serves more than 1,000 people for 2-plus consecutive days. Group A community water systems are approved and regulated by WA State Dept of Health.

Eligible Use of Funds: Includes but not limited to feasibility, consolidation, and restructuring studies, water system planning, cultural and environmental reviews, design, engineering and construction documents, value planning activities, and limited water rights exploration.

Terms/Requirements/Notes: Maximum loan amount is \$500,000 per jurisdiction (\$200,000 for limited water rights exploration). Loan must be repaid over 10 years, 0% interest. Suitable for planning and construction project phases.

Type: Loan/Grant

Funding Amount and Cycle: Currently ongoing & open year-round. Projects funded on first-come first-serve basis until funding is exhausted. About \$3 million to be awarded annually.

Link: [Drinking Water State Revolving Fund \(DWSRF\) | Washington State Department of Health](#)

E.1.10 WA PROMOTING RESILIENT OPERATIONS FOR TRANSFORMATIVE, EFFICIENT, AND COST-SAVING TRANSPORTATION (PROTECT) FORMULA

Agency: Washington State Department of Transportation (WSDOT)

Purpose/Goals: To make transportation infrastructure more resilient to future weather events and other natural disasters by focusing on resilience planning, making resilience improvements to existing transportation assets and evacuation routes, and addressing at-risk highway infrastructure.

Eligible Applicants: FY24 proposed projects had to meet criteria from the Brian Abbott Fish Barrier Removal Board, projects must, among other things: (a) correct a fish passage barrier on a salmon-bearing (anadromous) stream, (b) meet fish passage design criteria under Washington Administrative Code and other guidelines, (c) demonstrate documentation of current or historic anadromous species use at project location. Additional criteria includes: (a) city or county government as a certified sponsor, (b) city- or county-owned crossing, (c) completion or planned completion of NEPA, (d) Right-Of-Way certification prior to funding obligation, (e) have a construction project with \$2 million-plus of funding requests.

Eligible Use of Funds: Includes planning activities, resilience improvements, community resilience and evacuation activities, and at-risk coastal infrastructure activities. Note: FY2023-26 funds are allocated to fish passage projects selected via the Brian Abbott Fish Barrier Removal Board and coordinated with WSDOT Local Programs.

Terms/Requirements/Notes: Federal cost share should not exceed 80% of total project cost.

Type: Formula Grant

Funding Amount and Cycle: FY24 funding cycle was for \$50 million, the remainder of a broader \$75 million allocation by the Washington Legislature’s Joint Transportation Committee. The goal of this funding is for local fish passage projects. Unclear what

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funding will be available in future cycles, but most recent cycle closed in February 2024. The PROTECT program was established via the Infrastructure Investment & Jobs Act and collective funding through that is \$7.3 billion for FY2022-26.

Link: [PROTECT Program](#)

E.1.11 DoD MILITARY INSTALLATION RESILIENCE PROGRAM

Agency: Department of Defense (DoD) Office of Local Defense Community Cooperation (OLDCC)

Purpose/Goals: The Military Installation Sustainability program of assistance is designed to provide technical and financial assistance to states and local governments to analyze and implement actions necessary to foster, protect, and enhance military installation sustainability. The program alleviates and prevents incompatible development and/or other man-made or natural installation resiliency activities likely to impair the continued operational utility of a Department of Defense installation, range, special use air space, military operations area, or military training route. The program enables states and local governments to assist installations to optimize their mission and sustain their installation and enhances the long-term readiness and military value of the power projection platform.

Eligible Applicants: Defense communities only with states, counties, municipalities, other political subdivisions of a state; special purpose units of a state or local government; other instrumentalities of a state or local government; and tribal nations.

Eligible Use of Funds: Projects that address sustainability factors such as: urban growth, noise, stormwater and flood management,

energy and water security threats, extreme weather events, etc.

Terms/Requirements/Notes: 10% minimum cost share requirement. A minimum of ten percent (10%) of the project’s total proposed funding is to be comprised of non-Federal sources.

Type: Grant

Funding Amount and Cycle: Annual. Each year, typically in March, the Office of Local Defense Community Corporation puts out annual call to the Military Services for nominations for installation commanders. Military services may nominate installations through this annual process or nominate installations out of cycle. State and local governments can respond to NOFAs through the community nomination process through grants.gov.

Link: [Military Installation Sustainability | Office of Local Defense Community Cooperation \(oldcc.gov\)](#)

E.1.12 DEFENSE COMMUNITY INFRASTRUCTURE PROGRAM (DCIP)

Agency: U.S. Department of Defense (DoD) / Federal Highway Administration (FHWA)

Purpose/Goals: Is designed to address deficiencies in community infrastructure, supportive of a military installation, in order to enhance military value, installation resilience, and military family quality of life.

Eligible Applicants: Defense communities only with state and local governments.

Eligible Use of Funds: Eligible community infrastructure projects are any complete and useable transportation project; community support facilities (e.g., school,

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hospital, police, fire, emergency response, or other community support facility); and utility infrastructure projects [e.g., water, waste-water, telecommunications, electric, gas, or other utility infrastructure (with necessary cyber safeguards)] that: are located off of a military installation; support a military installation; are owned by a state or local government or a not-for-profit, member-owned utility service; that will enhance military value, military installation resilience and/or military family quality of life at the supported military installation (definitions of these enhancements are provided in Section E., paragraph 1. of the Notice of Funding Opportunity); that are endorsed by the local installation commander representing the installation benefiting from the proposed project; are where ground-disturbing work has not yet commenced; and are construction-ready.

Terms/Requirements/Notes: Previous cycles required 30% match, award floor was \$250,000 and ceiling was \$20 million.

Type: Grant

Funding Amount and Cycle: Annual. Pilot program launched in 2020; Congress appropriated \$50 million in FY20, supporting 16 projects; \$60 million in FY21, supporting 13 projects; and \$90 million in FY22, supporting 19 projects, and \$100 million in FY23 supporting 17 projects. FY24 submission period closed June 18, 2024.

Link: [Defense Community Infrastructure Pilot \(DCIP\) Program | Office of Local Defense Community Cooperation \(oldcc.gov\)](#)

E.1.13 REGIONAL CATASTROPHIC PREPAREDNESS GRANT (RCPGP)

Agency: U.S. Department of Homeland Security (DHS)/Federal Emergency Management Agency (FEMA)

Purpose/Goals: Build state and local capacity to manage catastrophic incidents by improving and expanding regional collaboration among emergency managers and other preparedness stakeholders; establish a resilient and sustainable housing market; ensure community housing recovery plans; achieve a measurable decrease in the long-term vulnerability of the Nation against current baselines amid a growing population base, changing climate conditions, and increasing reliance upon information technology.

Eligible Applicants: State or local government. Local government must be located within one of the 100 most populous MSAs. Seattle-Tacoma-Bellevue Metro Area MSA is eligible.

Eligible Use of Funds: The strategic priority for the FY 2024 RCPGP is investing in the following core capabilities: housing, community resilience, and long-term vulnerability reduction. Community and regional level resilience plans and strategies address the full range of hazards and stressors affecting the ability of communities to survive, adapt, and thrive and enable effective risk reduction.

Terms/Requirements/Notes: No cost share requirement. Recommended that multiple projects apply as one application to highlight a wide range of hazards. Competitive national program.

Type: Grant

Funding Amount and Cycle: FY2024

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application closed July 25, 2024. Expected awards: 5-10. Maximum Award amount \$3 million. Period of performance: 36 months.

Link: <https://www.fema.gov/grants/preparedness/regional-catastrophic/fy-24-nofo#appendixa>

E.1.14 SAFEGUARDING TOMORROW THROUGH ONGOING RISK MITIGATION (STORM) REVOLVING LOAN FUND PROGRAM

Agency: Federal Emergency Management Agency (FEMA)

Purpose/Goals: Establish state-level revolving loan funds for mitigation projects and activities to increase resilience and mitigate the impacts of events such as drought, extreme heat, severe storms, wildfires, floods and earthquakes.

Eligible Applicants: States, which will solicit local government agency projects for inclusion on the state Intended Use Plan. Local agencies cannot directly apply to FEMA for STORM loans.

Eligible Use of Funds: A project will be prioritized for funding if it:

- Benefits an underserved community - FEMA has historically used the CDC Social Vulnerability Index tool to define underserved communities ("high" vulnerability or an SVI >0.80). 40% of benefits will go to underserved communities;
- Supports partnerships between two or more eligible entities to implement a project or similar projects;
- Considers regional impacts of hazards on river basins, river corridors, micro-watersheds, macro-watersheds, estuaries, lakes, bays, and coastal regions, and areas at risk of earthquakes, tsunamis, droughts, severe storms, and

wildfires, including the wildland-urban interface; or

- Proposes to finance projects for the resilience of major economic sectors or critical national infrastructure;

Terms/Requirements/Notes: Max of \$5 million. Loan terms are less than 1% interest rate, deferred payment until after construction, and 20-year terms (30 years for DACs). Local agencies must apply through a state intended use plan.

Type: Loan

Funding Amount and Cycle: Current application closed. \$500 million total authorized through IJJA. FY23 was the first year of funding. Most recent FY24 funding closed April 30, 2024 with \$150 million available. States must match FEMA capitalization grant with a 10% state match.

Link: [STORM \(FEMA\)](#)

E.1.15 SERVICE AREA COMPETITION FUNDING

Agency: Health Resources and Services Administration (HRSA)

Purpose/Goals: Fund health centers to provide primary health care services in specific service areas (based on zip code). The goal is to ensure continuity of care for populations currently served by the Health Center Program.

Eligible Applicants: Public and nonprofit private entities in U.S. or territories, tribal and urban Indian organizations.

Eligible Use of Funds: Service area must be eligible in that there are specific requirements for special populations and service types. Service areas are announced

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via Service Area Announcement Table (SAAT). Award appears to be given to one health center per service area. Regarding the site:

- a) Services an entire service area listed in SAAT and services without regard for ability to pay, b) organization must provide General Primary Medical Care directly or via contracts, c) organization must perform major role in project, d) services must be accessible to all, e) organization must provide continuity of care to patients in area, f) must propose at least one new full time permanent, fixed building service site

Terms/Requirements/Notes: Applicant can request funds for no more than the total funding amount listed in the SAAT for the relevant service area. Funding can be reduced if the patient projection is less than 95% of the listed patient target. No cost-share requirement. Areas that are eligible include some portions of Pierce and Thurston counties. Healthcare facilities scoped in projects could have a strong chance of meeting thorough criteria on services provided. Robust number of awards granted.

Type: Grant

Funding Amount and Cycle: Multiple funding rounds. At least one per FY. Funding amounts depend on the Total Funding amount listed in SAATs. Total funding for each of the programs typically range from \$100 million-\$340 million with about 950 expected awards to be disbursed. Two-phase application process, first application is submitted via grants.gov then supplemental info is submitted in EHBs (electronic handbooks).

Link: [Apply for Service Area Competition \(SAC\) | Bureau of Primary Health Care \(hrsa.gov\)](#)

E.1.16 NEW ACCESS POINTS

Agency: Health Resources and Services Administration (HRSA)

Purpose/Goals: Supports new health service delivery sites to expand affordable and accessible health care for underserved populations. Goal is to provide primary health care services at one-plus new access points. Funding targets the nation's high-need geographic areas and medically underserved populations.

Eligible Applicants: Eligible applicants: public / nonprofit private entity in U.S. or territories, Tribal and urban Indian organizations may apply. Three (3) types of organizations can apply: a) new start applicant that currently doesn't receive H80 grant funding from Health Center Program, b) look-alike applicant that is designated as such, c) satellite applicant that receives operational funding but the application will only address new sites. **Eligible Use of Funds:** a) organization must provide all required health services to medically underserved populations, b) must propose at least one service delivery site that provides primary medical care as its main purpose for at least 40 hours per week, c) services must be accessible to all, d) site must have valid address.

Terms/Requirements/Notes: Up to \$650,000 per award. No cost-share requirement. Would only be applicable to the extent that any new access points are determined to be the best option for a mass sheltering cooperative or disaster medical coordination. More competitive due to lower number of awards.

Type: Grant

Funding Amount and Cycle: Total program funding is at \$50 million, with an expected 77 total amount of awards. This is a two-

phase application process, first application is submitted via grants.gov then supplemental info is submitted in EHBs (electronic handbooks).

Link [New Access Points | HRSA](#)

E.1.17 VARIOUS LOAN OPTIONS: DIRECT PLACEMENT, PUBLIC OFFERING, QUICK LOAN

Agency: Washington Health Care Facilities Authority

Purpose/Goals: Offers loan options for nonprofit 501c3 health care providers with various banks and equipment leasing vendors. Direct Placement Program is a cost effective program for larger / complex placements. Public Offerings Program makes low cost tax-exempt financing available for rated health care providers and those that which to use bonds. Quick Loan Program is for borrower to quickly access loans less than \$10 million.

Eligible Applicants: Must be nonprofit 501c3 health care provider in Washington

Eligible Use of Funds: Direct placement is for loans in excess of \$10 million (bonds are sold to commercial bank or lending institution). Public offerings finances larger capital projects through public market (tax-exempt bonds are sold to the public). Quick Loan is for loans less than \$10 million (bonds are sold to commercial bank or lending institution)

Terms/Requirements/Notes: Rolling application deadline. There is an application fee of \$7,500. Project will need to partner with health/medical nonprofit partners to be eligible. Recommended for healthcare-related projects.

Type: Loan

Funding Amount and Cycle: One application

with different aspects relevant for the specific loan type.

Link: [Loans and Applications | WHCFA \(wa.gov\)](#)

E.1.18 EMERGENCY MANAGEMENT PERFORMANCE GRANT

Agency: Federal Emergency Management Agency (FEMA)

Purpose/Goals: Grant program seeks to assist state, local, tribal, and territorial emergency management agencies in preparing for hazards and implementing the nation's National Preparedness System and National Preparedness Goal.

Eligible Applicants: State Administrative Agencies and State Emergency Management Agencies are eligible to receive funding. Only one application is accepted per state. JBLM MIRR should coordinate with the Washington Emergency Management Division to arrange subrecipient agreement with the Division. Eligible subrecipients include state and territory government entities, tribes, and local units of government.

Eligible Use of Funds: Requires that 87.5% of the project's deliverables directly address gaps in any Threat and Hazard Identification and Risk Assessment (THIRA)/Stakeholder Preparedness Review (SPR); JBLM MIRR is arguably a THIRA/SPR.

Type: Grant

Funding Amount and Cycle: Funding for prior years has ranged between \$300 million-\$400 million. The program is funded by the Department of Homeland Security Appropriations Act.

Link: [EMPG Page](#)

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E.1.19 URBAN AREA SECURITY INITIATIVE (UASI)

Agency: Department of Homeland Security (DHS) | Federal Emergency Management Agency (FEMA)

Purpose/Goals: This grant program is oriented around mitigating terrorism threats to high density areas and may not be applicable. Note that the UASI, the State Homeland Security Program, and the Operation Stonegarden grants all form part of the broader Homeland Security Grant Program.

Eligible Applicants: Only the State Administrative Agencies (SAA) can apply to this program, which is one of the three funds that comprise the broader Homeland Security Grant Program. Washington State Military Department is the agency that directly applies for UASI. The use of UASI funds may present challenges as the Seattle-Tacoma metropolitan area are the primary recipients of this grant and the MIRR study area's presence outside of the UASI region may complicate its use. Subawards can be made to subrecipients (e.g., other state/local entities), so long as they apply in partnership with a SAA. UASI recipients must complete a THIRA / SPR. UASI recipient must submit an investment justification (IJ) for the National Priority Areas. Eligible high-risk urban areas that are subrecipients for UASI, alongside a State Administrative Agency, are determined by DHS / FEMA's risk methodology per Homeland Security Act of 2002.

Eligible Use of Funds: Grant funding should be prioritized to support capability-building, closing capability gaps, or sustaining capabilities that address national priorities or support enduring needs. National priorities

include: enhancing cybersecurity, enhancing information and intelligence sharing and analysis, enhancing community preparedness and resilience, effective planning, etc. Note that one of the National Priority Areas has a minimum spend requirement of 3%. Recipients should allocate 30% of awarded funds across the priority areas. A state or high-risk urban area must allocate remaining 70% of funds to address capability gaps identified via THIRA / SPR.

Terms/Requirements/Notes: No cost share or match requirements.

Type: Grant

Funding Amount and Cycle: Annual funding cycle. Most recent deadline for FY24 was April 2024. The FY24 allocation for the Seattle area was \$5.6 million.

Link: [Washington UASI](#)

E.1.20 ENVIRONMENTAL AND CLIMATE JUSTICE COMMUNITY CHANGE GRANT

Agency: Environmental Protection Agency (EPA)

Purpose/Goals: To support community and place-based approaches to redressing environmental and climate injustices for communities facing most significant impacts and historical disinvestment. The goal is to promote projects that center collaboration and enhance community prosperity and health.

Eligible Applicants: Eligible entities include: a) a partnership between two community-based non-profit organizations; and b) a partnership between a CBO and either a federally-recognized tribe, a local government unit, or an institution of higher education. Applications must identify Target Investment Area (TIA) that are disadvantaged unincorporated communities.

Eligible Use of Funds: There are two tracks of funding. Track I is for Community-Driven Investments for Change. These are multi-faceted holistic vision projects that address environmental and climate justice challenges. These projects must address a combination of the following: increase community resilience through climate action activities, reduce local pollution, center community engagement, build community strength, reach priority populations, and maximize integration across projects. Track II is for Meaningful Engagement for Equitable Governance. These are projects that facilitate engagement of disadvantaged communities in the government process.

Terms/Requirements/Notes: No cost share or matching required.

Type: Cooperative Agreement

Funding Amount and Cycle: There is only one cycle with a 12-month rolling application. Current application period opened on November 21, 2023, and will close November 21, 2024, (or earlier if funds are exhausted sooner). Track I grant funds available are about \$10 million–\$20 million for each award, with the expectation of about 150 awards. Track II grant funds are about \$1 million–\$3 million for each award, with the expectation of about 20 awards.

Link: [NOFO FY2024 Community Change Grant Program PDF](#)

E.1.21 STATE HOMELAND SECURITY GRANT PROGRAM (SHSP)

Purpose/Goals: This grant program is a suite of risk-based grants to assist state, local, and tribal efforts in preventing, protecting against, mitigating, response to, and recovering from acts of terrorism and other threats. The grant provides grantees with the resources required

for implementation of the National Preparedness System and working toward the National Preparedness Goal of a secure and resilient nation. Note: the UASI, the State Homeland Security Program, and the Operation Stonegarden grants all form part of the broader Homeland Security Grant Program.

Eligible Applicants: Each state and territory receives a minimum allocation based on thresholds and a risk methodology established by DHS / FEMA per Homeland Security Act of 2002. Only the State Administrative Agencies (SAA) can apply to this program. Washington State Military Department is the agency that directly applies for SHSP. Recipients must complete a THIRA / SPR and submit an investment justification (IJ) for the National Priority Area.

Eligible Use of Funds: Grant funding should be prioritized to support capability-building, closing capability gaps, or sustaining capabilities that address national priorities or support enduring needs. Washington has used these funds for training emergency first responders, equipment purchases, planning, and exercise. Funds can also be used for management, administration, and development of citizen corps projects at the local level.

Eligible expenses include: PPE, IT, cybersecurity, power equipment, medical supplies, screening systems, communications, etc. Note that one of the National Priority Areas has a minimum spend requirement of 3%. Recipients should allocate 30% of awarded funds across the priority areas. A state must allocate remaining 70% of funds to address capability gaps identified via THIRA / SPR.

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Terms/Requirements/Notes: No cost share or match requirements.

Type: Grant

Funding Amount and Cycle: For FY24, Washington received \$5.6 million in allocated funding. Funds are awarded to the state and then the state has to allocate at least 80% of funds to local government units.

Link: [Washington State Homeland Security Program](#)

E.1.22 ASPR Hospital Preparedness Program Cooperative Agreement

Agency: Assistant Secretary for Preparedness and Response (ASPR)

Purpose/Goals: This grant program focuses on creating and enhancing disaster medical response partnerships on local and state scale.

Eligible Applicants: State governments or a state agency designated by the State/s chief executive officer.

Eligible Use of Funds: Planning, exercising, or operational coordination uses that improve an organization’s disaster preparedness.

Terms/Requirements/Notes: Recipients must match 10% of Federal allocation.

Type: Grant

Funding Amount and Cycle: 2024 project applications open from May 17, 2024 to June 18, 2024.

Link: <https://www.grantsolutions.gov/gs/preaward/previewPublicAnnouncement.do?id=111199>

E.1.23 DEFENSE COMMUNITY COMPATIBILITY ACCOUNT (DCCA)

Agency: Washington State Department of Commerce

Purpose/Goals: Supports necessary infrastructure and compatible land use near military installations. Prioritizes projects that enhance the economy, environment, and quality of life for local communities. DCCA offers framework for assessing civilian-military compatibility projects.

Eligible Applicants: Must be local government, federally recognized Indian tribe or entity that has an agreement with a Washington State military installation under DoD REPI program. Legislature makes final determination on which projects receive funding and total amount to be awarded.

Eligible Use of Funds: Project must: (a) be in Washington, (b) support necessary infrastructure near military installations and address incompatible development connected to Washington military installation, (c) address land development and military operations that impact economy, environment, or quality of life.

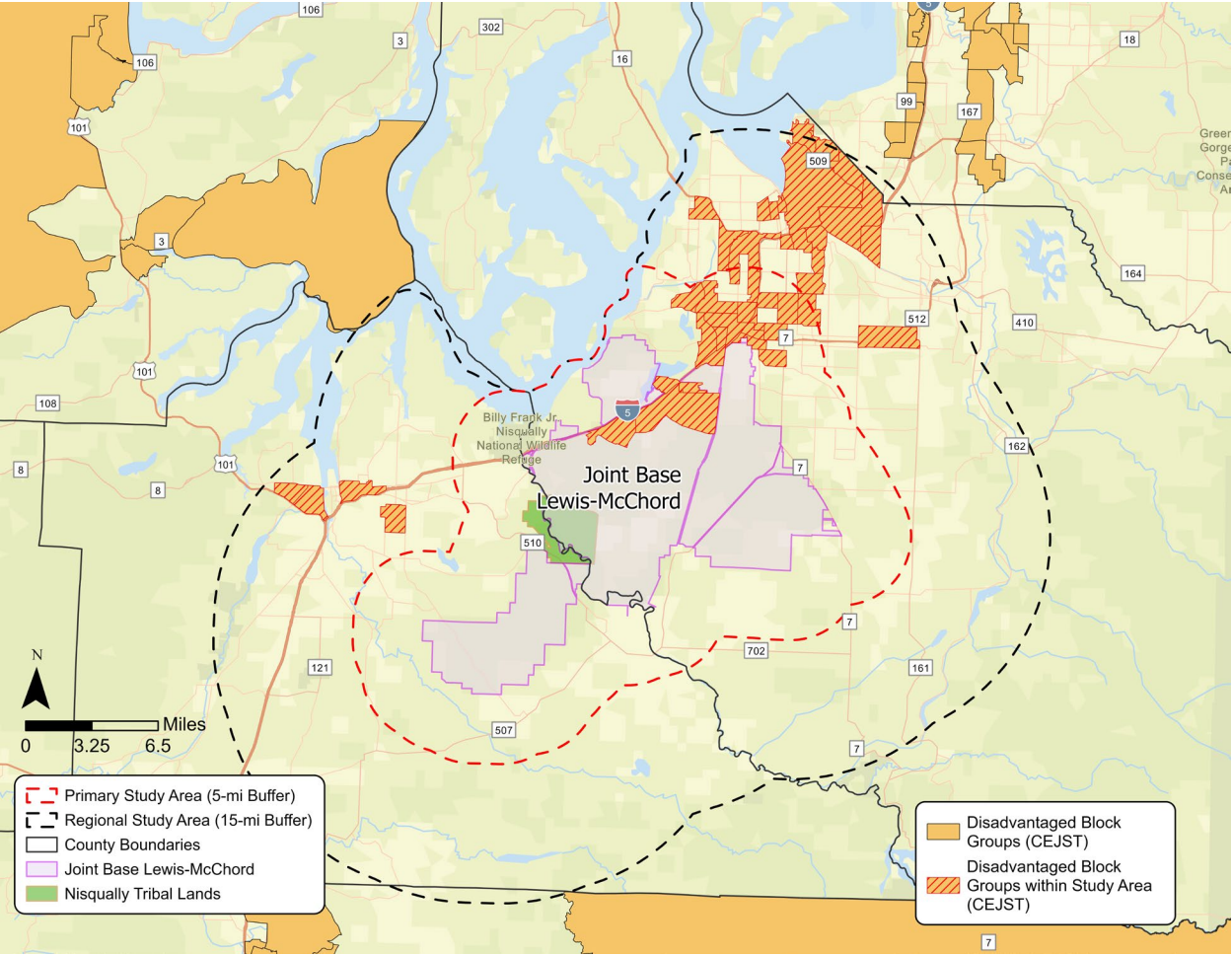
Terms/Requirements/Notes: Awards are contingent upon project list approval and funding allocation by the Legislature (tied to capital budget and appropriation process). There is no limit or required percentage of local or federal funds, but projects are scored on total amount of leveraged funds available.

Type: Grant

Funding Amount and Cycle: 2024 project applications open from April 1, 2024, through Sept. 13, 2024. This is only the second program cycle (last one was in 2022).

Link: [Defense Community Compatibility Account - Washington State Department of Commerce](#)

E.2 CJEST Disadvantaged Census Tracts



DISADVANTAGED BLOCK GROUPS

53053063000	Pierce County	53053061601	Pierce County	53053071806	Pierce County
53053071805	Pierce County	53053061900	Pierce County	53053071703	Pierce County
53053072000	Pierce County	53053062000	Pierce County	53053060200	Pierce County
53053072106	Pierce County	53053071901	Pierce County	53053062600	Pierce County
53053062801	Pierce County	53053061300	Pierce County	53053063501	Pierce County
53053071705	Pierce County	53053061002	Pierce County	53053071704	Pierce County
53053940002	Pierce County	53053063300	Pierce County	53053071803	Pierce County
53053940003	Pierce County	53053061400	Pierce County	53053063400	Pierce County
53053940005	Pierce County	53053071807	Pierce County	53067010300	Thurston County
53053940006	Pierce County	53053071808	Pierce County		
53053940007	Pierce County	53053072905	Pierce County		
53053940008	Pierce County	53053072907	Pierce County		
53053940011	Pierce County	53053071206	Pierce County		
53067010520	Thurston County	53053071504	Pierce County		
53067010510	Thurston County	53053071601	Pierce County		
53067011300	Thurston County	53053071706	Pierce County		

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APPENDIX E: FUNDING STRATEGY

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APPENDIX F: CLIMATE RISK DISCLOSURE STATEMENT

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The conclusions in the Report titled Military Installation Resilience Review: Joint Base Lewis-McChord are Stantec’s professional opinion, as of the time of the Military Installation Resilience Review, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not consider any subsequent changes.

Information and reference data that is subject to change includes, but is not limited to, downscaled climate projections from applicable Intergovernmental Panel on Climate Change (IPCC) Assessment Reports available at the time of project execution. These climate change projections are typically reviewed and renewed approximately every five years. It is advised that the client review the latest climate change projections at regular (5-year) intervals, engaging the support of a climate scientist. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient’s own risk.

As noted more specifically in this Report, Stantec’s services rely upon existing models, research and data regarding historical and projected climate patterns combined with information provided by Pierce County, Thurston County, and the South Sound Military and Communities Partnership (the Client). The generated conclusions and recommendations in our deliverables will be estimates based on these inputs, and we cannot guarantee actual results. Stantec has assumed all information received from the Client and other parties in the preparation of the Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

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JOINT BASE LEWIS-MCCHORD

MILITARY INSTALLATION RESILIENCE REVIEW