Wildfires Risk Assessment

This plan is an update of the 2004 City of Redmond Hazard Mitigation Plan (HMP). Although it is an update, this document has been redesigned so that it looks, feels, and reads differently than the original. This is due to several factors: new hazard information has become available that drives new definitions of risk, the City has matured and new capabilities are now available, and the new format will allow readers to more easily understand the content. In addition, the 2004 HMP included several action items that have been completed, creating an opportunity for developing new mitigation strategies.

7.1 Identify Wildfires Hazards

A wildfire is natural or human caused uncontrolled burning of vegetative fuel such as grasslands, trees, or woodland.[72] A wildfire that encroaches into or develops in areas such as residential neighborhoods or business districts is an urban/wildland interface fire.[73] As Redmond increases development in more open and undeveloped areas, the risk of urban/wildland fires increases.

Careless human activities cause 85% of wildfires in Washington State.[74] Some common human causes include: unattended outside fires, poorly extinguished campfires, fireworks, and cigarette butts thrown into dry vegetation. Naturally occurring fires, such as those sparked by lightning, are rare in Western Washington.[75]

Additionally, east winds have been associated with increased wildfire danger in Western Washington, and often occur due to high-pressure systems that develop in the State's interior during late summer and early fall. When these systems and wind conditions occur, a dry, continental air mass affects western Washington, interrupting the usually damp, humid weather conditions.

Wildfires and urban/wildland interface fires can often be a secondary hazard to drought.[76] Droughts will result in drier canopy cover and increase the amount of available fuel for wildfires. A problem with the Olympic Pipeline could cause a fire or in the case of a fire, a leak from the Olympic Pipeline could exacerbate the magnitude of an existing fire.

72 Emergency Management Division, "Wildfire," Washington Military Department, http://www.emd.wa.gov/hazards/haz_wildfire.shtml.
73 Office of Emergency Management, "Hazards and Disasters: Fire," King County, http://www.kingcounty.gov/safety/prepare/residents_business/Hazards_Disasters/Fire.aspx; and Resource Protection Division, "Wildfire Awareness," Washington State Department of Natural Resources, http://www.dnr.wa.gov/RecreationEducation/Topics/PreventionInformation/Pages/rp_prevent_wildfireawareness.aspx.
74 Resource Protection Division, "Fire Information & Prevention," Washington State Department of Natural Resources, http://www.dnr.wa.gov/RecreationEducation/FirePreventionAssistance/Pages/Home.aspx.
75 Emergency Management Division, "Hazard Profile – Wildland Fire," Washington Military Department, http://www.emd.wa.gov/plans/documents/WildlandfireNov2007Tab5.10.pdf.
76 Emergency Management Division, "Wildfire," Washington Military Department, http://www.emd.wa.gov/hazards/haz_wildfire.shtml.

Climate Change
Climate change trends will significantly increase the chance of both drought and periods of severe heat. As weather patterns change and less moisture is present, foliage and canopy covers become more susceptible to wildfires. This change will increase both the severity and frequency of wildfires in the City of Redmond.[77]

7.2 Profiling Wildfire Hazard Events

A. Location
Although Redmond currently has a low risk for wildfire and urban/wildland interface fires,[78] steep slopes with dense canopy are most at risk of a fire. Vegetation is the primary fuel for both types of fires, and because fire spreads more rapidly uphill than on flat terrain, steep slopes increase this risk. **Map 24, City of Redmond Areas of High Wildfire Risk**, shows the locations in Redmond with the greatest fire risk.

An additional factor for Redmond to consider is the location of the Olympic Pipeline, on the western edge of the City. A fire combined with a leak in the Olympic Pipeline would cause extensive damages. As illustrated in Map 24, there are portions of the pipeline that overlap with fire hazard areas.

B. Timing and Duration
Fire season for Washington State is typically early July to September or October, when the weather is the driest. This fire season tends to apply more to the eastern part of the State, which has a drier climate than Western Washington.[79] Redmond's location west of the Cascade Mountains experiences a damper climate than that of Eastern Washington.[80] This damper climate shortens Redmond's fire season.

C. Severity
The severity of both wildfires and urban/wildland interface fires is influenced by topography, vegetation, development patterns, the use of flammable landscaping and construction materials, and weather conditions. The severity of fires in Redmond varies depending on the type of fire.

A wildfire, primarily fueled by natural vegetation, can have a major impact in areas with dense canopy coverage, specifically areas of more undeveloped land. The severity of an interface fire will increase as urban development encroaches into areas previously undeveloped. Development may decrease the risk of wildfire, but the risk of interface fires will increase. As development continues, the man-made structures will provide fuel for fire and increase the severity of urban/wildland fires.[81]

77 Resource Protection Division, "2020 Strategic Plan for Wildland Fire Protection," Washington State Department of Natural Resources, http://www.dnr.wa.gov/RecreationEducation/Topics/FireInformation/Pages/rp_fire_2020strategicplan.aspx.
78 Resource Protection Division, "Communities at Risk," Washington State Department of Natural Resources, http://www.dnr.wa.gov/Publications/rp_burn_communitiesatrisk.pdf.
79 Emergency Management Division, "Wildfire," Washington Military Department, http://www.emd.wa.gov/hazards/haz_wildfire.shtml.
80 Resource Protection Division, "Fuel Moisture Graphs," Washington State Department of Natural Resources, http://www.dnr.wa.gov/SiteCollectionImages/Places/rp_fire_coast.jpg.
81 Resource Protection Division, "2020 Strategic Plan for Wildland Fire Protection," Washington State

D. Frequency

Previous Occurrences

There has not been a significant urban/wildland interface fire recorded in King County since 1900.[82]

Although the City of Redmond is not responsible for maintaining the Olympic Pipeline, it is important to consider the risk that the pipeline poses. Historically, there have been two serious pipeline-related fires in the Puget Sound Region. These incidents, in Bellingham (1999) and Renton (2004), resulted in major damage, significant injuries, and loss of life. There have not been any pipeline incidents in Redmond.

Probability of Future Events

Climate change will make Western Washington summers drier, thus increasing the risk of fire. New development in previously wooded or undeveloped areas, specifically in areas of high risk for wildfires, will increase the risk of urban/wildland interface fires.[83]

7.3 Assessing Wildfires Vulnerability

7.3.1 Overview

Redmond's vulnerability to wildfires is primarily concentrated on steep slopes with dense vegetation. Because wildfires spread so rapidly in these areas, plants and animals will have little time to react. Additionally, many of these areas of dense canopy cover on steep slopes contain excess dead and dry underbrush, which acts as fire propellant and can increase the intensity of a fire.[84]

Homes near, or adjacent to, areas vulnerable to wildfires will have a higher risk of an urban/wildland interface fire. A fast-moving wildfire moving up a steep slope will quickly engulf a building at the top of the slope if the building is not adequately protected from fire. Thus, buildings and populations near areas with risk of wildfire will be more vulnerable to an urban/wildland fire.

7.3.2 Profiling the Vulnerabilities

A. Man-made

During urban/wildland interface fires, man-made structures are at risk of being destroyed. Geospatial analysis was used to evaluate the number of buildings located in areas of steep slope and dense canopy coverage. As Redmond continues to grow,

Department of Natural Resources, http://www.dnr.wa.gov/RecreationEducation/Topics/FireInformation/Pages/rp_fire_2020strategicplan.aspx.

82 Emergency Management Division, "Hazard Profile – Wildland Fire," Washington Military Department, http://www.emd.wa.gov/plans/documents/WildlandfireNov2007Tab5.10.pdf.

83 Resource Protection Division, "2020 Strategic Plan for Wildland Fire Protection," Washington State Department of Natural Resources, http://www.dnr.wa.gov/RecreationEducation/Topics/FireInformation/Pages/rp_fire_2020strategicplan.aspx.

84 Emergency Management Division, "Hazard Profile – Wildland Fire," Washington Military Department, http://www.emd.wa.gov/plans/documents/WildlandfireNov2007Tab5.10.pdf.

and more structures are built on undeveloped land, the vulnerability of man-made structures will increase.

Table 15 shows the number and type of buildings located on steep vegetated slopes. As Redmond continues to grow, the currently vacant parcels will be developed and increase the number of vulnerable buildings.

Overland Fire Risk	
Type of Use	**Buildings**
Non-Residential	228
Multifamily	45
Single Family	513

Table 15: Number and Type of Buildings Vulnerable to Urban/Wildland Interface Fires
Source: Calculated from Washington State Geospatial Data Archive, "King County Data," University Libraries: University of Washington, http://wagda.lib.washington.edu/.

B. Natural

As previously noted, areas of dense canopy cover are extremely vulnerable to wildfire, particularly on steep slopes. A fire can temporarily alter or destroy a wooded habitat. Since fires are part of a natural cycle, the environment will recover from such a disturbance. However, urban development has made more species vulnerable, thus decreasing their resilience to a major disturbance such as a fire. Fires may also change the sedimentation and temperatures in rivers, stressing aquatic habitats.

C. Systems

Roads may be closed during a fire. Road closures may isolate neighborhoods and complicate evacuations. **Map 25, City of Redmond Roads Vulnerable to Wildfires**, highlights the sections of roads that may be compromised in a wildfire.

Although most utility lines are underground in Redmond, above ground electric transmission lines and cell towers may be impacted during an interface fire.

D. Populations

Map 26, City of Redmond Fire Risk and Vulnerable Populations, shows the location of facilities that concentrate vulnerable populations.

Hazard Specific

People who live or work near or in the fire hazard zone will face increased risk in the event of a fire.

Isolated Populations

People that live on, near, or require access through fire zones may become isolated during a fire. In the event of a large fire, compromised accessibility will complicate evacuation efforts.

Disabled Persons
People with limited mobility may experience additional difficulty in the event of a quick evacuation.

Children
Young people that are separated from their families may have limited mobility and insufficient knowledge about how to respond to a fire.

Elderly
Elderly people are more vulnerable to a fire if they have limited mobility or access to medical care. The elderly are more likely to have a compromised immune system and may have difficulty breathing smoke-filled air.

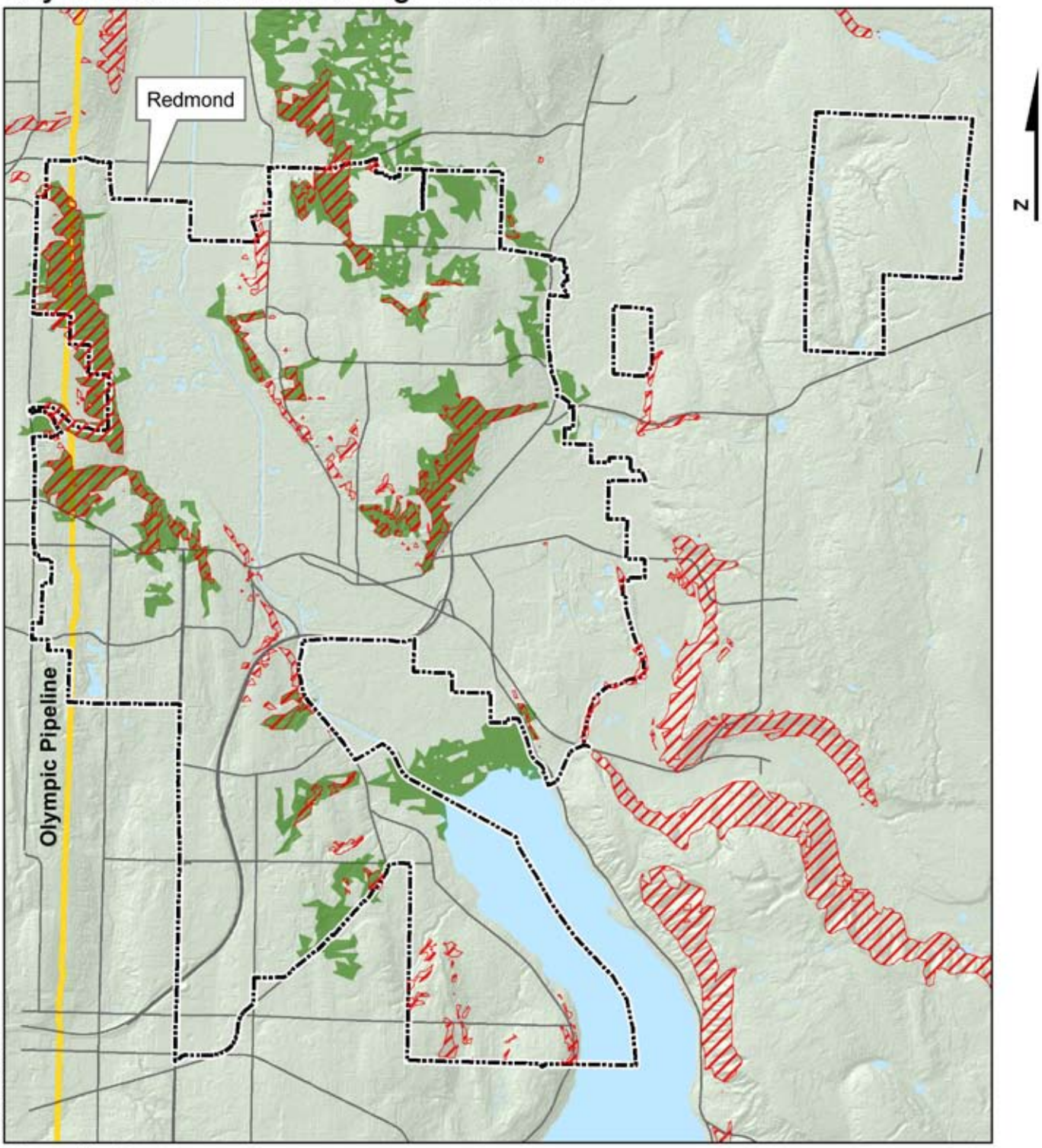
Limited English Language
People with limited English Language may not have sufficient access to mitigation or preparedness activities. Additionally, emergency announcements may not be adequate without translation.

Low-income Residents
People with limited financial resources may be more vulnerable to the potential losses from a fire.

7.3.3 Analyzing Development Trends

As the greater Puget Sound Region continues to grow the City of Redmond will see a population increase within the City boundaries and in nearby jurisdictions. As new development pushes into previously undeveloped areas the risks from urban/wildland interface fire will increase. As weather patterns intensify due to climate change, previously damp conditions west of the Cascade will experience drier summers, increasing potential fuel sources for wildfires and urban/wildland interface fires.

City of Redmond Areas of High Wildfire Risk



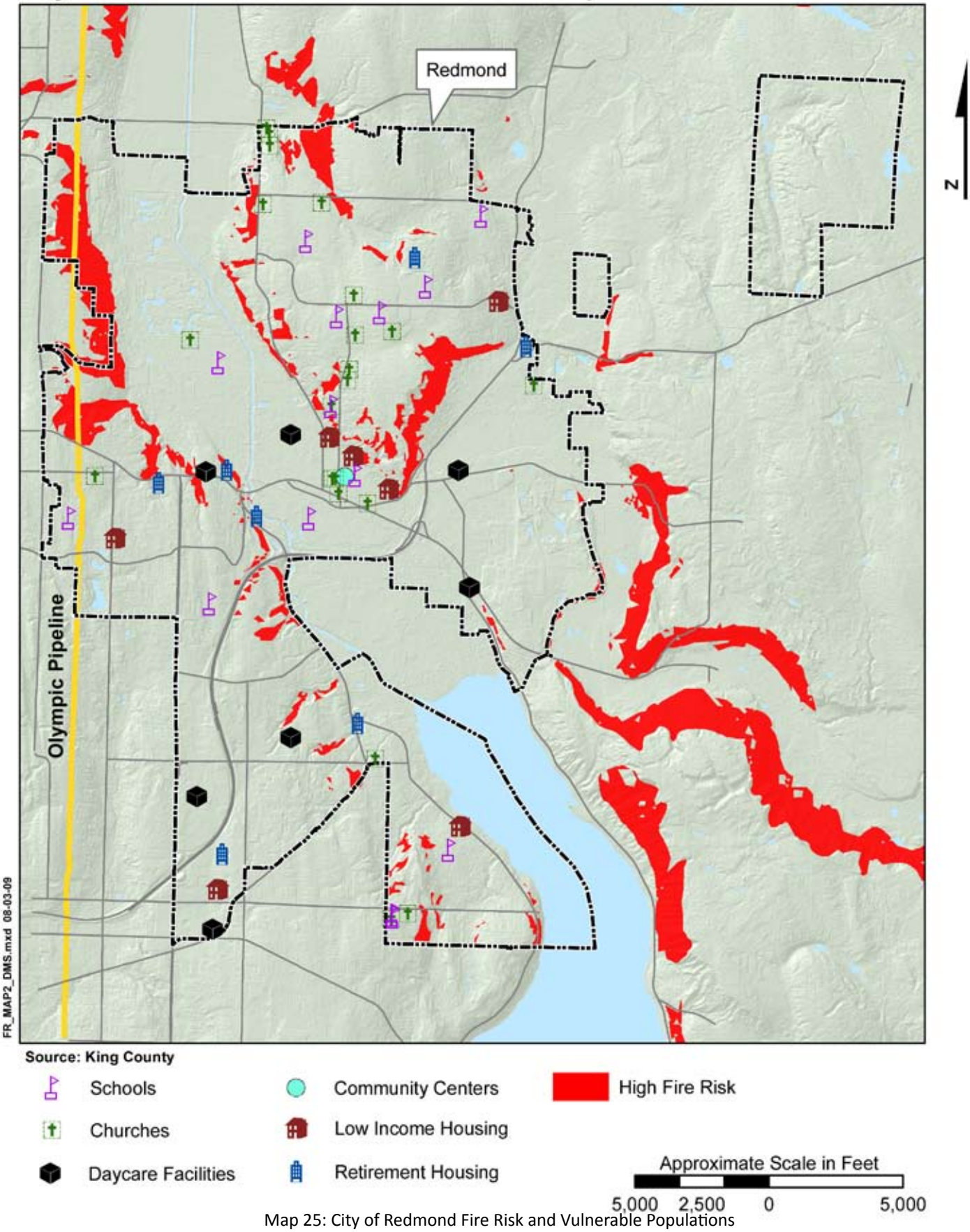
Source: King County

Olympic Pipeline
High Fire Risk
More then 55% Canopy Coverage

Approximate Scale in Feet
5,000 2,500 0 5,000

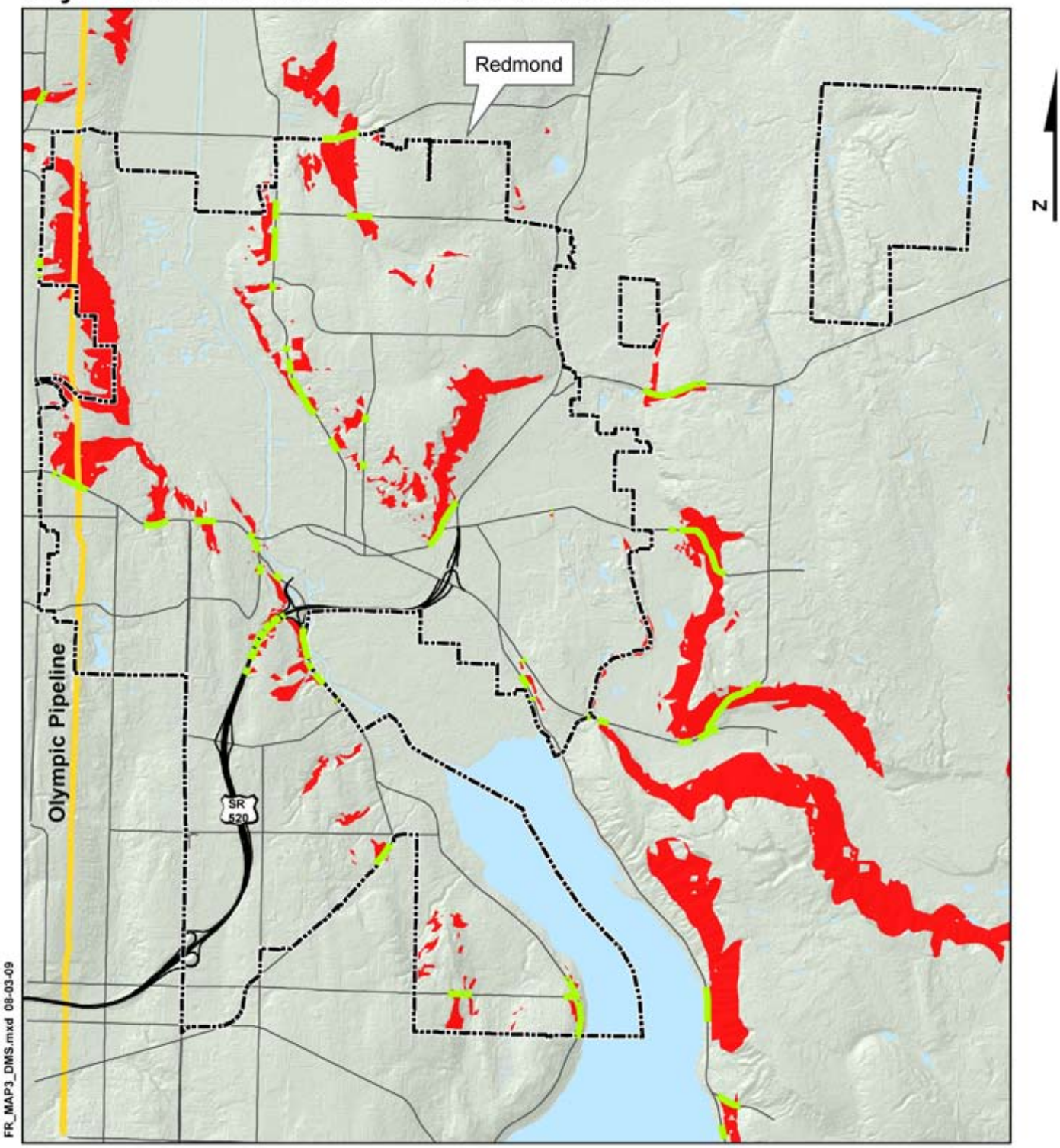
Map 24: City of Redmond Areas of High Wildfire Risk

City of Redmond Fire Risk and Vulnerable Populations



Map 25: City of Redmond Fire Risk and Vulnerable Populations

City of Redmond Roads Vulnerable to Wildfires



Source: King County

Major Arterial Roads

Vulnerable Arterial Roads

Areas of High Fire Risk

Olympic Pipeline

Approximate Scale in Feet

5,000 2,500 0 5,000

Map 26: City of Redmond Roads Vulnerable to Wildfires