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AIR QUALITY TECHNICAL REPORT

Fort Lawton Army Reserve Center Redevelopment Project
Seattle, Washington

April 28, 2025

Prepared for

City of Seattle, Washington

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LIST OF ABBREVIATIONS AND ACRONYMS

µg/m^3	micrograms per cubic meter
40 CFR	Code of Federal Regulations, Title 40
BMP	best management practice
CCA	Climate Commitment Act
CEQ	Council on Environmental Quality
City	City of Seattle
CO	carbon monoxide
Co_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
Ecology	Washington State Department of Ecology
EPA	US Environmental Protection Agency
Fort Lawton project	Fort Lawton Army Reserve Center Redevelopment Project
GHG	greenhouse gas
KSF	thousand square feet
Landau	Landau Associates, Inc.
Mpg	miles per gallon
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NH_3	ammonia
NO_2	nitrogen dioxide
No_x	nitrogen oxides
O_3	ozone
PM	particulate matter
$PM_{2.5}$	particulate matter less than or equal to 2.5 micrometers in size
PM_{10}	particulate matter less than or equal to 10 micrometers in size
PPM	parts per million
PSRC	Puget Sound Regional Council
RCW	Revised Code of Washington
SEIS	Supplemental Environmental Impact Statement
SO_x	sulfur oxides
SEPA	State Environmental Policy Act
VMT	vehicle miles traveled
VOC	volatile organic compound
WAC	Washington Administrative Code
WSDOC	Washington State Department of Commerce

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1.0 INTRODUCTION

At the request of the City of Seattle, Landau Associates, Inc. (Landau) prepared this report, which provides background information and analysis to support the Air Quality section of the Supplemental Environmental Impact Statement (SEIS) for the Fort Lawton Army Reserve Center Redevelopment Project (Fort Lawton project) in King County, Washington.

The following sections describe the current air quality conditions in the region, policies and regulations that govern air pollutant emissions, and regulations and policies that have been developed to reduce greenhouse gas (GHG) emissions. Impacts of the two following alternatives are analyzed. GHG emission rates generated by the two alternatives are also forecast at a screening level.

- Alternative 1:
  - A complex of buildings up to four stories in height, with a 2.2-acre footprint, and 500 units of housing allocated as follows:
    - 100 units of permanent supportive multifamily housing for formerly homeless seniors and veterans;
    - 175 units of affordable homeownership opportunities for families earning up to 80 percent of the area median income (including 45 townhouse units and 130 multifamily units); and,
    - 225 units of affordable multifamily rental apartments for low-income households earning up to 60 percent of area median income, including families with children.
  - Open space areas allocated as follows:
    - 2.6 acres of landscaped area
    - 18.1 acres of passive open space
  - Surface parking covering 4.4 acres and roadway/sidewalk covering 2.2 acres
- No Action Alternative: Assumes that no development would occur.

Under Alternative 1, full buildout is expected to be complete by 2032. Under the No Action Alternative, this analysis assumes that no buildout will occur. The project area for this evaluation is the former Fort Lawton Army Reserve Center in the Magnolia neighborhood in northwest Seattle. The study area includes nearby offsite locations, including Discovery Park and Kiwanis Memorial Preserve Park (Figure 1).

Current federal, state, and local air quality regulations regulate the construction and operation of new developments that would generate unacceptable air pollution emissions. However, population is expected to increase in the Puget Sound region regardless of which alternative is selected. Population increases are associated with expansion of residential, commercial, institutional, and industrial spaces, and therefore with increased air pollutant emissions in the region. Similarly, vehicle miles traveled (VMT) by vehicles used by residents and people who work in the region would also increase.

2.0 AFFECTED ENVIRONMENT

2.1 Existing Air Pollution Sources

Typical existing air pollution sources in Seattle include commercial and retail businesses, light industry, residential wood-burning devices (such as woodstoves), and vehicular traffic. On-road vehicular traffic along major roadways and in existing institutional (school), commercial, and residential areas is expected to be the single largest contributor to criteria pollutant emissions from the project. Vehicles contribute most of the carbon monoxide (CO), nitrogen dioxide (NO_2), and GHG emissions. Stationary equipment used in commercial and industrial areas is a secondary source of emissions, and space heating (such as gas and diesel heating equipment) contributes air pollutant emissions as well.

The nearest existing major source of air pollutant emissions is King County Natural Resources' Wastewater Treatment Plant located immediately west of Fort Lawton. The Washington State Department of Ecology (Ecology) lists the treatment plant as a major source of hazardous air pollutants, including particulate matter (PM), sulfur dioxide, nitrogen oxides (NO_x), volatile organic compounds (VOCs), CO, and ammonia (NH_3; Ecology 2024a).

2.2 National Ambient Air Quality Standards

The US Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) and specified future dates for states to develop and implement plans to achieve these standards. The standards are divided into primary and secondary standards; the former are set to protect human health within an adequate margin of safety, and the latter to protect environmental values, such as plant and animal life. Ecology established Washington State Ambient Air Quality Standards that are at least as stringent as the national standards for the six criteria air pollutants.

2.2.1 Key Criteria Air Pollutants

The criteria pollutants, described below, are six key air pollutants produced in the combustion of fossil fuels and other processes.

2.2.1.1 Carbon Monoxide

CO is a product of incomplete combustion generated by mobile sources (such as vehicular traffic and heavy equipment), residential wood combustion, and industrial sources that burn fuel. Of all pollutants for which short-term health standards exist, CO is emitted in the greatest quantity. The impact of CO is usually limited to the local vicinity of its emission. Since CO is of particular concern with respect to vehicular traffic, the highest ambient concentrations tend to occur near congested roadways and intersections, particularly during wintertime periods of air stagnation.

2.2.1.2 Ozone

Ozone (O_3) is a highly reactive form of oxygen that is generated by an atmospheric chemical reaction with ozone precursors like NO_x and VOCs. These precursors are emitted directly from industrial and mobile sources. Transportation equipment such as automobiles and trucks also significantly contribute

to ozone precursor emissions. Elevated ozone concentrations in the atmosphere is a regional issue rather than a localized problem, because the atmospheric reactions take time, and during this delay, ozone precursors may be dispersed far from their point of origin.

2.2.1.3 Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate matter is generated by industrial emissions, residential wood combustion, motor vehicle tailpipes, and fugitive dust from roadways, haul roads, and unpaved surfaces. There are federal standards for the emission of particulate matter less than or equal to 10 micrometers in size (PM_{10}) and particulate matter less than or equal to 2.5 micrometers in size ($PM_{2.5}$), because these sizes of particulate matter contribute the most to human health effects and regional haze. The highest ambient concentrations generally occur near the emission sources, which in King County would be from residential wood-burning stoves and motor vehicle tailpipes on major roads. $PM_{2.5}$ has a greater impact than PM_{10} at locations far from the emitting source because it remains suspended in the atmosphere longer and travels farther.

2.2.1.4 Lead

The main source of lead pollution has historically been the transportation sector, but tailpipe lead emissions have drastically declined since the EPA implemented regulatory efforts to remove lead from on-road motor vehicle gasoline in 1995. The major emission sources of lead currently include lead smelters and metals processing plants and combustion of aviation gasoline.

2.2.1.5 Nitrogen Oxides and Sulfur Oxides

NO_x and sulfur oxides (SO_x) are emitted by mobile sources and fuel-burning stationary sources. NO_x and SO_x pollution from tailpipe emissions form regional haze and acid deposition in the Olympic and Cascade Mountains surrounding Seattle, and NO_x is one of the ozone precursors that contributes to ongoing ozone issues in the Puget Sound region.

2.2.1.6 Greenhouse Gases

GHGs are a group of gases that, when present in the atmosphere, absorb or reflect heat that normally would radiate away from the earth, and thereby increase global temperature. Several GHG constituents are commonly evaluated: Carbon dioxide (CO_2), methane, nitrous oxide, water vapor, O_3, and halocarbons. CO_2 is the individual constituent normally emitted in the greatest amount and generally contributes the most to climate change. Each individual constituent has its own global warming potential. To express the average emission rate and global warming potential of the combined constituents, GHG emission rates are commonly expressed as the equivalent amount of carbon dioxide (CO_{2e}). The effects of GHG emissions are global rather than local, meaning the amount of GHG emitted is important, but not the specific location of the emissions.

2.3 Air Quality Attainment Status

Based on monitoring information collected over a period of years, the EPA and Ecology designate regions as being attainment or non-attainment areas for regulated air pollutants. Attainment status

indicates that air quality in an area meets the NAAQS, and non-attainment status indicates that air quality in an area does not meet those standards. If the measured concentrations in a non-attainment area improve so that they are consistently below the NAAQS, Ecology and the EPA can reclassify the non-attainment area to a maintenance area.

King County was in non-attainment for O_3 between 1992 and 1996, after which it became a maintenance area until 2016. In March 2008, the EPA lowered its 8-hour ozone standard from 0.08 parts per million (ppm) to 0.075 ppm to better protect public health. In 2015, EPA again lowered its 8-hour ozone standard to 0.070 ppm. In 2020, EPA reviewed and retained the standard without revision (EPA 2024a). King County is still designated an attainment area for ozone.

Similarly, in 2010 the EPA enacted a new, more stringent 1-hour average ambient air quality standard for NO_2. At this time, it is not known which regions in the country will be redesignated based on the new standard. Therefore, as of this time, King County is still considered an attainment area for NO_2.

King County was in non-attainment for PM_{10} between 1990 and 2001 and was a maintenance area until 2021, but it is currently designated as an attainment area for PM_{10}.

King County is currently designated as an attainment area for $PM_{2.5}$. In May 2024, EPA lowered the primary $PM_{2.5}$ standard from 12.0 micrograms per cubic meter ($\mu g/m^3$) to 9.0 $\mu g/m^3$. The current designation of areas as attainment will continue until EPA reviews the status of each area (EPA 2024b).

The Central Puget Sound area (including King County) was designated non-attainment for CO in 1990. The EPA approved a CO maintenance plan for the Central Puget Sound area in 1996. In 2004, the EPA approved a second CO/ozone maintenance plan. As discussed above, vehicular emissions are the largest source of CO. The Central Puget Sound CO maintenance plan relies on Chapter 173-422 of the Washington Administrative Code (WAC), a vehicle inspection and maintenance program, to require vehicles in the region to conform to emission standards intended to reduce overall CO emissions in the region. The 20-year maintenance period ended in 2016, and the area is now in attainment, but the maintenance strategies remain in effect (Ecology 2024b).

2.4 Air Toxics Issues

Existing development in the Fort Lawton area poses no special issues related to air toxics. According to the EPA's National Air Toxics Assessment 2011 database, the respiratory cancer risk in the Fort Lawton area is approximately 30 x 10-6 or 30 cancer cases per million population. This reported respiratory cancer risk is typical of other urban and suburban areas in the Puget Sound region (EPA 2024c).

2.5 Puget Sound Regional Council Transportation Conformity Analysis

Within the region, all federal- or state-funded significant transportation projects (including constructing or widening roadways and signalized intersections) proposed within non-attainment or maintenance areas are subject to the Transportation Conformity Regulations (Code of Federal Regulations, Title 40 [40 CFR], Parts 51 and 93; Chapter 173-420 WAC). These regulations ensure that transportation projects,

plans, and programs will conform to existing plans and timetables for attaining or maintaining NAAQS. The Fort Lawton site is not located in a maintenance or a non-attainment area.

2.6 Puget Sound Clean Air Agency Regulations

All construction sites in the Puget Sound region are required to implement rigorous emission controls to minimize fugitive dust and odors during construction, as required by PSCAA Regulation 1, Section 9.15, Fugitive Dust Control Measures. All construction work in Fort Lawton will implement these air quality emission controls.

The PSCAA regulates emissions from industrial and commercial sources; however, none of the proposed alternatives for the Fort Lawton project include industrial or commercial development; therefore, emissions from industrial and commercial sources have not been included in this analysis.

2.6.1 Climate Change Policy

2.6.1.1 National Environmental Policy Act Requirement for Climate Change Analysis

On December 7, 2009, the EPA signed the Endangerment and Cause or Contribute Findings for GHGs under Section 202(a) of the federal Clean Air Act (EPA 2009). Under the Endangerment Finding, the EPA determined that the current and projected concentrations of the six key GHGs—CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride—in the atmosphere threaten the public health and welfare of current and future generations. Under the Cause or Contribute Finding, the EPA determined that the combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG emissions that threaten public health and welfare.

On August 1, 2016, the Council on Environmental Quality (CEQ) issued final National Environmental Policy Act (NEPA) guidance on the consideration of the effects of climate change and GHG emissions (CEQ 2016). This guidance advises federal agencies to consider opportunities to reduce GHG emissions caused by federal actions, adapt their actions to climate change impacts throughout the NEPA process, and address these issues in their agency NEPA procedures. Where applicable, the scope of the NEPA analysis should cover the GHG emission effects of a Proposed Action and alternatives and the relationship of climate change effects to a Proposed Action or alternatives. However, this guidance document does not set numerical thresholds for what levels of GHG emissions would constitute a significant impact, nor does the guidance document specify what types of mitigation measures should be required by local municipalities. The guidance was rescinded in 2017 and replaced with a new guidance document in 2019, which was rescinded in 2021 with an executive order to revise and update the 2016 guidance document. Notices for comments regarding the updated guidance document were received through April 2023 and are being reviewed before final issuance of the updated guidance (CEQ 2024).

2.6.2 State of Washington Greenhouse Gas Requirements

Washington State Executive Order 07-02 was issued in February 2007, establishing the following GHG reduction goals (Ecology 2008):

- Reduce emissions to 1990 levels by 2020, 25 percent below 1990 levels by 2035, and 50 percent below 1990 levels by 2050.
- Increase "green economy jobs" in Washington State to 25,000 by 2020. The term "green economy jobs" means the design, manufacture, marketing, and installation of equipment to support sustainable development both within and beyond Washington State.
- Reduce expenditures on fuel imported into Washington State by 20 percent by 2020.

The above-noted GHG reduction goals apply statewide, but they do not specify any requirements for local government agencies to implement measures to reduce emissions in their jurisdictions.

Chapter 70.235 of the Revised Code of Washington (RCW), Limiting GHG Emissions, codifies the GHG reduction goals of Executive Order 07-02 and specifies them as "limits" rather than "goals." The new law also adds a fourth requirement to help achieve the GHG reduction targets:

- Decrease the annual per-capita VMT by 18 percent by 2020, 30 percent by 2035, and 50 percent by 2050.

The state law applies only to actions taken by Washington State agencies and local governments that receive state funds for their project. State regulations regarding GHG emissions include prerequisites for distribution of capital funds for infrastructure and economic development projects, where projects receiving funding must be evaluated for consistency with state and federal GHG limits and state VMT goals (RCW 70.235.070).

Ecology issued revised guidance in June 2011 for State Environmental Policy Act (SEPA) reviews regarding actions for which Ecology is the SEPA lead agency (Ecology 2013a). Ecology's 2011 guidance for Ecology-led SEPA determinations sets the SEPA significance threshold at 25,000 metric tons per year of GHG emissions or a mitigation plan that anticipates 11 percent reduction on that GHG emission increase. The 2011 Ecology guidance did not specify significance thresholds or mitigation requirements for local governmental actions for which a city is the SEPA lead agency. Ecology's SEPA guidance has since been removed from its website and is no longer considered a published guidance document.

In 2011, the Washington State Department of Commerce (WSDOC) released an updated Washington State Energy Strategy for 2012 (WSDOC 2011), which includes short- and long-term policy options to meet the following goals:

1) Maintain competitive energy prices that are fair and reasonable for consumers and businesses and support Washington's continued economic success.
2) Increase competitiveness by fostering a clean energy economy and jobs through business and workforce development.
3) Meet the state's obligations to reduce GHG emissions.

The Washington State Energy Strategy outlines strategies to meet these goals in the categories of transportation efficiency, building efficiency, distributed energy, and pricing.

Washington State's Climate Commitment Act (CCA) was signed into law in 2021 and went into effect on January 1, 2023. The CCA caps and reduces GHG emissions from Washington's largest emitting sources

and industries, to help Washington achieve a goal to reduce GHG emissions by 95 percent of 1995 emissions by 2050. Washington businesses and operations that emit more than 25,000 annual metric tons of CO_{2e} are required to comply with the cap-and-invest program established by the CCA, which sets an annual cap on GHG emissions and auctions a controlled number of allowances; entities with emissions less than 25,000 annual metric tons of CO_{2e} may opt in to the program.

The Clean Fuel Standard, passed by the Washington Legislature in 2021 and in effect as of January 1, 2023, created rules for the Clean Fuels Program to meet the goals of the standard. Under the program, a market approach is intended to incentivize fuel producers to reduce the GHG impact of their products by 20 percent by 2034 (Ecology 2022). For the Greenhouse Gas Assessment for Projects, a new rule directed by Governor Jay Inslee in December 2021 that is also known as the GAP rule, rulemaking is currently paused while public comments for the CCA and Clean Fuel Standard are being considered, along with any potential intersections with the new rules (Ecology 2024b).

2.6.3 Puget Sound Clean Air Agency and Greenhouse Gases

In 2004, the PSCAA published its strategy document for climate change, entitled *Roadmap for Climate Protection: Reducing Greenhouse Gas Emissions in Puget Sound* (PSCAA 2004). In this strategy document, the PSCAA recommended a broad range of GHG reduction measures, including regional vehicle trip reduction, building energy efficiency improvements, solid waste reduction, forestry and agriculture practice improvements, and community education. This document also encouraged local municipalities to implement their own GHG reduction measures.

Currently the PSCAA is leading the EPA's Climate Pollution Reduction Grant program for the Puget Sound region (PSCAA; 2024), a component of the federal Inflation Reduction Act along with the WSDOC. Priority climate action plans and implementation proposals covering all source categories, including transportation, the built environment, and more, were due to the EPA in spring 2024.

2.6.4 City of Seattle Climate Change Policies

In June 2013, the City of Seattle (City) adopted Resolution 31447, the Seattle Climate Action Plan (City of Seattle 2013a). Additionally, in October 2013, Seattle published the Seattle Climate Action Plan Implementation Strategy (City of Seattle 2013b). The Climate Action Plan provides a framework that focuses on reducing GHG emissions in road transportation, building energy, and waste sectors of the economy.

Seattle's 2035 Comprehensive Plan (City of Seattle 2024a) and the One Seattle Plan, Seattle's Draft Comprehensive Plan (City of Seattle 2024b), outline the City's goal of becoming carbon-neutral by 2050. The One Seattle Plan outlines policies related to transportation, development pattern, building energy, and solid waste that are aimed at reducing the emission of GHGs.

3.0 IMPACTS

3.1 Qualitative Impacts of Alternative 1

This section describes the qualitative air quality issues associated with the Fort Lawton project action alternative (Alternative 1).

3.1.1 Construction Impacts

During demolition and construction, dust from excavation and grading could cause temporary, localized increases in the ambient concentrations of fugitive dust and suspended particulate matter. Construction activity must comply with PSCAA regulations requiring reasonable precautions to minimize dust emissions (Regulation I, Section 9.15). Regardless, construction activity could cause localized fugitive dust impacts at homes and businesses near the construction site.

Construction activities would likely require the use of diesel-powered, heavy trucks and smaller equipment such as generators and compressors. These engines would emit air pollutants that could slightly degrade local air quality in the immediate vicinity of the activity. However, these emissions would be temporary and localized, and the resulting construction tailpipe emissions would likely be far outweighed by emissions from existing traffic in the region.

Some construction activities could cause odors detectable to some people in the vicinity of the activity, especially during paving operations using tar and asphalt. Such odors would be short-term and localized. Stationary equipment used for the construction activities must comply with PSCAA regulations requiring the best available measures to control the emissions of odor-bearing air contaminants (Regulation I, Section 9.11).

Construction equipment and material hauling could temporarily increase traffic flow on City streets adjacent to a construction area. If construction delays traffic enough to significantly reduce travel speeds in the area, general traffic-related emissions would increase.

Development under Alternative 1 will require removal of some of the existing vegetation. As described above, removal of vegetation leads to soil carbon GHG emissions. At the Fort Lawton site, existing wooded areas in the northern and southern parts of the site would be preserved, and forest land in the western portion of the site would be dedicated to the adjacent Discovery Park. Under Alternative 1, approximately the same amount of vegetated area would be created in the form of landscaping, passive open space, and active open space as would be removed, resulting in no change to the total amount of vegetation at the Fort Lawton site.

3.1.2 Operational Impacts

No new commercial or industrial development is planned for the Fort Lawton project; therefore, only impacts from residential development have been considered. Impacts from residential development, including heating and transportation-related impacts, are described below.

3.1.3 Regional Air Quality Impacts

Photochemical smog (the regional haze produced by ozone and fine particles) is largely caused by regional tailpipe emissions of cars and trucks traveling on public streets throughout the Puget Sound region, rather than localized emissions from any individual neighborhood. Tailpipe emissions caused by Alternative 1 would be proportional to the regional VMT associated with the project.

Alternative 1 would increase local VMT, which would contribute to tailpipe emissions in the immediate project vicinity; however, the project is not intended to increase the forecasted population and economic growth throughout the Puget Sound region. Providing housing for Puget Sound residents closer to needed services is expected to decrease total VMT in the region; therefore, the increased emissions caused by development at the Fort Lawton site are not expected to contribute to future worsening of regional air quality. Any change in tailpipe emissions would be very small relative to the overall regional tailpipe emissions in the Puget Sound air basin.

Photochemical smog was a serious concern in the Puget Sound region before the late 1980s, but federal tailpipe emission regulations have reduced vehicular emissions to the point that the region is currently a designated attainment area for ozone.

The Puget Sound Regional Council (PSRC) set regional transportation emission budgets for three pollutants: CO, NO_x, and $PM_{2.5}$. The corresponding PSRC air quality conformity analyses concluded that its forecasted regional emissions for the 2040 planning year will be far below the allowable budgets (PSRC 2010). Because the change in tailpipe emissions associated with the Fort Lawton project under Alternative 1 is expected to be small compared to the overall tailpipe emissions in the Puget Sound region, and because the region is currently designated an attainment area, it is concluded that Alternative 1 would not result in a significant impact on regional air quality.

3.1.4 Mobile Source Air Toxics

Development of the Fort Lawton site would include the addition of roadways and improvements to existing roadways. When a street is widened and, as a result, moves closer to receptors, the localized level of mobile source air toxics emissions could be higher. On a regional basis, the EPA's vehicle and fuel regulations (coupled with ongoing future fleet turnover) will over time cause substantial reductions that will cause region-wide mobile source air toxics levels to be significantly lower than today in most cases.

3.1.4.1 Emissions from Vehicle Travel

Tailpipe emissions from vehicles traveling on public roads would be the major source of air pollutant emissions associated with development at the Fort Lawton site. Potential air quality impacts caused by increased tailpipe emissions are divided into two general categories: CO hotspots caused by localized emissions at heavily congested intersections, and regional photochemical smog caused by combined emissions throughout the Puget Sound region.

Development under Alternative 1 would increase vehicle travel on existing public roads. However, it is unlikely that the increased traffic and congestion would cause localized air pollutant concentrations at local intersections to form a hotspot (i.e., a localized area where air pollutant concentrations exceed NAAQS). The PSCAA operates ambient air pollution monitors at some of the most heavily congested intersections in the Puget Sound region, and none of those monitors have indicated exceedances over the past several years.

Furthermore, EPA motor vehicle regulations have steadily decreased tailpipe emissions from individual vehicles. Continuing decreases from individual vehicle emissions are expected to more than offset the increase in vehicle traffic, leading to a decrease in total GHG emissions from transportation sources, even as populations increase. For these reasons, it is unlikely that air quality impacts at local intersections would be significant.

3.1.4.2 Space Heating Emissions at Residential Buildings

Emissions would be generated by natural gas, fuel oil, and/or propane combustion used for space heating (stationary combustion) at new dwellings. However, per-building space heating emissions are expected to decrease in response to energy conservation issues and as future residents purchase more fuel-efficient furnaces. Therefore, future space heating emissions at the Fort Lawton site are not expected to cause significant air quality impacts in the Puget Sound region.

3.1.4.3 Residential Wood Burning

Residential wood-burning appliances elevate concentrations of particulate matter and toxic air pollutants, especially when heavy wood burning is combined with stagnant weather conditions. The ambient air pollutant concentrations caused by residential wood combustion generally occur in the immediate vicinity of the wood-burning appliance.

The PSCAA and Washington State have regulations in place to improve regional air quality by limiting $PM_{2.5}$ emissions from woodstoves. Continued enforcement of these regulations and policies ensures that future emissions from residential wood combustion would prevent ambient pollutant concentrations in heavily populated areas from approaching health-based NAAQS limits.

No wood burning appliances are planned to be incorporated into the Fort Lawton project.

3.1.4.4 Indirect/Cumulative Impacts

Development facilitated by the action alternative would result in indirect effects on air quality. For example, additional people and vehicles in and around the Fort Lawton site could lead to greater concentrations of pollutants that could adversely affect air quality.

Alternative 1 would increase local VMT. However, as mentioned above, compared to other population and economic growth throughout the region, infill housing such as the Fort Lawton project is intended to result in fewer VMT than equivalent housing in suburban areas farther from employment centers and public transportation. VMT is addressed quantitatively in Table 3.

All future development in the Puget Sound region would also contribute to worldwide emissions of GHG, which would contribute to potential future effects caused by global climate change (e.g., changes in seasonal temperature, seasonal precipitation, and local sea level rise).

3.2 Quantitative Impacts of Alternative 1

The following sections describe the quantitative air quality impacts of the Fort Lawton project compared to the No Action alternative.

3.2.1 Greenhouse Gas Emission Calculation Methods

This section describes methods used for estimating projected GHG emissions based on Alternative 1. Screenshots of Greenhouse Gas Emission Calculation tools are included in Appendix A.

For this analysis, GHG emissions are expressed as metric tons of CO_{2e} per year. For the purposes of determining significance under SEPA, the forecasted GHG emission increase is based on comparing the future emission rate for Alternative 1 to the forecasted future emission rate of the No Action Alternative.

King County's "SEPA GHG Emissions Worksheet"—acquired through King County's SEPA Environmental Checklist guidance (King County 2019)—was used to evaluate existing and projected future (2032, the assumed buildout year for the Fort Lawton project) GHG emissions for Alternative 1. This analysis provides a screening-level estimate of life-cycle "business as usual" emissions for residential, institutional, commercial, and industrial land uses, not including individual large stationary industrial sources or any special project-level emission reduction measures or other mitigation measures.

The available input data used for the GHG emission calculations were limited to aggregate housing units for single- and multi-family housing, and for offices associated with senior supportive services and rental management. Given the input limitation, this method of analysis is considered an adequate screening-level tool for the purpose of forecasting GHG emission rates.

Three types of life-cycle emissions were estimated using the SEPA GHG Calculation Tool: stationary combustion equipment, energy, and transportation (Ecology 2013b). Energy emissions are generated by stationary combustion (i.e., furnace combustion of natural gas for space heating) and electricity consumption throughout the lifespan of a building. These emission estimates are based on the US Energy Information Administration's residential and commercial energy consumption surveys.

Transportation emissions include tailpipe emissions generated by on-road vehicles used by particular building occupants. This evaluation accounts for transportation emissions for the residents, delivery vehicles, and other visitors in residential areas. The transportation emissions do not account for vehicles passing through the study area unless they are directly associated with the buildings being evaluated.

For projections of 2025 transportation emissions, the default value for the average fuel economy in the calculations listed above was 43.6 miles per gallon (mpg). This value reflects the EPA's proposed corporate automobile fuel economy vehicle mileage standard for cars and light trucks for 2025 (54.5 mpg), reduced by 20 percent to reflect real-world CO_2 emission rates (EPA 2012).

3.2.1.1 "Soil Carbon" Greenhouse Gas Emissions from Permanent Removal or Restoration of Biomass

The general term "soil carbon GHG emissions" refers to the effect of permanently removing vegetation for the purpose of constructing new development. This exacerbates global climate change by two mechanisms. First, the biomass consisting of aboveground vegetation and underground root mass is immediately removed and disposed of, which immediately causes the biomass to decay and release carbon dioxide to the atmosphere. Second, the aboveground vegetation that was permanently removed is no longer available to remove CO_2 from the atmosphere during natural photosynthesis.

Likewise, the restoration and replanting of vegetation in areas that have already been cleared of vegetation is a way to recapture carbon by locking the carbon into the plant structure and releasing oxygen into the atmosphere.

Proposed development under Alternative 1 will require removal of some of the existing vegetation, which will lead to soil carbon GHG emissions. However, existing wooded areas in the northern and southern parts of the site would be preserved, and forest land in the western portion of the site would be dedicated to the adjacent Discovery Park. A breakdown of the estimate of the area of paved and developed areas currently present at the site is included in Appendix B. Under Alternative 1, the amount of green space proposed is approximately equal to the area present before development or under the No Action alternative. Therefore, soil carbon is not expected to be a contributor to GHG emissions under this alternative.

3.2.1.2 Land-Use Values for Greenhouse Gas Calculations

For the purposes of this analysis, the GHG emissions are expressed in terms of increase in GHG emissions over the pre-development condition and are compared to the No Action alternative. Table 1 lists the projected land-use values used for calculating GHG emissions. The baseline land use is assumed to be the existing land, prior to any new development. The values listed represent the increase compared to the pre-development condition.

Table 1. Increase in Land Use for Greenhouse Gas Emissions Calculations

Facility	Units	Proposed Acres	Proposed KSF
500 Housing Units			0
Large Building	**325**	1.1	47.916
Small Building	**175**	1.1	47.916
Offices[a]			29.921
Open Space (Sports Field, Landscaped Area, Passive Open Space)		20.7	901.692
266 Parking Spaces		4.4	191.664
Roadways/Sidewalk		6.6	287.496
Total Pavement			479.16
Subtotal		**33.9**	

a) For the purposes of this analysis, services associated with Senior Supportive Housing (case management, counseling, and other services) and affordable rental housing (management offices) were assumed to occupy the ground floors of the Senior Supportive Housing building. Offices were conservatively assumed to consist of outpatient healthcare or undefined offices, which have similar estimated GHG emissions.

3.2.2 Greenhouse Gas Emissions

The direct and indirect impacts of Alternative 1 caused by construction emissions, localized stationary source emissions, localized CO hotspots, and regional tailpipe emissions are described qualitatively in Section 3.1. This section describes a quantitative analysis of GHG emissions.

The annual GHG emissions for Alternative 1 are calculated based on the future land use listed in Table 1. Table 2 lists the life-cycle GHG emission increases caused by combined future development at the Fort Lawton site.

Table 2. Comparison of Annual GHG Emissions

GHG Emission Estimates	Emissions Per Unit or Per Thousand Square Feet (MTCO2e)			Projected Average Annual GHG Emissions (metric tons CO_2e per year)[a]	
	Multifamily Units, Large Building	Multifamily Units Small Building	Medical Outpatient	Alternative 1	No Action
Forecasted Emissions					
Emissions (Stationary Combustion)[b]	33	54	39	264	0
Emissions (Electricity)[b]	357	681	737	3,194	0
Emissions (Transportation)[c]	295	295	284	1,938	0
Emissions (Pavement)				297	0
Total Emissions				5,693	0
Statewide estimated 2032 annual GHG Emissions:				**46,750,000**	
Project Emissions as a Percent of Total State GHG Emissions:				**0.012%**	**0.000%**

a) Calculation assumes a typical 80.5-year lifespan for the project. The lifespan is based on the King County SEPA GHG Emissions Worksheet (King County 2019)
b) Emission factors from King County SEPA GHG Emissions (King County 2019)
c) A breakdown of calculations for Transportation Emissions are included in Appendix A, Table A-1. Factors are based on the current year, 2025, a conservative assumption because of forecasted increases in vehicle fuel efficiency and reduction in VMT per person.

As listed in Table 2, Alternative 1 would result in increases in GHG emissions compared to the No Action Alternative. As noted in the discussion of GHG emissions calculation methods (Section 3.2.1), GHG calculations are based on King County's SEPA GHG Emissions Worksheet (King County 2019). Screenshots of the worksheet are included in Appendix A. Transportation emissions modifications are included in Table A-1. The emissions estimate is based on inputs that tend to conservatively overestimate emissions, including the following:

- The higher impact "Health Care Outpatient" land use classification is used for the senior supportive housing offices and management offices.
- 2025 value for miles per gallon of fuel was used, while in fact the miles per gallon will decrease over the lifetime of the project.
- Coefficients for building energy efficiency that are built into the model are sourced from 2007 and prior, and they do not account for increased building energy efficiency.

The conservative inputs were used to maintain a realistic "worst-case" emissions scenario; actual emissions of the project are likely to be lower.

As shown in Table 2, total GHG emissions associated with the Proposed Action are estimated to be 5,693 metric tons CO_{2e} per year. Washington State GHG legislation requires that total gross GHG emissions for 2040 fall to 70 percent below 1990 emissions (93,500,000 metric tons CO_{2e} per year) by 2040 (Ecology

2025). The GHG emissions of the Proposed Action would be only a small fraction (0.012 percent) of future statewide annual GHG emissions. Therefore, the impact is not considered significant.

3.2.3 Vehicle Miles Traveled

Table 3 shows the future contribution to VMT from the Fort Lawton project. Alternative 1 would result in greater VMT than No Action. However, the total VMT contribution to the greater Puget Sound Area is 0.03 percent. In addition, the purpose of the project is to create higher density housing in the area, which will reduce statewide VMT by decreasing the pressure for housing in areas with longer commuting distance. Therefore, it is anticipated that increased VMT associated with Alternative 1, and the potential for increased tailpipe emissions, is not considered significant.

Table 2. Comparison of Vehicle Miles Traveled

	Alt 1	No Action
Puget Sound 2030 daily VMT[a]	94,278,000	94,278,000
Project-related VMT[b]	24,670	0
Contribution of Increase to Regional Tailpipe Emissions	0.03%	0.00%

a) Source: PSRC Regional Transportation Plan (PSRC 2025).
b) Source: Email from Heffron Transportation Inc. (Heffron 2025).

3.3 Impacts of No Action Alternative

Under the No Action Alternative, no development would occur at the Fort Lawton site at this time. While construction emissions, localized stationary source emissions, localized CO hotspots, and regional tailpipe emissions in the surrounding neighborhoods would be similar to the impacts described in Sections 3.1 and 3.2, no new emissions would be caused by the project.

The No Action Alternative would result in no new residential dwelling units, and no active or passive open space. Therefore, the No Action Alternative would not increase localized GHG emissions in the study areas and would not result in any additional VMT.

However, it is important to note that while we assume a zero increase in GHG emissions and VMT, the No Action alternative will create pressure for additional residential building farther from the need. Housing built farther from where it is needed will result in longer commutes, which would increase statewide VMT and GHG emissions.

4.0 MITIGATION MEASURES

The following mitigation measures could contribute to a reduction in GHG associated with Action Alternative 1.

4.1 Incorporated Plan Features

The following features currently incorporated into the Fort Lawton project plan would contribute to a reduction in GHG from the project:

- Affordable housing developed on the Fort Lawton site would comply with the Evergreen Sustainable Development Standards (ESDS), which include the following GHG reduction measures:
  - Walkable neighborhoods (resulting in lower transportation-related emissions)
  - Reductions in energy use and increased insulation (resulting in lower emissions related to space heating)
- Sidewalks and trails would be located throughout the site, to provide opportunities for non-motorized circulation.
- King County Metro transit bus stops would be provided at two locations along Texas Way West in Fort Lawton, to encourage mass-transit use between the Fort Lawton site and offsite services.

4.2 Applicable Regulations and Commitments

Additionally, all development in Seattle is required to comply with the following regulations.

- National Ambient Air Quality Standards: As described above in Section 2.2, the EPA establishes NAAQS and specifies future dates for states to develop and implement plans to achieve these standards.
- State Ambient Air Quality Standards: Ecology establishes state ambient air quality standards that are at least as stringent as the national standards for the same six GHG pollutants; in the case of sulfur dioxide, state standards are more stringent.
- Outdoor Burning: The PSCAA enforces state outdoor burning regulations required by RCW 70.94.743.
- Puget Sound Clean Air Agency Regulations: All construction sites in the Puget Sound region are required to implement rigorous emission controls to minimize fugitive dust and odors during construction, as required by PSCAA Regulation 1, Section 9.15: Fugitive Dust Control Measures. All industrial and commercial air pollutant sources in the Puget Sound region are required to register with the PSCAA. Facilities with substantial emissions are required to obtain a Notice of Construction air quality permit before construction is allowed to begin.
- State of Washington GHG Laws: As described above in Section 2.6.2, Washington enacted a new law establishing GHG reduction limits.

4.3 Construction Emission Control

All construction contractors should be required to implement air quality control plans for construction activities at the Fort Lawton site. Developers should be required to prepare a dust control plan that commits the construction crews to implement all reasonable control measures described in the *Guide to Handling Fugitive Dust from Construction Projects* (AGC and FDTF 1997). Copies of that guidance document are distributed by the PSCAA. The air quality control plans should include best management practices (BMPs) to control fugitive dust and odors emitted by diesel construction equipment.

The following BMPs would be used to control fugitive dust:

- Use water sprays or other non-toxic dust control methods on unpaved roadways.
- Minimize vehicle speed while traveling on unpaved surfaces.
- Prevent track-out of mud onto public streets.
- Cover soil piles when practicable.
- Minimize work during periods of high winds when practicable.

The following mitigation measures should be used to minimize air quality and odor issues caused by tailpipe emissions:

- Maintain the engines of construction equipment according to manufacturers' specifications.
- Minimize idling of equipment while the equipment is not in use.
- If there is heavy traffic during some periods of the day, scheduling haul traffic during off-peak times (e.g., between 9:00 a.m. and 4:00 p.m.) would have the least effect on traffic and would minimize indirect increases in traffic-related emissions.

Burning of slash or demolition debris will not be permitted without express approval from the PSCAA. No slash burning is anticipated for any construction projects at the Fort Lawton site.

5.0 SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

No significant unavoidable adverse impacts on regional or local air quality are anticipated. Temporary, localized dust and odor impacts could occur during construction activities. The regulations and mitigation measures described above are adequate to mitigate any adverse impacts anticipated to occur as a result of the Fort Lawton project.

6.0 LIMITATIONS

The conclusions made in this report are based on the results of a qualitative analysis of planning documents that did not include field measurements or incorporation of detailed site-specific information. While this review allows for a preliminary assessment of potential impacts, it does not constitute a site-specific study.

7.0 USE OF THIS REPORT

This report has been prepared for the exclusive use of EA Engineering, Science, and Technology, Inc., PBC for specific application to the Fort Lawton Army Reserve Center Redevelopment Project. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of Landau. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau, shall be at the user's sole risk. Landau warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

8.0 REFERENCES

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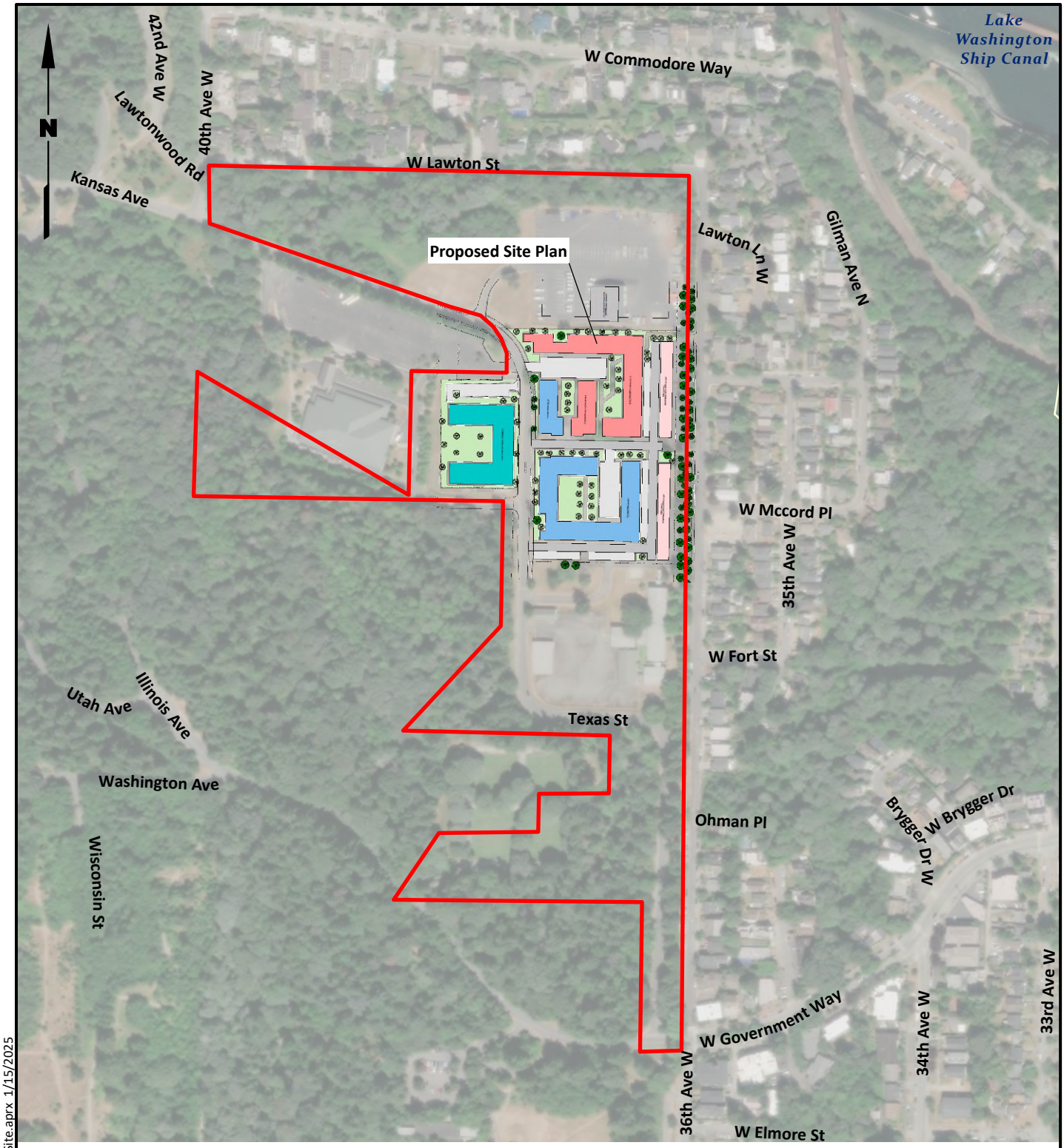

Legend

Project Area

0 400 800

Scale in Feet

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Source: Esri World Imagery; EA Engineering, Science, and Technology, Inc.

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LANDAU ASSOCIATES

Air Quality Technical Report	**Project Area**	Figure 1

APPENDIX A
Greenhouse Gas Calculation Inputs

Table A-1 Transportation Emissions

	2006	***2021***	***2023***	**2025**
WA Annual VMT[a]	56,531,930,000	*57,800,000,000*	*59,804,000,000*	61000080000
Population[b]	6,395,798	*7,766,975*	*7951150*	8110173
Vehicle miles per person	8839	*7442*	*7521*	7521
Average MPG[c]	19.75			43.6
gallons gas/mile	0.0506			0.0229
lb CO_{2e} per gallon[d]	24.3	*24.3*	*24.3*	24.3
lb/metric tonne[d]	0.000453592	*0.000453592*	*0.000453592*	0.000453592
vehicle GHG emission	4.93			1.90

2006 (King County GHG Calculator)

	people/ unit	# ksf/unit	people/ ksf	vehicle GHG emission per person per year	$MTCO_{2e}$/ yr/unit	$MTCO_{2e}$/ yr/ksf	lifespan	GHG/ lifespan
MF Large	1.93	0.85	2.28	4.93	9.50		80.55	766
MF Small	1.93	1.39	1.38	4.93	9.50		80.55	766
HC Outpatient	19.26	10.40	1.85	4.93		9.13	62.55	571

2025 (scaled to 2025 MPG)

	people/ unit	# ksf/ unit	people/ ksf	vehicle GHG emission per person per year	$MTCO_{2e}$/ yr/unit	$MTCO_{2e}$/ yr/ksf	lifespan	GHG/ lifespan
MF Large	1.93	0.85	2.28	1.90	3.66		80.55	295
MF Small	1.93	1.39	1.38	1.90	3.66		80.55	295
HC Outpatient	19.26	10.40	1.85	1.90		3.52	80.55	284

Table A-1 References and Notes:

a) The 2025 VMT is projected from the 2021 and 2023 VMT. 2006 is included for comparison. VMT numbers are sourced from WSDOT, summary of DVMT and AVMT reported to FWHA in Highway Performance Monitoring System submittals. Available at:
https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwsdot.wa.gov%2Fsites%2Fdefault%2Ffiles%2F2024-10%2FVMTHIST.docx&wdOrigin=BROWSELINK

b) Population data sources:
Population data for 2023 and 2025: Washington State Office of Financial Management,
Total population and percent change; accessed January 7, 2025.
https://ofm.wa.gov/washington-data-research/statewide-data/washington-trends/population-changes/total-population-and-percent-change

Population data up to 2021, and an alternate source for the 2021 VMT: WSDOT VMT Targets Final Report, June 2023.
https://wsdot.wa.gov/sites/default/files/2023-06/VMT-Targets-Final-Report-June2023.pdf

c) Miles per gallon (MPG) for 2006 is sourced from King County SEPA GHG Emissions Worksheet (see Note d). MPG for 2025 is sourced from US Environmental Protection Agency, Office of Transportation and Air Quality. 2012. EPA and NHTSA Set Standards to Reduce Greenhouse Gases and Improve Fuel Economy for Model Years 2017-2025 Cars and Light Trucks. August. Available at http://www3.epa.gov/otaq/climate/documents/420f12051.pdf.

d) CO2 coefficients and table setup and calculations are sourced and modified from King County SEPA GHG Emissions Worksheet (King County 2019).
Available at: https://kingcounty.gov/~/media/depts/permitting-environmental-review/dper/documents/forms/SEPA-Greenhouse-Emissions-Worksheet-Instructions.ashx?la=en

Screenshots for King County GHG Calculator; calculator was modified for project calculations:

Section I: Buildings

Type (Residential) or Principal Activity (Commercial)	# Units	Square Feet (in thousands of square feet)	Emissions Per Unit or Per Thousand Square Feet (MTCO2e) Embodied	Energy	Transportation	Lifespan Emissions (MTCO2e)
Single-Family Home	0		98	672	792	0
Multi-Family Unit in Large Building	325		33	357	766	375601
Multi-Family Unit in Small Building	175		54	681	766	262531
Mobile Home	0		41	475	709	0
Education		0.0	39	646	361	0
Food Sales		0.0	39	1,541	282	0
Food Service		0.0	39	1,994	561	0
Health Care Inpatient		0.0	39	1,938	582	0
Health Care Outpatient		29.9	39	737	571	40262
Lodging		0.0	39	777	117	0
Retail (Other Than Mall)		0.0	39	577	247	0
Office		0.0	39	723	588	0
Public Assembly		0.0	39	733	150	0
Public Order and Safety		0.0	39	899	374	0
Religious Worship		0.0	39	339	129	0
Service		0.0	39	599	266	0
Warehouse and Storage		0.0	39	352	181	0
Other		0.0	39	1,278	257	0
Vacant		0.0	39	162	47	0

Section II: Pavement

Pavement		479.00				23950
	Total Project Emissions:					702343

Transportation Emissions Worksheet

Type (Residential) or Principal Activity (Commercial)	# people/ unit or building	# thousand sq feet/ unit or building	# people or employees/ thousand square feet	vehicle related GHG emissions (metric tonnes CO2e per person per year)	MTCO2e/ year/ unit	MTCO2e/ year/ thousand square feet	Average Building Life Span	Life span transportation related GHG emissions (MTCO2e/ per unit)	Life span transportation related GHG emissions (MTCO2e/ thousand sq feet)
Single-Family Home	2.8	2.53	1.1	4.9	13.7	5.4	57.9	792	313
Multi-Family Unit in Large Building	1.9	0.85	2.3	4.9	9.5	11.2	80.5	766	904
Multi-Family Unit in Small Building	1.9	1.39	1.4	4.9	9.5	6.8	80.5	766	550
Mobile Home	2.5	1.06	2.3	4.9	12.2	11.5	57.9	709	668
Education	30.0	25.6	1.2	4.9	147.8	5.8	62.5	9247	361
Food Sales	5.1	5.6	0.9	4.9	25.2	4.5	62.5	1579	282
Food Service	10.2	5.6	1.8	4.9	50.2	9.0	62.5	3141	561
Health Care Inpatient	455.5	241.4	1.9	4.9	2246.4	9.3	62.5	140506	582
Health Care Outpatient	19.3	10.4	1.9	4.9	95.0	9.1	62.5	5941	571
Lodging	13.6	35.8	0.4	4.9	67.1	1.9	62.5	4194	117
Retail (Other Than Mall)	7.8	9.7	0.8	4.9	38.3	3.9	62.5	2394	247
Office	28.2	14.8	1.9	4.9	139.0	9.4	62.5	8696	588
Public Assembly	6.9	14.2	0.5	4.9	34.2	2.4	62.5	2137	150
Public Order and Safety	18.8	15.5	1.2	4.9	92.7	6.0	62.5	5796	374
Religious Worship	4.2	10.1	0.4	4.9	20.8	2.1	62.5	1298	129
Service	5.6	6.5	0.9	4.9	27.6	4.3	62.5	1729	266
Warehouse and Storage	9.9	16.9	0.6	4.9	49.0	2.9	62.5	3067	181
Other	18.3	21.9	0.8	4.9	90.0	4.1	62.5	5630	257
Vacant	2.1	14.1	0.2	4.9	10.5	0.7	62.5	657	47

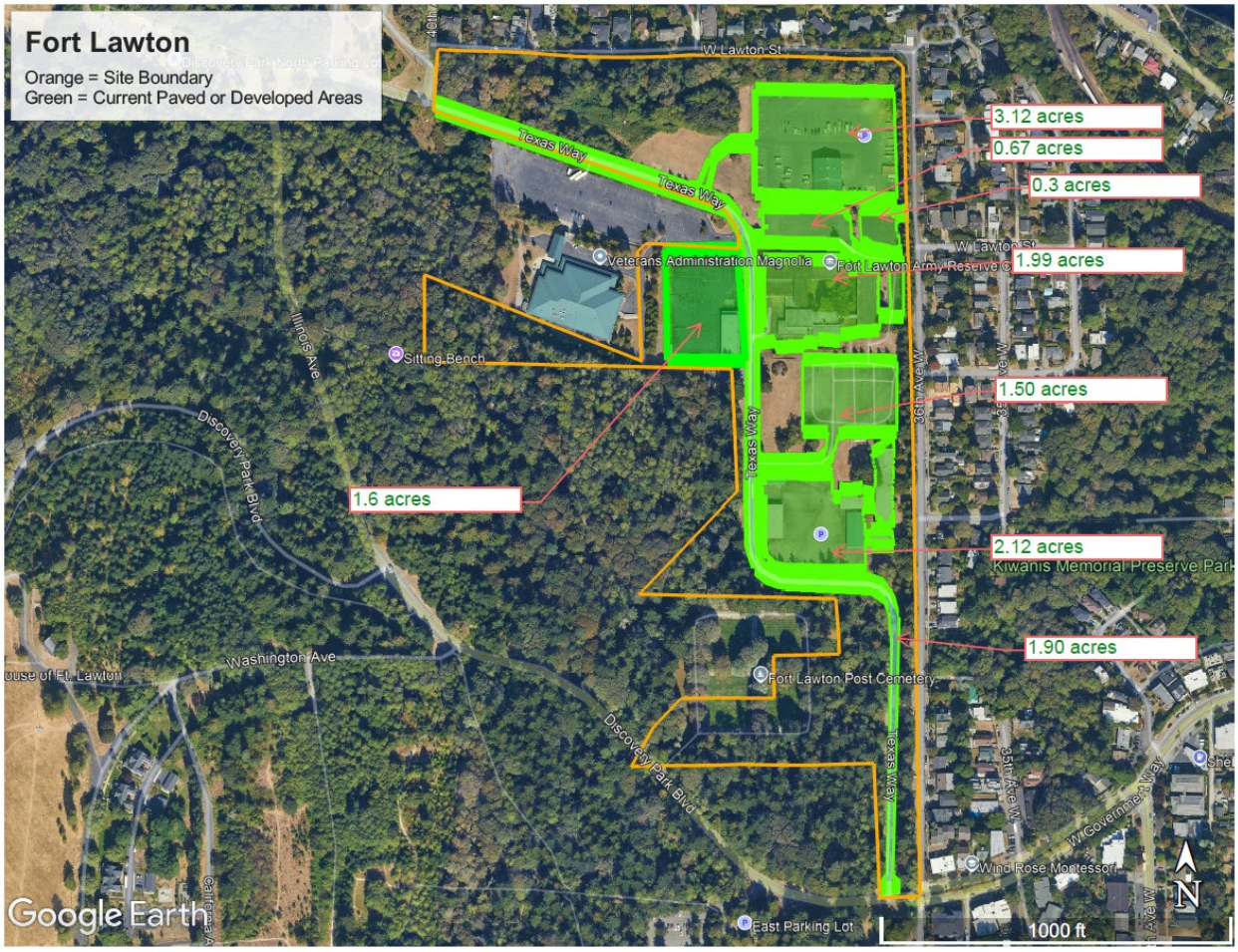
Sources	
All data in black text	King County, DNRP. Contact: Matt Kuharic, matt.kuharic@kingcounty.gov
# people/ unit	Estimating Household Size for Use in Population Estimates (WA state, 2000 average)
	Washington State Office of Financial Management
	Kimpel, T. and Lowe, T. Research Brief No. 47. August 2007; http://www.ofm.wa.gov/researchbriefs/brief047.pdf
	Note: This analysis combines Multi Unit Structures in both large and small units into one category;
	the average is used in this case although there is likely a difference
Residential floorspace per unit	2001 Residential Energy Consumption Survey (National Average, 2001)
	Square footage measurements and comparisons; http://www.eia.doe.gov/emeu/recs/sqft-measure.html
# employees/thousand square feet	Commercial Buildings Energy Consumption Survey commercial energy uses and costs (National Median, 2003)
	Table B2 Totals and Medians of Floorspace, Number of Workers, and Hours of Operation for Non-Mall Buildings, 2003
	http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set1/2003excel/b2.xls
	Note: Data for # employees/thousand square feet is presented by CBECS as square feet/employee.
	In this analysis employees/thousand square feet is calculated by taking the inverse of the CBECS number and multiplying by 1000.
Vehicle related GHG emissions	
Estimate calculated as follows (Washington state, 2006)_	
56,531,930,000	2006 Annual WA State Vehicle Miles Traveled
	Data was daily VMT. Annual VMT was 365*daily VMT.
	http://www.wsdot.wa.gov/mapsdata/tdo/annualmileage.htm
6,395,798	2006 WA state population
	http://quickfacts.census.gov/qfd/states/53000.html
8839	vehicle miles per person per year
0.0506	gallon gasoline/mile
	This is the weighted national average fuel efficiency for all cars and 2 axle, 4 wheel light trucks in 2005. This
	includes pickup trucks, vans and SUVs. The 0.051 gallons/mile used here is the inverse of the more commonly
	known term "miles/per gallon" (which is 19.75 for these cars and light trucks).
	Transportation Energy Data Book. 26th Edition. 2006. Chapter 4: Light Vehicles and Characteristics. Calculations
	based on weighted average MPG efficiency of cars and light trucks.
	http://cta.ornl.gov/data/tedb26/Edition26_Chapter04.pdf
	Note: This report states that in 2005, 92.3% of all highway VMT were driven by the above described vehicles.
	http://cta.ornl.gov/data/tedb26/Spreadsheets/Table3_04.xls
24.3	lbs CO2e/gallon gasoline
	The CO2 emissions estimates for gasoline and diesel include the extraction, transport, and refinement of petroleum
	as well as their combustion.
	Life-Cycle CO2 Emissions for Various New Vehicles. RENew Northfield.
	Available: http://renewnorthfield.org/wpcontent/uploads/2006/04/CO2%20emissions.pdf
	Note: This is a conservative estimate of emissions by fuel consumption because diesel fuel,
2205	with a emissions factor of 26.55 lbs CO2e/gallon was not estimated.
4.93	lbs/metric tonne
	vehicle related GHG emissions (metric tonnes CO2e per person per year)
average lief span of buildings, estimated by replacement time method	See Energy Emissions Worksheet for Calculations
Commercial floorspace per unit	EIA, 2003 Commercial Buildings Energy Consumption Survey (National Average, 2003)
	Table C3. Consumption and Gross Energy Intensity for Sum of Major Fuels for Non-Mall Buildings, 2003
	http://www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/2003set9/2003excel/c3.xls

APPENDIX B
Current Versus Planned Greenspace

Current greenspace, estimated by overlaying the project area on Google Earth. The total area of both paved areas and areas developed with buildings was added using Google Earth measurement tools.

Total area of paving or development, current conditions / no build alternative: 13.2 acres.

Total area of paving or development, proposed under Alternative 1: 13.2 acres.



Source: Google Earth imagery, Accessed January 3, 2025.