



FREQUENT TRANSIT SERVICE STUDY

FINAL REPORT
WSDOT PUBLIC TRANSPORTATION DIVISION

JUNE 2023

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EXECUTIVE SUMMARY

In its 2022 session, the Legislature directed the Washington State Department Of Transportation to conduct a study and develop initial and final reports about statewide transit service benchmarks ([ESSB 5689 – 2022 Sect. 221 \(15\)](#)). WSDOT published the [initial report](#) in December 2022. This final report supplements the initial report and finalizes the study.

The final report builds on definitions and analysis identified in the initial report. This report:

- Identifies gaps in accessible, frequent [fixed-route](#) transit.
- Presents funding scenarios that address identified gaps.
- Analyzes gaps for disparities in race, age, and disability.
- Recommends further studies to measure access to all forms of [public transportation](#).
- Summarizes stakeholder engagement, methodologies, and data sources.

WSDOT engaged the [Joint Transportation Committee](#), a variety of public agency stakeholders, and transit rider advocates to guide the study’s design, findings, and recommendations. This report continues the conversation about the expansion of fixed-route transit and other forms of public transportation (e.g., demand response, micromobility, ridesharing).

Study results

Gaps in accessible, frequent fixed-route transit and scenarios for expanded service

To identify gaps in frequent transit, WSDOT developed two scenarios for expanding frequent fixed-route transit and other forms of public transportation. The scenarios use the initial report’s analysis of current populations living within a half-mile of bus stops served at various frequency levels as the benchmark for comparison to potentially higher levels of service. Current frequency levels are in Table 1.

Table 1: current benchmark of transit-frequency levels, population within a half-mile, and percentage of Washington residents

Transit frequency	Description	Estimated population living within half a mile	Percentage of Washington residents
Level 1	12 min headway days; 15 nights and weekends	530,000	7%
Level 2	15 min headway days; 30 nights and weekends	1,520,000	20%
Level 3	30 min headway days; 60 nights and weekends	3,040,000	40%
Level 4	60 min headway minimum 5 days a week	4,390,000	58%
Level 5	6 trips per day on weekdays	4,610,000	61%
Level 6	2 trips per day on weekdays	4,720,000	63%
24-hour	1 trip every 2 hours overnight	690,000	9%

Table 2 shows the percentage of populations served at each level of fixed-route transit service for the benchmark and the two scenarios for expanded service. The population estimates represent the projected state population in 2038, which is the timeframe of the study’s funding scenarios. The difference between each scenario and the benchmark is the current gap in frequent transit.

Table 2: benchmark compared to scenarios

Transit frequency	Population served: benchmark	Population served: scenario 1	Population served: scenario 2
Level 1	640,000 (7%)	2,750,000 (30%)	1,840,000 (20%)
Level 2	1,840,000 (20%)	3,670,000 (40%)	4,590,000 (50%)
Level 3	3,670,000 (40%)	5,050,000 (55%)	5,320,000 (58%)
Level 4	5,320,000 (58%)	5,600,000 (61%)	5,600,000 (61%)
Level 5	5,600,000 (61%)	5,780,000 (63%)	5,960,000 (65%)
Level 6	5,780,000 (63%)	5,960,000 (65%)	6,420,000 (70%)
24-Hour	830,000 (9%)	3,210,000 (35%)	2,290,000 (25%)

Funding scenarios

WSDOT developed a cost framework to estimate costs for each service-expansion scenario. The framework analyzed operational and capital costs across the past 10 years to project total state transit-system costs for the next 15 years, through 2038. Results are in Table 3.

Table 3: expected costs for benchmark and scenarios for the next 15 years, presented as a range with low and high estimates

	Expected 2038 annual system cost	Expected total 15-year funding need	15-year funding gap from benchmark
No expansion from benchmark	\$5-7 billion	\$64-83 billion	--
Scenario 1 expansion	\$10-14 billion	\$103-131 billion	\$39-48 billion
Scenario 2 expansion	\$8-11 billion	\$84-111 billion	\$20-28 billion

Scenarios 1 and 2 increase access to fixed-route transit for many people in Washington. Increasing access across the state not only requires additional funding but policy changes and successful investments in infrastructure and operations. Current infrastructure, capital equipment, vehicles, policies, and the size of fixed-route transit and the public transportation labor force are inadequate to address the gaps outlined in this report. Members of the stakeholder advisory groups identified areas where short- and long-term changes are needed to expand access to fixed-route transit across the state.

Disparities in race, age, and disability

WSDOT staff explored available demographic data to analyze disparities in transit access by race, age, and disability. The best data available during the study was 2016-2020 American Community Survey data at the block group level, the same data used for general population data in the initial report.

WSDOT replicated the initial report process (see Table 1) for each demographic group at the statewide and county level. Staff performed a series of [regression analyses](#) on the demographic data. Staff also used [cluster analysis](#) to group census block groups by statistical similarities.

These analyses were inconclusive. None of the analyses were successful in developing a statistical model that could demonstrate the presence or absence of disparities on a statewide basis.

Recommendations for future study

Through discussion with stakeholders and subject matter experts, WSDOT developed recommendations for future study:

- In addition to fixed-route service, research the levels and types of [demand-response](#) service and measure access to these services within the state.
- In collaboration with other departments, examine policy options that could integrate land use, energy, transportation, and other expansion requirements.
- Collect data and develop systems to achieve more accurate and precise analysis of disparities in access to fixed-route transit with a focus on accessibility and the inclusion of people with disabilities and other underserved communities.
- Explore funding scenarios that provide stable and long-term funding sources to transit agencies, other municipal entities, and nonprofits to expand fixed-route transit, demand-response transit, Complete Streets, and other accessible infrastructure.

WSDOT will consider and explore the recommendations in its next update of the Washington State Public Transportation Plan.

INTRODUCTION

In its 2022 session, the Legislature directed WSDOT to conduct a study and develop initial and final reports about statewide transit service benchmarks ([ESSB 5689 – 2022 Sect. 221 \(15\)](#)). WSDOT published the [initial report](#)¹ in December 2022. This final report supplements the initial report and finalizes the study.

WSDOT engaged the Joint Transportation Committee, a variety of stakeholders, and transit rider advocates to guide the study design, findings, and recommendations. This report provides information for ongoing conversations about expansion of fixed-route transit and other forms of public transportation.

This report:

- Identifies gaps in accessible, frequent [fixed-route](#) transit.
- Presents funding scenarios that address the identified gaps.
- Analyzes those gaps for disparities in race, age, and disability.
- Recommends further studies to measure access to all forms of [public transportation](#).
- Summarizes stakeholder engagement, methodologies, and data sources.

¹ Key components of the initial report:

- Response to the study's key question ("How many people in Washington live within a half-mile walk of frequent fixed-route transit?") based on available data
- Recommendations for addressing the statewide walkway data gap to more accurately understand how many people live within a half-mile of frequent fixed-route transit stops
- Summaries of stakeholder engagement, methodology, and data sources

STUDY RESULTS

Gaps in accessible, frequent fixed-route transit

WSDOT developed two scenarios for expanding frequent fixed-route transit and other forms of public transportation to identify gaps in frequent transit. The scenarios use the initial report’s analysis of current populations living within a half-mile of bus stops served at various frequency levels (Table 4) as the benchmark for comparison to potentially higher levels of service.

This analysis is based on fixed-route transit services in the state as of August 2022 and 2016-2020 American Community Survey census. This report recognizes that transit services have faced constraints since the COVID-19 pandemic that resulted in service reductions on a statewide basis. It also analyzes the latest data to best model the status of the transit network.

Table 4: current benchmark of transit-frequency levels, population within a half-mile, and percentage of Washington residents

Transit frequency	Description	Estimated population living within half a mile	Percentage of Washington residents
Level 1	12 min headway days, 15 nights and weekends	530,000	7%
Level 2	15 min headway days; 30 nights and weekends	1,520,000	20%
Level 3	30 min headway days; 60 nights and weekends	3,040,000	40%
Level 4	60 min headway minimum 5 days a week	4,390,000	58%
Level 5	6 trips per day on weekdays	4,610,000	61%
Level 6	2 trips per day on weekdays	4,720,000	63%
24-hour	1 trip every 2 hours overnight	690,000	9%

Table 5 illustrates the benchmark—which is percentage of population served at each level of fixed-route transit—and the two scenarios for expanded service. The population estimates demonstrate the state’s projected population in 2038, which is the timeframe of the study’s funding scenarios. The difference between each scenario and the benchmark is the current gap in frequent transit.

Table 5: benchmarks compared to scenarios

Transit frequency	Population served benchmark	Population served scenario 1	Population served scenario 2
Level 1	640,000 (7%)	2,750,000 (30%)	1,840,000 (20%)
Level 2	1,840,000 (20%)	3,670,000 (40%)	4,590,000 (50%)
Level 3	3,670,000 (40%)	5,050,000 (55%)	5,320,000 (58%)
Level 4	5,320,000 (58%)	5,600,000 (61%)	5,600,000 (61%)
Level 5	5,600,000 (61%)	5,780,000 (63%)	5,960,000 (65%)
Level 6	5,780,000 (63%)	5,960,000 (65%)	6,420,000 (70%)
24-Hour	830,000 (9%)	3,210,000 (35%)	2,290,000 (25%)

Scenario 1 focuses on increasing the percentage of the population served by the highest transit-frequency level. In this scenario, 30 percent of Washingtonians would have access to Level 1 transit.

Scenario 2 focuses on increasing access in Level 2 transit. In this scenario, half of Washingtonians would have access to Level 2 transit, and more people would have access to lower transit-frequency levels. However, fewer people than in Scenario 1 would have access to Level 1 transit.

Both scenarios focus on large increases in the highest transit-frequency levels (i.e., levels 1, 2, and 3) while making smaller net increases to levels 4, 5, and 6.

Based on stakeholder feedback and research, areas currently served by levels 1-4 generally have population density and existing infrastructure to support expansion of fixed-route transit. Areas currently served by levels 5 and 6 or that have no current fixed-route transit access may, in many cases, may be better served by expanding access to other forms of public transportation (e.g., [demand response](#)). See [Recommendations for future study](#) for further discussion.

Funding scenarios

WSDOT developed a cost framework to estimate costs for both service-expansion scenarios. The framework analyzed operational and capital costs across the past 10 years to project total state transit system costs for the next 15 years, through 2038. See [Cost types](#) for more information.

Projecting the funding needs for 15 years is an imprecise exercise that relies on many non-financial factors. The projections in Table 6 are rough estimates of all costs, local, state, and federal required to grow the

transit system to the scenario service level for the next 15 years. Across that period, annual system costs would increase from current expenditures of more than \$4 billion per year to the expected 2038 annual system cost in Table 6, adjusted for inflation and growth of the system. The final column indicates the funding gap between expected 15-year costs based on no expansion from the benchmark versus the expected 15-year costs for scenarios 1 and 2.

Table 6: expected costs for benchmark and scenarios for the next 15 years

	Expected 2038 annual system cost	Expected total 15-year funding need	15-year funding gap from benchmark
No expansion from benchmark	\$5-7 billion	\$64-83 billion	--
Scenario 1 expansion	\$10-14 billion	\$103-131 billion	\$39-48 billion
Scenario 2 expansion	\$8-11 billion	\$84-111 billion	\$20-28 billion

Paths to achieving the funding scenarios

Scenarios 1 and 2 increase access to fixed-route transit for many people in Washington. Increasing access across the state not only requires additional funding but policy changes and successful investments in infrastructure and operations. Current infrastructure, capital equipment, vehicles, policies, and the size of fixed-route transit and the public transportation labor force are inadequate to address the gaps outlined in this report.

Some of these issues will be more challenging to address than others. Members of the stakeholder advisory groups identified areas where short- and long-term changes are necessary to expand access to fixed-route transit across the state.

Policy changes

Land-use and transportation infrastructure

Frequent transit works when enough people live, work, and travel in an area served by fixed-route transit and when the service has the infrastructure it needs to operate reliably. Some communities do not have the population density to support fixed-route transit in part because of local and statewide land-use policies.

In many instances, local transportation infrastructure and development codes prioritize personally owned automobile parking and travel over transit reliability, transit priority, and land-use density. Lawmakers should update laws like the Growth Management Act to encourage density, transit-oriented development, transit priority, and other investments in sustainable transportation. During the 2023 session, the legislature passed [E2SHB 1181](#) (Chapter 228, Laws of 2023) which modifies the Growth Management Act to encourage efficient multi-modal transportation.

Funding sources

Fixed-route transit in Washington receives funding primarily through local sales tax. While communities can vote to increase taxes to fund transit, voters across the state do not consistently approve such tax increases, nor do governing boards uniformly pursue tax increases to fund more transit. Because of this, local taxes may not be a stable funding source for fixed-route transit in the long term.

Fixed-route transit also relies on state and federal funding, which carry requirements that can limit or delay expansion.

Infrastructure improvements

To increase fixed-route transit, roads must be improved to accommodate more transit, including dedicated transit-only lanes and turning lanes. New sidewalks, walkways, curb cuts, crosswalks, and other infrastructure need to be constructed for riders of all ages and abilities to access transit and to enable safe and easy use of the system. These infrastructure investments require action from the government agencies that own and operate roads and pathways. More detailed information can be found in the WSDOT [Active Transportation Plan](#).

Zero emissions transitions

The state's transit agencies are engaged in major planning and operational transformations as they continue to move towards zero-emission fleets. Any additional requirements for expanded service and access will increase the need for further capital investments due to the complexity and cost of operating zero-emission technology.

Economic changes

Supply chain

Transit agencies need more buses and bus facilities to increase fixed-route transit. Significantly increasing access to fixed-route transit requires thousands of new vehicles and the expansion of facilities to support and maintain those vehicles. Since 2020, some materials—and particularly, vehicles—have been increasingly difficult to purchase at any price due to supply chain disruptions that have yet to diminish. The supply of zero-emissions vehicles and infrastructure are particularly constrained, and demand will continue to increase rapidly.

Labor shortages

Like many private and public industries, transit currently has a workforce shortage. Specifically in Washington, there is a significant shortage of transit drivers and maintenance workers. Agencies are already unable to meet current service needs because of these shortages, which sometimes require cuts in service. Transit agencies need more drivers to increase service.

COVID-19 recovery

The COVID-19 pandemic resulted in a decline in transit ridership. While ridership is on its way back, it remains below pre-pandemic levels. Increasing service will be difficult in the near term while transit agencies are still addressing the pandemic's effects and returning their services to pre-pandemic levels.

Disparities in race, age, and disability

Overview

WSDOT staff explored available demographic data to analyze disparities in transit access by race, age, and disability. The best data available during the study was 2016-2020 American Community Survey data at the block group level, the same data used for general population data in the initial report.

WSDOT replicated the initial report process (see Table 1) for each demographic group at the statewide and county level. WSDOT staff used software written in [R](#) to perform a series of linear, multivariate, [regression analyses](#) on the same demographic variables and a range of other demographic variables available through the same data set. Staff also used [cluster analysis](#) to group census block groups by statistical similarities and overlaid the initial report process on this cluster analysis.

Because of the known limitations to the available data and study process, these analyses were inconclusive. None of the analyses were successful in developing a statistical model that could demonstrate the presence or absence of disparities on a statewide basis.

Inconclusive results

The table on the following page gives an overview of the data collected, as well as the statewide aggregate population and various demographic groups estimated to live within a half-mile of each level of transit.

Based on limited available data, this table indicates that some demographic groups have rates of transit access somewhat above the rate of the general public, some have similar rates, and some have lower rates. This does not demonstrate the presence of disparities in access based on these demographic factors. The data and process did not include many of the factors critical to the investigation of disparities. See [Data and process limitations](#) for more information.

Table 7: Statewide methodology results based on limited and insufficient data and processes

Transit frequency	General population (percent of statewide population)	Adults with a disability (percent of statewide population)	People in households below 200 percent of federal poverty line (percent of statewide population)	People of Color (percent of statewide population)	Adults 65+ (percent of statewide population)	Youths under 18 (percent of statewide population)
Statewide population	7,512,000	870,000	1,780,000	1,991,000	1,164,000	1,653,000
Level 1	526,000 (7%)	53,000 (6%)	132,000 (7%)	228,000 (11%)	61,000 (5%)	77,000 (5%)
Level 2	1,522,000 (20%)	163,000 (19%)	386,000 (22%)	559,000 (28%)	196,000 (17%)	273,000 (17%)
Level 3	3,037,000 (40%)	340,000 (39%)	795,000 (45%)	1,031,000 (52%)	403,000 (35%)	611,000 (37%)
Level 4	4,395,000 (58%)	508,000 (58%)	1,132,000 (64%)	1,376,000 (69%)	620,000 (53%)	923,000 (56%)
Level 5	4,612,000 (61%)	531,000 (61%)	1,175,000 (66%)	1,429,000 (72%)	654,000 (56%)	977,000 (59%)
Level 6	4,720,000 (63%)	544,000 (63%)	1,206,000 (68%)	1,455,000 (73%)	672,000 (58%)	1,006,000 (61%)
24-Hour	690,000 (9%)	66,000 (8%)	157,000 (9%)	277,000 (14%)	81,000 (7%)	105,000 (6%)

Data and process limitations

This section describes the barriers that prevented the analyses from identifying conclusive results.

Insufficient data

Multiple significant data gaps exist that prevented WSDOT from better analyzing demographic disparities in access to transit.

Walkways

As noted in the initial report, no statewide data exists on walkways, including their accessibility features. Because of this, the current study methodology uses half-mile radiuses to calculate distance to transit. However, walking routes are not evenly distributed, and it is likely that the demographics of individuals who actually live within a half-mile and walk along an accessible route to transit are different than the demographics of the population estimated in this study.

Residences

This study uses census data at the block group level. Block groups are areas of widely variable size and the exact locations of populations within those block groups are not known. Population demographics within each block group are likely not evenly distributed. However, this report assumes an even distribution.

To maintain individual privacy, the Census Bureau will never release counts attached to individual households and has started to insert “noise” into published data to prevent individuals from being identified. However, developing standards for consistent zoning data and other investments to better estimate exact population locations could greatly increase the accuracy and precision of the report’s analysis.

Destinations

This study only looks at transit access where people live – but every trip starts somewhere and ends somewhere else. For someone to safely complete any trip, access to destinations is as important as access from their residence. While data is available for some destinations (e.g., employment, landmarks), the analysis required to collect and interpret that data is extensive and outside the scope of this report. As such, the current methodology is only analyzing half of the accessibility of any given trip.

Transit service performance

This study relies on transit-service-schedule data. However, actual service rarely aligns perfectly with scheduled service. Some trips may be missed and many services may be late or early, which can have a significant effect on the practical usefulness of transit service. Some transit agencies publish real-time data feeds related to system performance – but not all agencies consistently publish that data, and WSDOT currently lacks the technical capacity to manage and review it to understand the difference between scheduled and actual service.

Point-in-time analysis

Trend analysis would provide important context to the analysis of disparities in this study.

This study relied on transit service data from 2022 and population data from 2016 through 2020. Transit service has changed since 2022 and people have continued to move to and around Washington since 2020. The COVID-19 pandemic disrupted and sped up these trends, leading to reduced transit service and significant changes in population data.

For example, the data in this report shows that People of Color are more likely to live in dense areas that have access to frequent transit. However, during the timeframe in which population data for this study was collected, there has been displacement of People of Color and low-income residents from city centers to suburbs, where transit access is traditionally lower.

Prior to the 2022 legislative proviso directing WSDOT to conduct this study, the agency had not historically collected transit data and analyzed access using the methods in this report. Until there is a historical record of trends in access as they change over time, it will continue to be difficult to determine disparities from single-point-in-time studies.

Community and individual needs

Community engagement should be paired with a more robust quantitative, analytical approach in future studies.

This study applies a consistent methodology across all communities in the state. This approach is valuable and necessary to objectively analyze transit access on a statewide basis. However, a standardized approach does not account for unique communities and individuals.

In addition to filling data and analysis gaps, planners must conduct more robust community engagement to identify the needs and priorities of community members and visitors.

Recommendations for continued research and system development

An improved analysis of disparities—i.e., one that identifies specific locations in the transportation network where access is low and likely to have a significant effect on vulnerable populations living in overburdened communities—is possible. Successfully performing such an analysis requires:

- Collecting improved data on the transit, pedestrian, and road networks, as well as the places where people live and the destinations to which they travel.
- Performing and improving routine analysis over time to track changes and identify trends as they emerge.
- Coordinating quantitative analysis with qualitative research and community engagement to illustrate the barriers to access not easily found through quantitative approaches.

WSDOT would need to pursue all three approaches to fulfill the desired goals of this study. The agency recommends integrating these approaches into the statewide Public Transportation Plan process along with other ongoing WSDOT research efforts.

STUDY CONCLUSION

This study responded to a legislative request to define, measure, and specify a funding scenario that improves access to frequent fixed-route transit. WSDOT did not frame this study around any other specific statewide goals such as those related to carbon emissions, budget, or equity.

WSDOT believes expanding public transportation supports Washington's statewide transportation system policy goals: preservation, safety, stewardship, mobility, economic vitality, and environment. In addition, expanding public transportation would improve the relative performance of the transportation system for vulnerable populations in overburdened communities, decrease carbon emissions, reduce vehicle miles traveled, lower out-of-pocket costs per trip, and improve resiliency.

This study provides an initial framework for the beginning of a discussion about the policy and budget changes necessary to maintain a sustainable, cost-effective, and equitable transportation system.

Recommendations for future study

Through discussion with stakeholders and subject matter experts, WSDOT developed recommendations for future study:

- In addition to fixed-route service, research the levels and types of demand-response service and measure access to these services within the state.
- In collaboration with other departments, examine policy options that could integrate land use, energy, transportation, and other expansion requirements.
- Collect data and develop systems to achieve more accurate and precise analysis of disparities in access to fixed-route transit with a focus on accessibility and the inclusion of people with disabilities and other underserved communities.
- Explore funding scenarios that provide stable and long-term funding sources to transit agencies, other municipal entities, and nonprofits to expand fixed-route transit, demand-response transit, Complete Streets, and other accessible infrastructure.

WSDOT will consider and explore the recommendations in its next version of its Public Transportation Plan.

APPENDIX A: STUDY PROCESS

The following describes major steps of this study, including formative decision-making, engagement structure, data assessment, and analysis.

Statewide benchmark

To understand and document gaps in access to frequent transit, WSDOT began the analysis process by defining benchmarks as the number of people who currently have access to frequent fixed-route transit. WSDOT did this by calculating how many people have access to each level of frequent transit as defined in the initial report.

WSDOT developed benchmarks for the population as a whole and for People of Color, older adults, and people with disabilities. WSDOT selected these population groups as part of the benchmark because they would help to inform the portion of the report about disparity of access based on age, race, and disability.

Gaps

WSDOT staff identified gaps in frequent fixed-route transit by developing two different scenarios that illustrate the expansion of fixed-route transit and other forms of public transportation. WSDOT calculated the differences between increased service and benchmarks from the number of people who had access to each level of frequent fixed-route transit defined in the initial report. WSDOT developed the scenarios to have an even service level upon which to develop funding scenarios, while also demonstrating different visions of increased access to transit.

Processes to analyze demographic disparities

WSDOT based its demographic analyses on the process used in the initial report to calculate the percentage of people who live within a half-mile of transit stops of each level of service. WSDOT applied this process in three ways for different views of access to each level of transit:

- **Statewide:** WSDOT calculated access to each level of transit by each demographic group on a statewide basis.
- **County:** WSDOT calculated access to each level of transit by each demographic group on a county-by-county basis.
- **Cluster:** WSDOT used a “cluster” analysis to categorize census areas into different types of statistical groupings, then calculated access to each level of transit by each demographic group within each resulting cluster.

WSDOT collected the demographic data from the 2016-2020 American Community Survey at the block group level and included:

- Adults 18 and older with a disability
- People of Color (total people minus white/non-Hispanic people)
- Youth under 18
- Adults 65 or older
- People in households with incomes below 100 percent of the federal poverty line
- People in households with incomes below 200 percent of the federal poverty line

Additionally, WSDOT used linear regression analysis tools in ArcGIS Pro and R code libraries to experiment with different statistical models that might provide additional analytical value. WSDOT incorporated additional data also at the block group level for this process including:

- Population density
- Job density (using the U.S. Census' Longitudinal Employer-Household Dynamics data)
- Households without a vehicle
- Limited-English-proficiency households
- Local sales tax rate (using Washington Department of Revenue data joined with Public Transit Benefit Area boundaries and census block group boundaries)

After considering different statistical approaches with stakeholders and consultants with demographic data science expertise, WSDOT staff determined these statistical approaches insufficient to describe any disparities in access.

Process to define funding scenarios

WSDOT developed a financial model to calculate rough cost estimates to represent funding scenarios, then bundled multiple cost types into the unit of account in a roughly accurate way. However, WSDOT intended this exercise only to identify the financial scale of a large service-expansion plan, not the actual expected cost of delivering future service improvements. The method considers costs for:

- Operational expenses
- Capital investments
- Service-expansion costs
- Paratransit costs

The next two sections describe the process for defining the financial model, and the sources of data and process that WSDOT used to incorporate costs of each type.

People served as a unit of account

This report's analyses count the number of people estimated to live within a half-mile radius of frequent transit stops. Consistent with that process, WSDOT calculated the cost of the scenarios developed in this report by developing assumptions of the cost to provide transit within a half mile of each person in the state at each frequent transit level. The process used to calculate the per-person costs for each level of transit is below.

1. Sum up all costs (see [Cost types](#) for more information) for the 10-year period of 2012 through 2021 for all agencies in Washington.
2. Normalize the costs of each year on 2021 service levels (note that 2021 service levels were about 25 percent lower than 2019 service levels on a statewide basis) and dollars by:
 - a. Correcting for changes in level of service by adjusting the previous year's costs based on relative aggregate revenue miles of service provided by all agencies.
 - b. Accounting for inflation based on the Producer Price Index (similar to the Consumer Price Index – also published by the US Bureau of Labor Statistics, the PPI measures inflation for organizations that produce consumer products).

3. Calculate the average annual cost of the system at 2021 service levels and dollars, by dividing total normalized expenditures over the 10-year period by 10.
4. Scale costs per person based on level of transit provided to each person, assuming the following cost ratios (WSDOT selected these ratios based on rough scaling of service between levels, accounting for the trend of relatively higher density with higher levels of transit):
 - a. Level 6 = 1
 - b. Level 5 = 2.5
 - c. Level 4 = 4
 - d. Level 3 = 7
 - e. Level 2 = 12
 - f. Level Night = 14
 - g. Level 1 = 20

For example, if the average cost per person is \$100, depending on the balance of levels of service in the state, the cost of providing Level 6 transit would be \$10 per person, while the cost of providing Level 1 transit would be \$200 per person.

5. WSDOT then used these per-person costs to calculate an estimate for the cost of providing service to people according to the frequent transit levels, along with expected inflation, over the timeframe of service growth in each scenario.

Cost types

WSDOT included the following types of costs and cost assumptions to determine the sum of all transit costs.

Operational and capital costs for all modes

WSDOT gathered costs as well as revenue miles from the [Summary of Public Transportation](#). WSDOT included operational and capital costs for all public transit modes, including demand-response and vanpool, as these services are often deployed by transit agencies along with fixed-route service and would generally be expected to expand along with fixed-route service.

Service expansion versus ongoing service

WSDOT included additional costs in significant service expansions beyond operating the service due transit agencies' needs for hiring, training, planning, marketing, and other work related to growing service. WSDOT included these costs because this study assumes there will be significant service expansions and a means to calculate the expense of this growth was necessary. WSDOT also accounted for capital expenditures based on how rapidly the transit services are expected to grow in each scenario.

Timeline of expenses

WSDOT chose to calculate growth toward the scenarios across a 15-year timeframe to 2038 assuming a 3-percent rate of inflation over that timeframe for the low-end estimate and a 4-percent rate of inflation for the high-end estimate.

WSDOT assumed service levels as well as operational and capital costs will scale linearly, adjusted for inflation, over the timeline of investment. In other words, if the population within a half-mile of a level of frequent transit increases by 50 percent over a 15-year timeframe, the base operational and capital costs will be 50 percent higher plus the rate of expected inflation over that timeframe.

WSDOT assumed that additional capital expenses beyond the trend line from the previous 10 years would be necessary, especially during the beginning of the project period, to meet the service levels of each scenario. Scenario 1, which is assumed to require more rail infrastructure, was assumed to have greater additional capital costs than Scenario 2, which would extend for a longer period.

WSDOT added the cost of 15 years of service to calculate the expected 15-year base operational and capital costs.

Legislative direction, decision-making process, and stakeholder engagement framework

In its 2022 session, the Legislature directed WSDOT to conduct a study and develop initial and final reports about statewide transit service benchmarks (ESSB 5689 – 2022 Sect. 221 (15)). WSDOT published the initial report in December 2022. This is the final report on the study.

WSDOT continued with the decision-making process it established during the development of the initial report and used the initial report as a foundation for the final report.

WSDOT began work on the study in June 2022 by interviewing a cross-section of stakeholders. These stakeholders included:

- Urban, small-urban, and rural transit staff.
- Nonprofit employers who represent transit riders and prospective transit riders.
- People knowledgeable about transit-data science.

The project team used information from these interviews to develop a high-level approach for the study and create a structure for engagement throughout the project.

WSDOT worked with individuals and groups in the following ways throughout the study:

Ad hoc engagement

WSDOT project team members, advisory group members, and individual stakeholders were encouraged to provide input when and however they wanted, be it one time or frequently.

Examples of engagement included individual and small group discussions with project team members and advisory groups, presentations by project team members, emails, document reviews and comment periods, and an open house website.

Advisory groups

WSDOT recruited and convened both technical and policy advisory groups to inform and guide the study and make recommendations to WSDOT executives. These groups provided continuity of engagement and group interaction, which supported learning and insights that emerged from iteration.

Joint Transportation Committee and WSDOT executives

Project team members consulted with both the Joint Transportation Committee staff and WSDOT executives to develop an engagement approach, give periodic briefings at key project milestones, and perform draft-document review.

APPENDIX B: STAKEHOLDER ADVISORY GROUPS²

Policy advisory group members

- Amy Asher, Mason Transit
- Don Chartock, WSDOT Public Transportation Division
- Celeste Gilman, WSDOT Active Transportation Division
- Tom Hingson, Everett Transit
- Justin Leighton, Washington State Transit Association
- E Susan Meyer, Spokane Transit
- Paulo Nunes-Ueno, Front and Centered
- Angie Peters, Valley Transit
- Hester Serebrin, Transportation Choices Coalition
- Anna Zivarts, Disability Rights Washington

Technical advisory group members

- Melissa Gaughan, King County Metro
- Brian Lee, Puget Sound Regional Council
- Justin Leighton, Washington State Transit Association
- Steffani Lillie, Kitsap Transit
- Karl Otterstrom, Spokane Transit
- Lindsey Sehmel, Pierce Transit
- Tony Tompos, Pullman Transit
- Brad Windler, Skagit Transit

² WSDOT's Government and Tribal Relations office reached out to tribal representatives to request their participation on the study's advisory group.

APPENDIX C: GLOSSARY

Access and accessibility

Unless otherwise specified in this report, accessibility means the ability of people to access fixed-route transit stops by using walkway infrastructure.

This framing of accessibility includes considerations of American with Disability Act (ADA) requirements for transit facilities, such as transit stops. It does not include access to ADA-required complementary paratransit service or ADA requirements for transit operations.

Cluster analysis

An analysis technique that finds trends in how different demographic qualities tend to group together.

Demand-response service

Any service that responds to rider requests for service by stopping at an unplanned location along a fixed route, deviating from a fixed route, or by initiating a trip to serve the rider (and possibly other riders) that would not otherwise have been performed.

Fixed-route service

Any shared-ride service that picks up or drops off passengers at designated locations according to a schedule.

Headway

The time between consecutive buses running on a fixed-route schedule.

Linear regression analysis

A technique that finds statistically significant correlations (e.g., positive and negative, small and large) between different demographic qualities.

Public transportation

Any form of transportation, accessible and available to the public, which does not involve a single person in a motorized vehicle. "Public" in this sense refers to the access to the service, not to the ownership of the system providing the service.

ENGLISH**Title VI Notice to Public**

It is the Washington State Department of Transportation's (WSDOT) policy to assure that no person shall, on the grounds of race, color, national origin, as provided by Title VI of the Civil Rights Act of 1964, be excluded from participation in, be denied the benefits of, or be otherwise discriminated against under any of its programs and activities. Any person who believes his/her Title VI protection has been violated, may file a complaint with WSDOT's Office of Equity and Civil Rights (OECR). For additional information regarding Title VI complaint procedures and/or information regarding our non-discrimination obligations, please contact OECR's Title VI Coordinator at (360) 705-7090.

Americans with Disabilities Act (ADA) Information

This material can be made available in an alternate format by emailing the Office of Equity and Civil Rights at wsdotada@wsdot.wa.gov or by calling toll free, 855-362-4ADA(4232). Persons who are deaf or hard of hearing may make a request by calling the Washington State Relay at 711.

ESPAÑOL**Notificación de Título VI al Público**

La política del Departamento de Transporte del Estado de Washington (Washington State Department of Transportation, WSDOT) es garantizar que ninguna persona, por motivos de raza, color u origen nacional, según lo dispuesto en el Título VI de la Ley de Derechos Civiles de 1964, sea excluida de la participación, se le nieguen los beneficios o se le discrimine de otro modo en cualquiera de sus programas y actividades. Cualquier persona que considere que se ha violado su protección del Título VI puede presentar una queja ante la Oficina de Equidad y Derechos Civiles (Office of Equity and Civil Rights, OECR) del WSDOT. Para obtener más información sobre los procedimientos de queja del Título VI o información sobre nuestras obligaciones contra la discriminación, comuníquese con el coordinador del Título VI de la OECR al (360) 705-7090.

Información de la Ley sobre Estadounidenses con Discapacidades (ADA, por sus siglas en inglés)

Este material puede estar disponible en un formato alternativo al enviar un correo electrónico a la Oficina de Equidad y Derechos Civiles a wsdotada@wsdot.wa.gov o llamando a la línea sin cargo 855-362-4ADA(4232). Personas sordas o con discapacidad auditiva pueden solicitar la misma información llamando al Washington State Relay al 711.

한국어 – KOREAN**제6조 관련 공지사항**

워싱턴 주 교통부(WSDOT)는 1964년 민권법 타이틀 VI 규정에 따라, 누구도 인종, 피부색 또는 출신 국가를 근거로 본 부서의 모든 프로그램 및 활동에 대한 참여가 배제되거나 혜택이 거부되거나, 또는 달리 차별받지 않도록 하는 것을 정책으로 하고 있습니다. 타이틀 VI에 따른 그/그녀에 대한 보호 조항이 위반되었다고 생각된다면 누구든지 WSDOT의 평등 및 민권 사무국(OECR)에 민원을 제기할 수 있습니다. 타이틀 VI에 따른 민원 처리 절차에 관한 보다 자세한 정보 및/또는 본 부서의 차별금지 의무에 관한 정보를 원하신다면, (360) 705-7090으로 OECR의 타이틀 VI 담당자에게 연락해주시시오.

미국 장애인법(ADA) 정보

본 자료는 또한 평등 및 민권 사무국에 이메일 wsdotada@wsdot.wa.gov 을 보내시거나 무료 전화 855-362-4ADA(4232)로 연락하셔서 대체 형식으로 받아보실 수 있습니다. 청각 장애인은 워싱턴주 중계 711로 전화하여 요청하실 수 있습니다.

русский – RUSSIAN**Раздел VI Общественное заявление**

Политика Департамента транспорта штата Вашингтон (WSDOT) заключается в том, чтобы исключить любые случаи дискриминации по признаку расы, цвета кожи или национального происхождения, как это предусмотрено Разделом VI Закона о гражданских правах 1964 года, а также случаи недопущения участия, лишения льгот или другие формы дискриминации в рамках любой из своих программ и мероприятий. Любое лицо, которое считает, что его средства защиты в рамках раздела VI были нарушены, может подать жалобу в Ведомство по вопросам равенства и гражданских прав WSDOT (OECR). Для дополнительной информации о процедуре подачи жалобы на несоблюдение требований раздела VI, а также получения информации о наших обязательствах по борьбе с дискриминацией, пожалуйста, свяжитесь с координатором OECR по разделу VI по телефону (360) 705-7090.

Закон США о защите прав граждан с ограниченными возможностями (ADA)

Эту информацию можно получить в альтернативном формате, отправив электронное письмо в Ведомство по вопросам равенства и гражданских прав по адресу wsdotada@wsdot.wa.gov или позвонив по бесплатному телефону 855-362-4ADA(4232). Глухие и слабослышащие лица могут сделать запрос, позвонив в специальную диспетчерскую службу штата Вашингтон по номеру 711.(4232). Глухие и слабослышащие лица могут сделать запрос, позвонив в специальную диспетчерскую службу штата Вашингтон по номеру 711.

tiếng Việt – VIETNAMESE

Thông báo Khoản VI dành cho công chúng

Chính sách của Sở Giao Thông Vận Tải Tiểu Bang Washington (WSDOT) là bảo đảm không để cho ai bị loại khỏi sự tham gia, bị từ khước quyền lợi, hoặc bị kỳ thị trong bất cứ chương trình hay hoạt động nào vì lý do chủng tộc, màu da, hoặc nguồn gốc quốc gia, theo như quy định trong Mục VI của Đạo Luật Dân Quyền năm 1964. Bất cứ ai tin rằng quyền bảo vệ trong Mục VI của họ bị vi phạm, đều có thể nộp đơn khiếu nại cho Văn Phòng Bảo Vệ Dân Quyền và Bình Đẳng (OECR) của WSDOT. Muốn biết thêm chi tiết liên quan đến thủ tục khiếu nại Mục VI và/hoặc chi tiết liên quan đến trách nhiệm không kỳ thị của chúng tôi, xin liên lạc với Phối Trí Viên Mục VI của OECR số (360) 705-7090.

Thông tin về Đạo luật Người Mỹ tàn tật (Americans with Disabilities Act, ADA)

Tài liệu này có thể thực hiện bằng một hình thức khác bằng cách email cho Văn Phòng Bảo Vệ Dân Quyền và Bình Đẳng wsdotada@wsdot.wa.gov hoặc gọi điện thoại miễn phí số, 855-362-4ADA(4232). Người điếc hoặc khiếm thính có thể yêu cầu bằng cách gọi cho Dịch vụ Tiếp âm Tiểu bang Washington theo số 711.

العَرَبِيَّة – ARABIC

العنوان 6 إشعار للجمهور

تتمثل سياسة وزارة النقل في ولاية واشنطن (WSDOT) في ضمان عدم استبعاد أي شخص، على أساس العرق أو اللون أو الأصل القومي من المشاركة في أي من برامجها وأنشطتها أو الحرمان من الفوائد المتاحة بموجبها أو التعرض للتمييز فيها بخلاف ذلك، كما هو منصوص عليه في الباب السادس من قانون الحقوق المدنية لعام 1964. ويمكن لأي شخص يعتقد أنه تم انتهاك حقوقه التي يكفلها الباب السادس تقديم شكوى إلى مكتب المساواة والحقوق المدنية (OECR) التابع لوزارة النقل في ولاية واشنطن. للحصول على معلومات إضافية بشأن إجراءات الشكاوى و/أو بشأن التزاماتنا بعدم التمييز بموجب الباب السادس، يرجى الاتصال بمكتب الباب السادس في مكتب المساواة والحقوق المدنية على الرقم 705-7090 (360).

معلومات قانون الأمريكيين ذوي الإعاقة (ADA)

يمكن توفير هذه المواد في تنسيق بديل عن طريق إرسال رسالة بريد إلكتروني إلى مكتب المساواة والحقوق المدنية على wsdotada@wsdot.wa.gov أو عن طريق الاتصال بالرقم المجاني: 855-362-4ADA (4232). يمكن للأشخاص الصم أو ضعاف السمع تقديم طلب عن طريق الاتصال بخدمة Washington State Relay على الرقم 711.

中文 – CHINESE

《权利法案》Title VI公告

<華盛頓州交通部(WSDOT)政策規定，按照《1964年民權法案》第六篇規定，確保無人因種族、膚色或國籍而被排除在WSDOT任何計畫和活動之外，被剝奪相關權益或以其他方式遭到歧視。如任何人認為其第六篇保護權益遭到侵犯，則可向WSDOT的公平和民權辦公室(OECR)提交投訴。如需關於第六篇投訴程式的更多資訊和/或關於我們非歧視義務的資訊，請聯絡OECR的第六篇協調員，電話(360) 705-7090。

《美国残疾人法案》(ADA)信息

可向公平和民權辦公室發送電子郵件 wsdotada@wsdot.wa.gov 或撥打免費電話 855-362-4ADA(4232)，以其他格式獲取此資料。听力丧失或听觉障碍人士可拨打711联系Washington州转接站。

Af-soomaaliga – SOMALI

Ciwaanka VI Ogeysiiska Dadweynaha

Waa siyaasada Waaxda Gaadiidka Gobolka Washington (WSDOT) in la xaqiijiyo in aan qofna, ayadoo la cuskanaayo sababo la xariira isir, midab, ama wadanku kasoo jeedo, sida ku qoran Title VI (Qodobka VI) ee Sharciga Xaquuqda Madaniga ah ah oo soo baxay 1964, laga saarin ka qaybgalka, loo diidin faa'iidooyinka, ama si kale loogu takoorin barnaamijyadeeda iyo shaqooyinkeeda. Qof kasta oo aaminsan in difaaciisa Title VI la jebiyay, ayaa cabasho u gudbin kara Xafiiska Sinaanta iyo Xaquuqda Madaniga ah (OECR) ee WSDOT. Si aad u hesho xog dheeraad ah oo ku saabsan hanaannada cabashada Title VI iyo/ama xogta la xariirta waajibaadkeena ka caagan takoorka, fadlan la xariir Iskuduwaha Title VI ee OECR oo aad ka wacayso (360) 705-7090.

Macluumaadka Xeerka Naafada Marykanka (ADA)

Agabkaan ayaad ku heli kartaa qaab kale adoo iimeel u diraaqa Xafiiska Sinaanta iyo Xaquuqda Madaniga ah oo aad ka helayso wsdotada@wsdot.wa.gov ama adoo wacaaya laynka bilaashka ah, 855-362-4ADA(4232). Dadka naafada maqalka ama maqalku ku adag yahay waxay ku codsan karaan wicitaanka Adeega Gudbinta Gobolka Washington 711.

If you have difficulty understanding English, you may, free of charge, request language assistance services by calling 360-705-7921 or email us at: PubTrans@wsdot.wa.gov

ESPAÑOL - SPANISH

Servicios de traducción

Aviso a personas con dominio limitado del idioma inglés: Si usted tiene alguna dificultad en entender el idioma inglés, puede, sin costo alguno, solicitar asistencia lingüística con respecto a esta información llamando al 360-705-7921, o envíe un mensaje de correo electrónico a: PubTrans@wsdot.wa.gov

한국어 - KOREAN

번역 서비스

영어로 소통하는 것이 불편하시다면 360-705-7921, 으로 전화하시거나 다음 이메일로 연락하셔서 무료 언어 지원 서비스를 요청하실 수 있습니다: PubTrans@wsdot.wa.gov

русский - RUSSIAN

Услуги перевода

Если вам трудно понимать английский язык, вы можете запросить бесплатные языковые услуги, позвонив по телефону 360-705-7921, или написав нам на электронную почту: PubTrans@wsdot.wa.gov

tiếng Việt - VIETNAMESE

các dịch vụ dịch thuật

Nếu quý vị không hiểu tiếng Anh, quý vị có thể yêu cầu dịch vụ trợ giúp ngôn ngữ, miễn phí, bằng cách gọi số 360-705-7921, hoặc email cho chúng tôi tại: PubTrans@wsdot.wa.gov

العَرَبِيَّةُ - ARABIC

خدمات الترجمة

إذا كنت تجد صعوبة في فهم اللغة الإنجليزية، فيمكنك مجاناً طلب خدمات المساعدة اللغوية عن طريق الاتصال بالرقم 360-705-7921 أو مراسلتنا عبر البريد الإلكتروني: PubTrans@wsdot.wa.gov

中文 - CHINESE

翻译服务

如果您难以理解英文，则请致电：360-705-7921，或给我们发送电子邮件：PubTrans@wsdot.wa.gov，请求获取免费语言援助服务。

Af-soomaaliga - SOMALI

Adeegyada Turjumaada

Haddii ay kugu adag tahay inaad fahamtid Ingiriisida, waxaad, bilaash, ku codsan kartaa adeegyada caawimada luuqada adoo wacaaya 360-705-7921 ama iimayl noogu soo dir: PubTrans@wsdot.wa.gov

MORE INFORMATION

Monica Ghosh

Washington State Department of Transportation
Public Transportation Division
360-810-1191
Monica.Ghosh@wsdot.wa.gov

Thomas Craig

Washington State Department of Transportation
Public Transportation Division
Thomas.Craig@wsdot.wa.gov